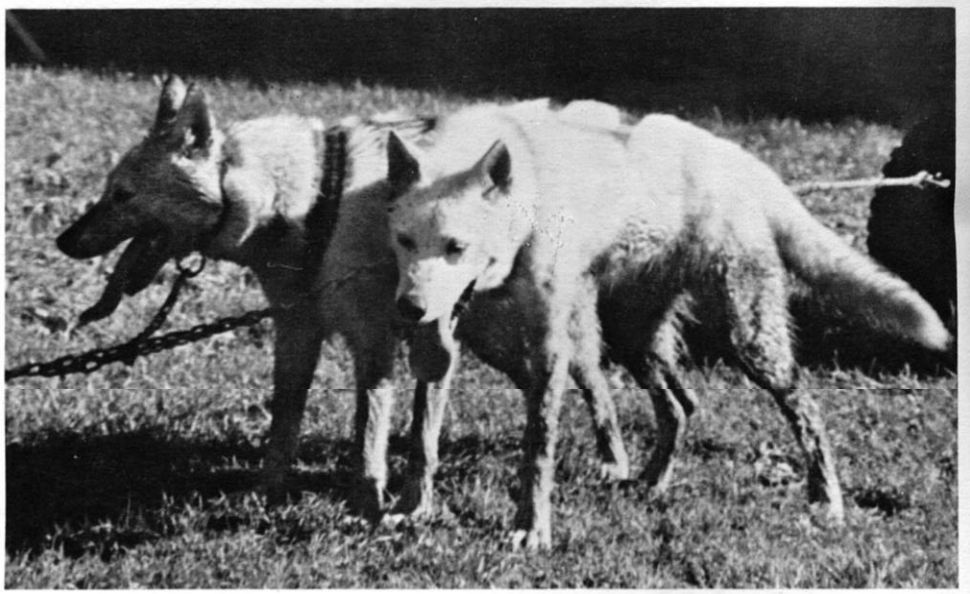
Heat Stress in Dogs

by Robert L. Downey and illustrated by HOWL

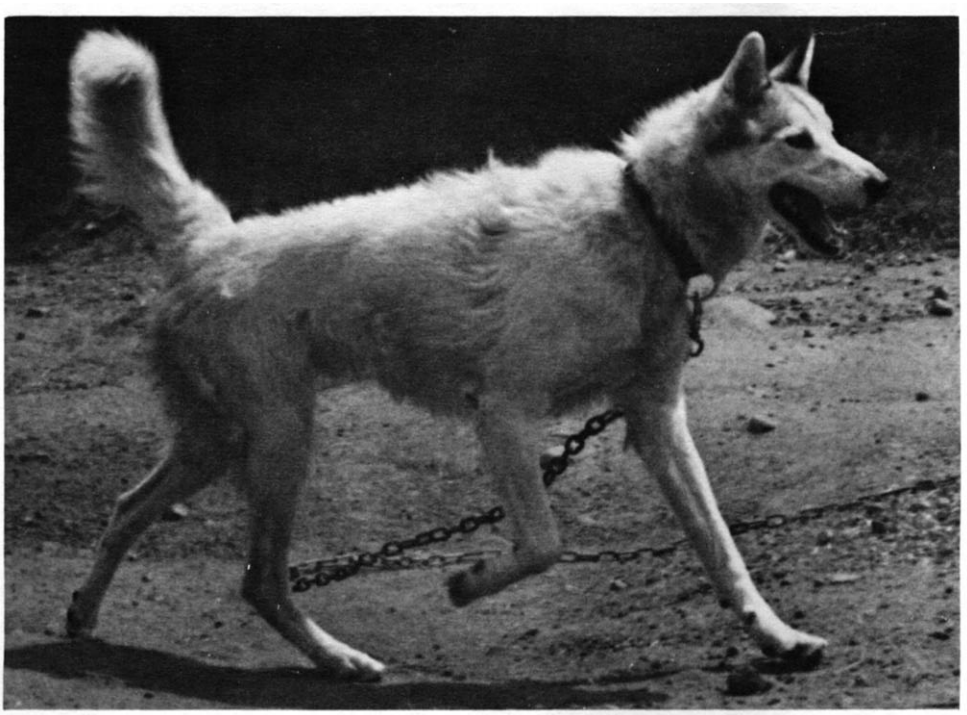
HOWL gratefully thanks R.L. Downey for allowing us the liberty to use his 1981 paper on heat stress in sled dogs. The following presentation edits the original paper and employs sections of the original text as captions with photos to illustrate the context. Some narrative information not found in the original text has been added. Capitals used for emphasis are added.

Heat is one of the most severe environmental stresses a dog can be subjected to. It may decrease appetite, growth, reproduction, and working ability.

Major changes in body fluids and tissues associated with over heating is known as **Hyperthermia**. This condition may be influenced by the dog's muscular exertion, physical condition, hair coat, and surrounding factors like relative humidity and ventilation. The severity and duration of hyperthermia is influenced by 3 separate but often interrelated syndromes.



If these dog's have been worked TOO HARD for TOO LONG they may not eat well tonight or exercise as well tomorrow due to HEA T STRESS.



There may be little outward evidence of clinical harm associated with heat stress, while major changes have occurred in body fluids and /issues. This over heating is called HYPERTHERMIA

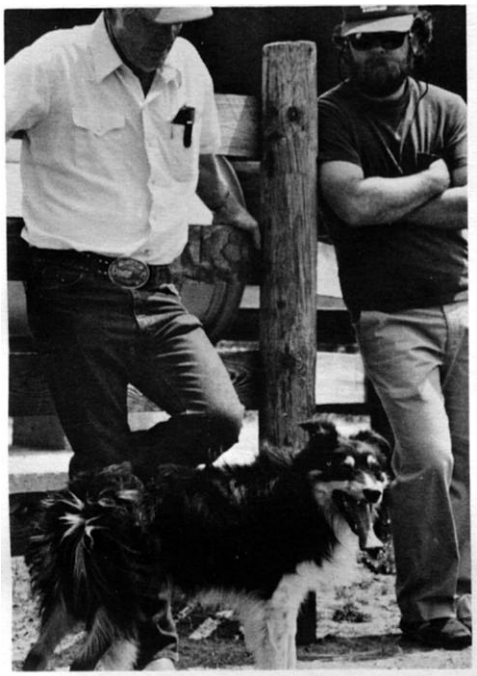
HEATSTROKE

HEATSTROKE also known as sunstroke, can be noted by the sudden onset of high fever and sudden collapse. It is the most lethal and most common of the three syndromes. It most frequently occurs when environmental temperature exceeds normal body temperature and results from inadequate elimination of heat from the body. Immediate cooling of the animal must occur to avoid possible permanent brain damage if not death.

The optimum environmental temperature for the dog is between 60-70 degrees F. In this range there is little or no temperature stress on him. **Extreme** caution should be used when cooling off the dog. When the body temperature of the dog falls to within 2-3 degrees F of his normal temperature, cooling off efforts should cease for fear of the body temperature continuing to fall below normal. This equally serious problem is called HYPOTHERMIA.

It is very important for warm climate trainers to INCREASE their CONDITIONING program SLOWLY during warmer weather periods in their area, especially in the absence of wind and/or when the humidity is high along with the temperature.

Since physical FITNESS INCREASES HEAT TOLERANCE. Take your time to



Shepherd.7 like noted veteran Border Collie trialer, Lewis Pulfer, knows the dangers of working in the high humidity and severe heat of summer in places like Ohio, Virginia or Texas.

ACCLIMATIZE your dogs to warm weather. Acclimation to a hotter environment INCREASES ABILITY to WORK in HIGHER TEMPERATURES. The acclimation process takes 7 to 9 days to 3 weeks. depending on the condition of the animal.

Generally speaking, most heat problems can be avoided with proper ventilation, shade, and plenty of clean, cold drinking water.

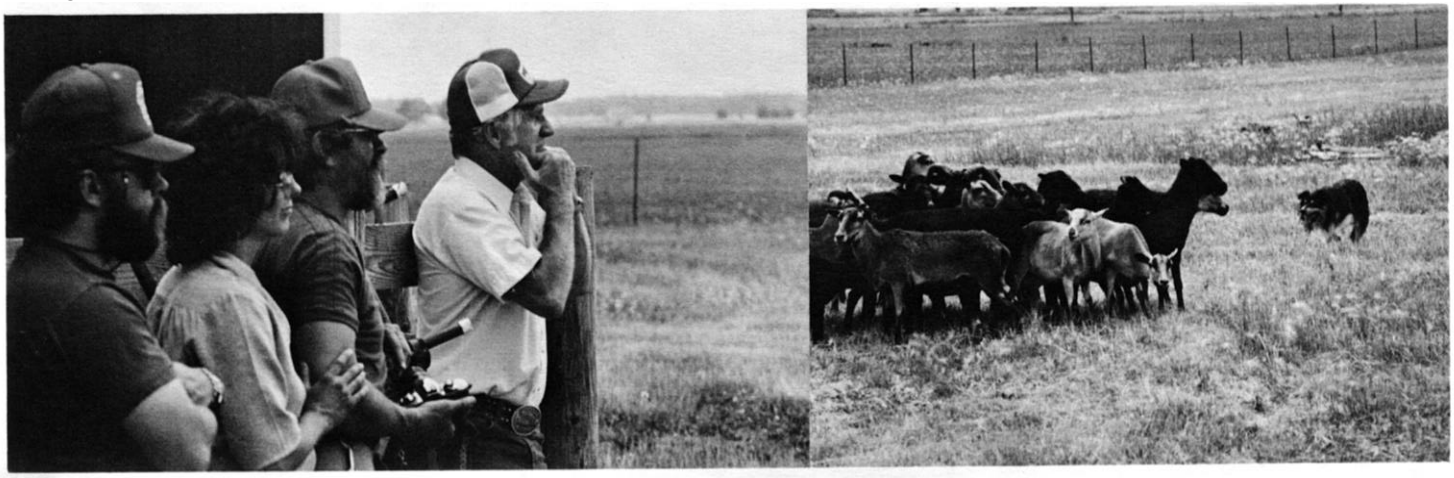
HEAT CRAMPS

Heat cramps, the rarest of the 3 heat caused syndromes, is usually seen in working dogs following severe exertion in hot weather. These are painful muscle spasms.

HEAT EXHAUSTION

An interesting theory has evolved in regards to heat exhaustion in dogs. Heat Exhaustion is complicated by the dog's panting to dissipate heat. Severe and strenuous exercise in dogs leads to metabolic acidosis from the accumulation of lactic and other acids in the body. This allows the respiratory center in the brain to become overly sensitive to the slight decrease in oxygen headed for the brain. Panting increases even more to increase oxygen intake and dissipate heat. Increased panting leads to excessive depletion of carbon dioxide hypocapnia. The body attempts to conserve carbon dioxide by decreasing breathing thus limiting the dissipation of heat and oxygen availability. If the breathing does not decrease, the excessive losses of carbon dioxide leads to constriction of the small vessels carrying blood to the brain, which can cause collapsing. This under-ventilation diminishes heat loss from the dog, allowing increased danger of heat exhaustion. This is commonly seen in dogs working in temperatures in which they arc not acclimated.

Most of the work done in acclimation to heat has been done in humans. In unfit humans it took some almost 3 weeks climatize, while some very fit humans took only 4 days! Remember, heat acclimatization and physical conditioning both lead to LARGE INCREASES of PERFORMANCE in HEAT, resulting largely from changes in the cardiovascular system.

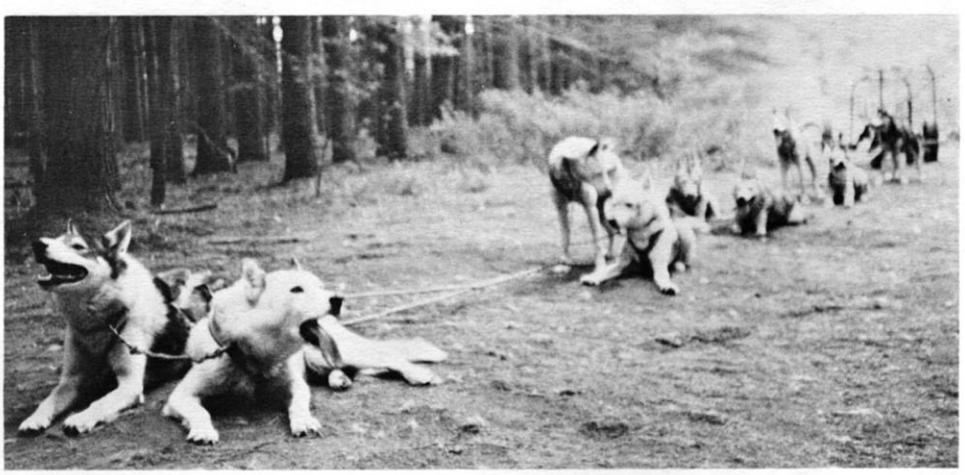


Mushers Bill Brisbois, Ginger Dunlap, HOWL Editor, and Harris Dunlop watch Lewis Pulfer at his/arm near Quincy, Ohio. Acclimatized and physically fit dogs, like a trail competing Border Collie, con work better in the dangerous zone of body temperatures above 106 degrees F.

The most effective method of cooling a life-threatening over heated dog was thought to be to plunge him into ice water. More recently the recommended method of cooling off the animal is the use of tepid (moderately cool) water. Border Collie people have been doing this, perhaps unknowingly, by using tubs located outdoors in the shade. A good source of life saving, gradual temperature reducing, tepid water.

Winter does not mean that heat stress is eliminated. This is especially true when a sudden warm spell breaks a severe cold spell. This often occurs in the Northeast, but mushers have experienced this in Minnesota and Alaskans often welcome the abrupt change which can occur during both the big races in Anchorage or Fairbanks. Even Iditarod races have been "too warm!"

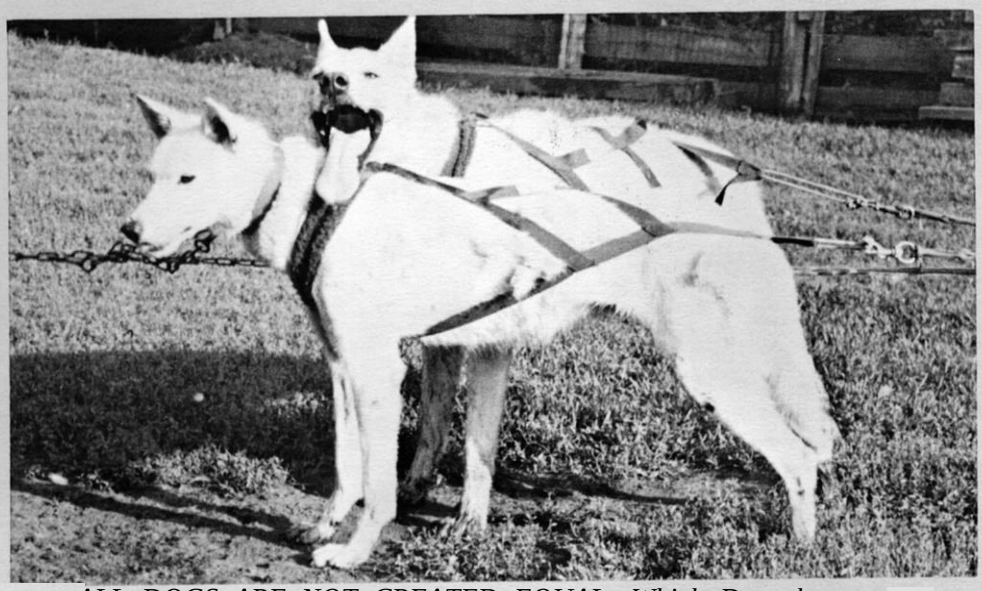
These dogs have just finished a fast 20 mile heat of the North American where they ran the fastest for the day. They are in good spirits and assisting their COOLING DOWN by GRABBING SNOW and RUBBING their bodies, on important cooling technique as massaging con stimulate heat dissipation and help move stagnant air.



THE HARD DRIVING LEADER HAS THE MOST STRESSFUL JOB: Which leader shows the affects of training the most? You should be able to tell that the leader on the right is still gasping for air. Close to hyperventilation. she is illustrating the fatigue and near circulatory collapse following strenuous exertion. The mole leader to her right, is still showing signs of rapid breathing as seen through observing the heaving of the rib cage; now shallow, rapid inhalation persists. Mental stress can increase brain temperature. When you deal with your leaders, remember many fail due the emotional drain. When the dog becomes nervous, the nerves constrict the surface blood vessels thus reducing heat loss and thereby raising core temperature. This con affect lead ability, as soon after the brain temperature rises and impairs mental functioning.

Learning the Pant

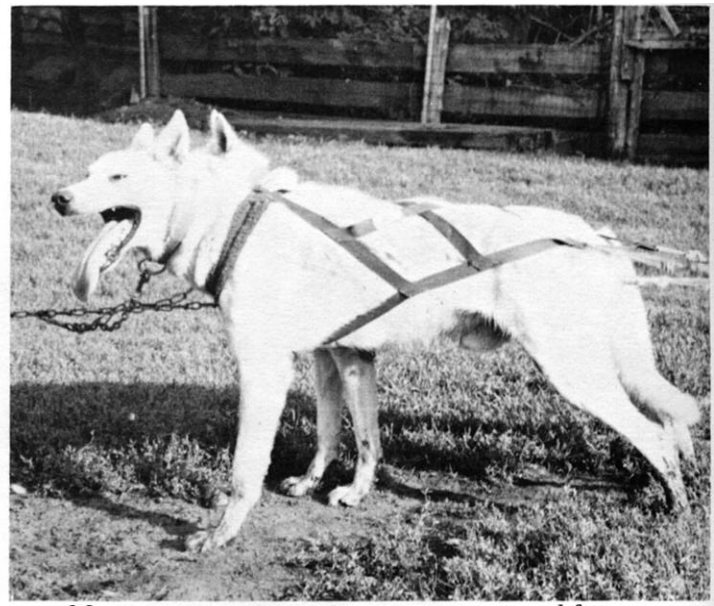
One of the ways to "read" your dog's stress threshold is to study the attitude of the hard working dog, particularly the body and breathing.



ALL DOGS ARE NOT CREATED EQUAL: Which Dog shows more fatigue of this pair? The differences ore especially noted at the onset of conditioning. Some dogs are less excitable or their systems are better at dealing with heat due to their calmer personality, or beginning fitness, coat density, individual musculature, or personnel exertion and drive. Do not make the mistake of evaluating all dogs by the same measures.

***THIS PANT INDICATES SAFE HEAT DISSIPATION: The** standing dog not only shows you did not go beyond the safe limits of his physical fitness! but affords the dog better air circulation and cooling opportunity then the dog lying down after exercise. It is better to walk an almost exhausted dog if he is not prostrate, or almost so, due to over exertion.*

INTERVAL TRAINING provides more powerful and frequent stimulation of responses helpful to regulation of body temperatures than moderate continuous training.



Most ***PANTING animals are we// structured for MAX-IMUM efficiency of E VA PORA TION by two methods.*** *First,* ***the NOSE has complex infolding of*** *bones of which their* ***TOTAL SURFACE AREA IS GREATER than the TOTAL BODY SURFACE*** *area of the* ***ENTIRE DOG.***

TRANSPOR TA *TION IN* ***POORL Y*** *VENTILA* ***TED DOG BOXES can he extremely dangerous. These Canadian constructed dog boxes, by*** *J.Verbeek,* ***show how*** *effective unrestricted door openings allow maximum air passage; bars are excellent as they restrict little air flow.*

Cages ***should not have (ross*** *ventilation during the* Winter *as the* ***CROSS DRAFTS CAN CA USE*** *RESPIRA* ***TORY PROBLEMS. Still ample*** *opening* ***and boxes about 23"*** *by* ***23"*** *and 30'' or more deep,* ***provide adequate ventilation.***

Strenuous interval training in humans in a cool environment is more effective for heat acclimimatization than training by continuous, moderate work.

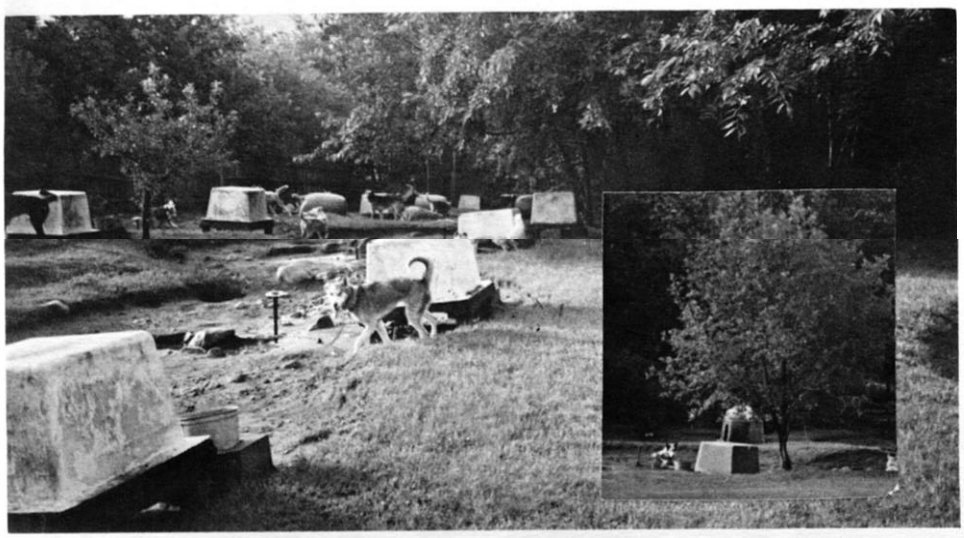
The nasal interior and the nasal gland is an organ unique to dogs and other panting mammals. The gland secrets fluid onto the mucosa, providing a constant supply of water for 'evaporation. The mouth is also an evaporative region which obtains moisture from the salivary glands for cooling. This evaporation is minimized with increased relative humidity or poor ventilation. Of major importance is the continual air change immediately surrounding the body of the dog. Stagnant air near the body is quickly elevated to body temperature thus rendering useless the most important means of heat elimination in the body.

Cage confinement with inadequate ventilation can be very dangerous. Dogs have died from heatstroke in cages, where the air temperatures were 20 degrees F BELOW the dog's normal body temperature, while dogs in outside runs with SHADE RARELY suffer from heatstroke even when temperature reach 105 degrees F. (See article on SHADE beginning on page 13.)

Panting dogs at REST in a hot environment inhale through the nose and exhale through the mouth. But EXERCISING dogs inhale and exhale both through the nose and the mouth, thus increasing evaporation. Finally, blood flow to the tongue may be increased six-fold, allowing larger amounts of blood to be cooled to help prevent the potentially devastating alterations of brain function.

TREES make the best SHADE because of the cooling from vaporization and evaporation from the surface of their leaves. These dog's at Gosta Winberg's kennels in Sweden illustrate this cool environment.

Behavior also plays a major role in brain temperature regulation. The autonomic nervous system controls the dilation and constriction of blood vessels near the skin. This system is affected by emotion and activity. When an animal becomes excited the nerves constrict the blood vessels in the skin, reducing heat loss and raising core temperature, soon after the brain temperature rises. Thus excitability puts the animal that much closer to the threshold of brain damage from heat. Thus calmness before any exercise or stressful situation can possibly improve performance.

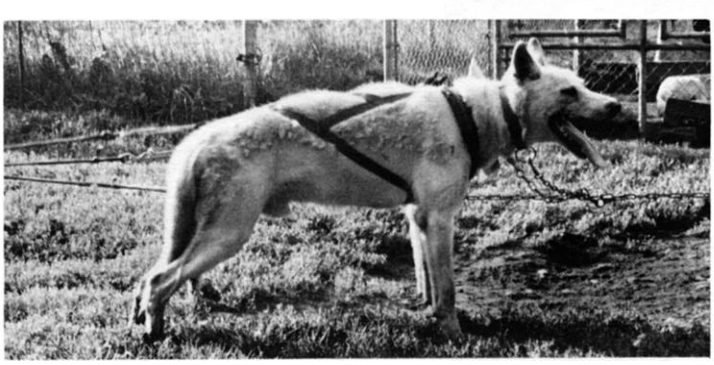


Shade over GRASS is cooler than shade over bare soil. Coat length and density are overplayed in their ability to fight hyperthermia. Clipping a dog's coat in the summer probably makes the owner feel better than the dog, especially if the dog is kept outside where the longer coat may actually keep the dog cooler by insulating against the sun's rays.

COAT LENGTH MAY BE OVERPLA YED in causing the dog discomfort in wormer climates. Polar breeds have a very dense undercoat which helps insulate against the sun's rays. This provides these dogs with goodprotection against the heat of summer as well as the bitter cold of winter. Reproduction is also greatly affected by the heat. Male sperm counts are decreased from direct heat on the testicles. Unacclimated females resorb fetuses at rates as high as 30 percent. Often, the young that ore born hove decreased body weights.

REPRODUCTION can be greatly affected by heat **in both MALE SPERM COUNT and RESORBED FETUSES. If *you* have litter *sizes* of I to 3 pups. you might review your kennel and training environment.**

OBESE (very fat) DOGS are *more prone* to heat regulation problems than lean dogs. Subcutaneous fat has about twice the insulative value of muscle, so heat dissipation is greatly reduced. For animals about the size of the dog, heavy *exercise presents* the most severe thermal stress that may be encountered. The brains cooling mechanism is greatly affected by heavy exercise in extreme heat.



In **RUNNING DOGS, the *EXCESS* rote *of* HEAT production is TEN-TIMES the heat gain that could occur in the HOTTEST DESERT on Earth! It seems that maximum efficiency of brain cooling in dogs occurs during exercise. In dogs exposed to hot, dry air, the blood supplying the brain is cooled slightly lower than the core temperature. But during heavy exercise in less severe, but still warm temperatures, the brain cools almost 3 times greater than the core body temperature.**

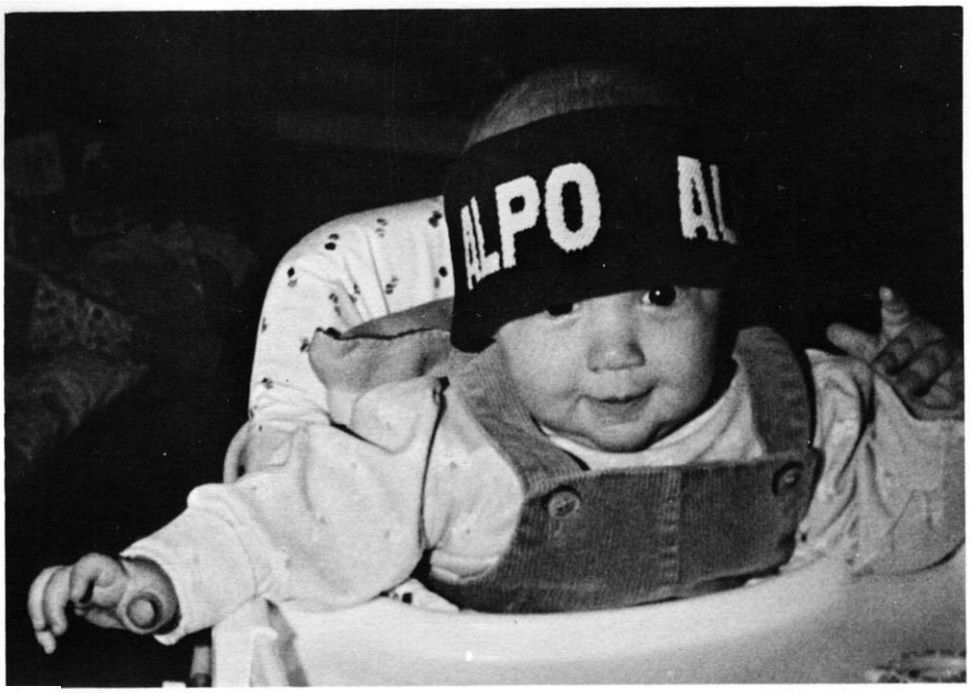
Dogs *are basically* known *for* their EXTREME TOLERANCE *of heat* as well as the ability to work for long periods in the heat. However once the tolerance threshold is crossed *over* the dangers of severe heat damage suddenly becomes of primary concern.

About the Author:

Robert Downey, along with wife ***Mary*** Jo, are well known sprint racers. I" addition, Rob Downey is known for his frequent presentations on the sled dog symposium circuit, where he presents on nutritional matters.

Downey has extensive practical experience in this arena too. Rob published papers while associated with the celebrated sled dog studies at the University of Pennsylvania School of Veterinary Medicine. While at New Bolton Center he worked with Dr. David S. Kronfeld managing the study models comprised of both Beagle and sled dogs.

At the conclusion of the research, Rob turned his considerable energies to the formulation and marketing of a dog food. This resulted in the formulation of a line of very fine products and the formation of ANNAMAET PETFOODS, INC. This line of products have found wide acclaim amongst kennel operators in mahy discriminating field and performance arenas of hunting as well as sled dogs. An increasing interest from show and breed kennel people has been occurring of late. These products are, now rapidly becoming wide spread as a result of Rob Downey's diligent application and desire to meet the nutritional needs of canines.

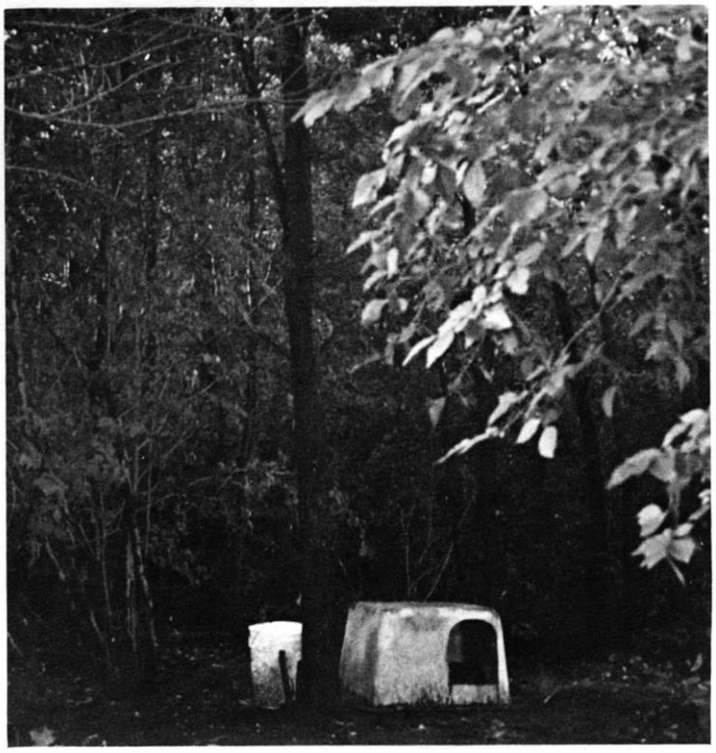


SARA** DOWNEY, **Rob** and **Mary Jo's contribution** to **junior mushing.

Presently the Downey's live in Sellersville, PA where they are engaged in raising a" enthusiastic future mushing daughter, Sara, with ideas on canine nutrition of her own.

SHADE

***This** natural setting of trees is a good place to locate **your kennel. The** temperatures **are** significantly **cooler under** trees.*



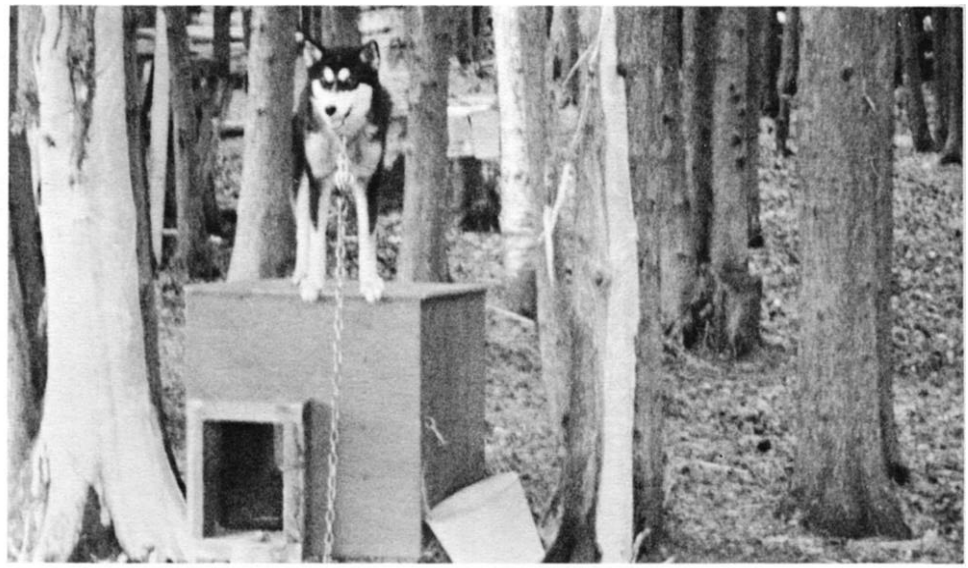
A nice** cool place for a **bitch** to **have** her pups. **A** private **place with enough** space **so a fence is** not **needed for** the first **few weeks. Remember, excitement, fear or worry con** elevate **body** temperature. **A** large container **for water is only good for** the **adult bitch. Smaller containers ore needed for pups who will first take water** at about **three weeks.

We all know shade can assist in making us more comfortable. Shade can also make the difference of life or death, especially to very young pups. Even adult dogs can have their lives threatened if the temperatures are in the 90's or above! The danger increases when the air is still; air current can carry off heat and affect cooling. If you live where humidity is high. you run still another risk of heat related prostration.

If you have a choice, locate your kennel in trees, especially your whelping areas.

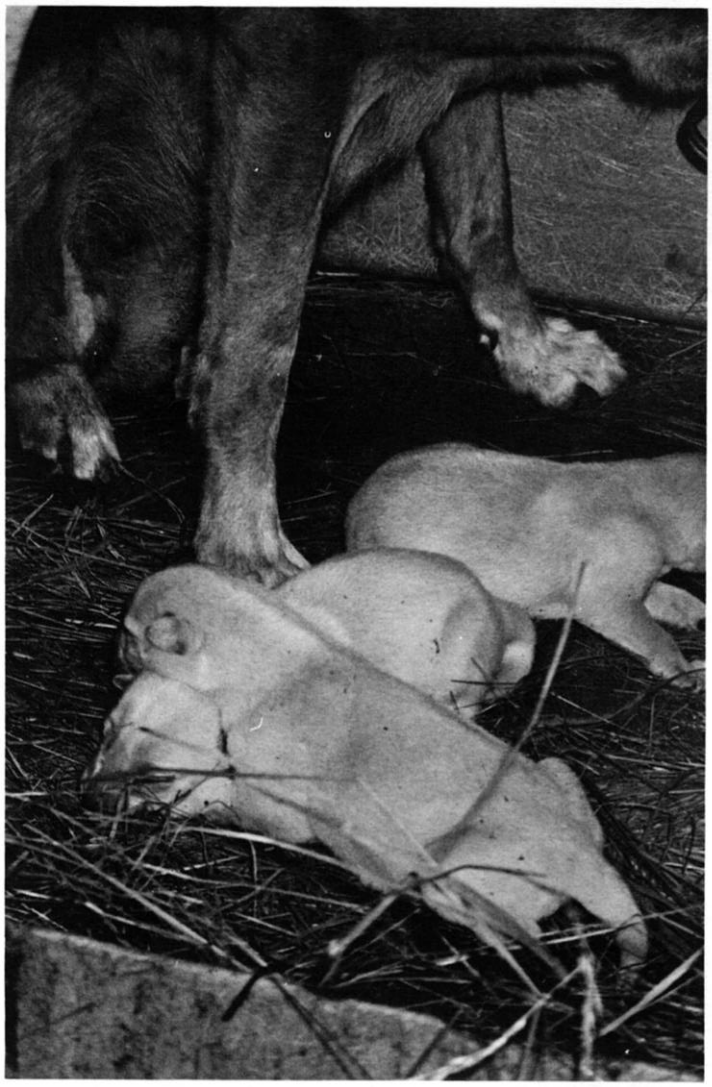
If you have a hard time locating trees in your kennel area, you might find the very fast growing Frysville Hybrid Poplars a significant advantage. The trees can be purchased from Miles W. Fry and Son Company, 300 Frysville Road, Ephrata, PA 17522. Send for a brochure with current prices. Or call 717-354-4501.

The best planting time is spring. You

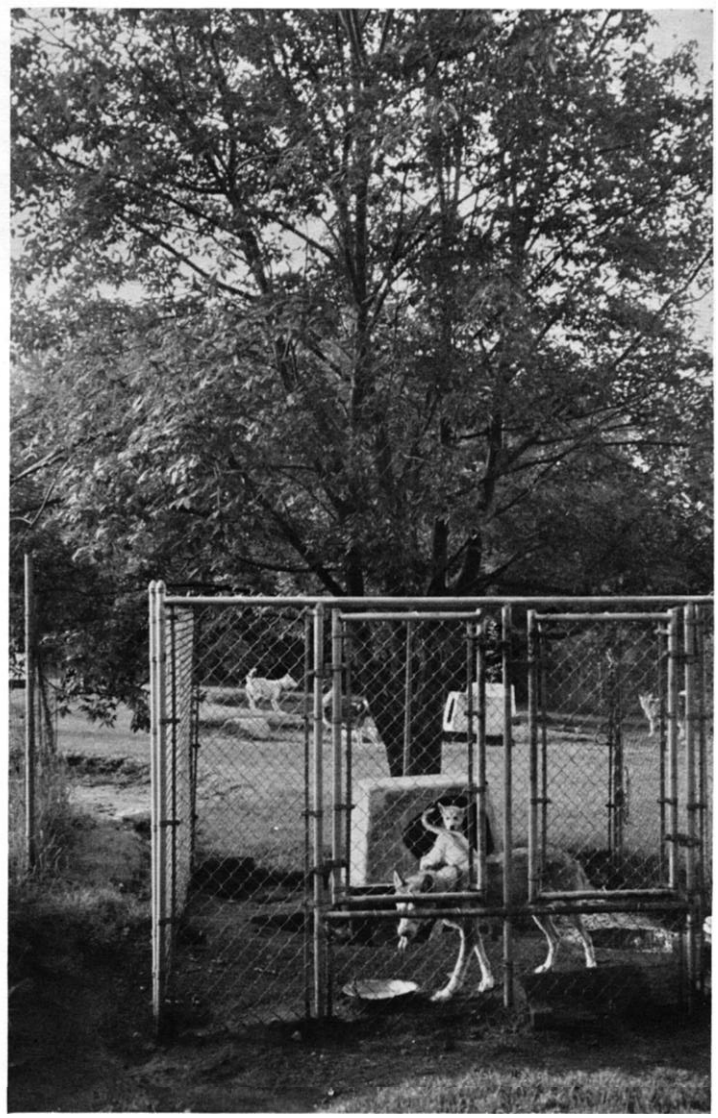


Dennis FitzGerald photo

A beautiful spot for this young husky. Keep in mind, that in time. any tree within a dog area will probably be destroyed. Once a tree is ringed (bark removed all the way around) the tree will die.

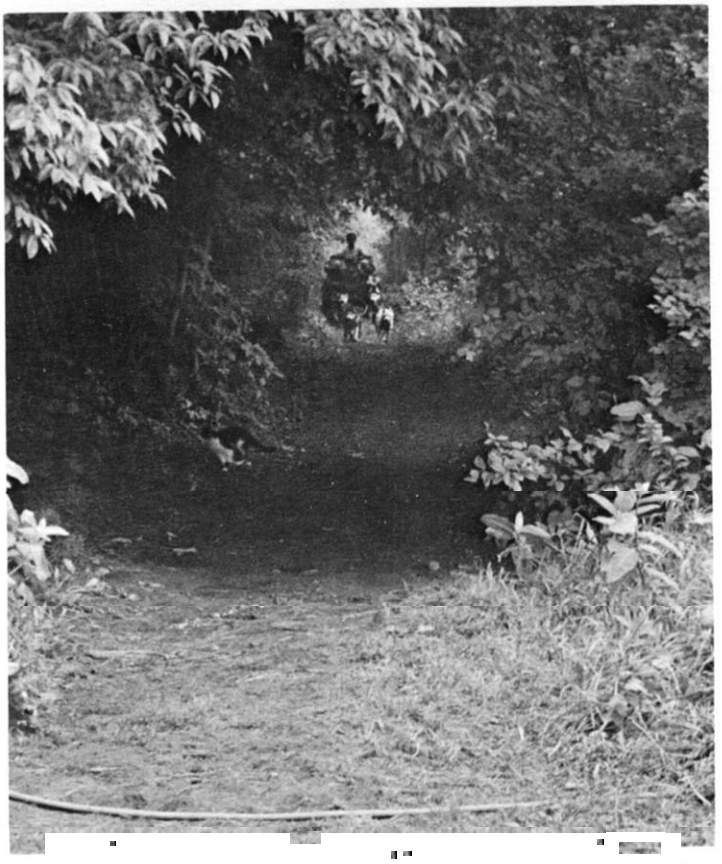


Pups ore particularly sensitive to environmental extremes in temperature in the first 72 hours. They cannot regulate their body temperatures to adequately withstand high air temperatures. Shaded areas will make a difference.



A good whelping and living area for a birch ond her pups. Note the low dish for easy access to water for pups. The tree outside the pen insures protection from the shade.

Dogs will seek the shade of a vehicle, rock, building, or dog house, if no shade is provided. These yard dogs illustrate this by locating under a play house.



If you train in the warmer months, you might be able to locate your training and conditioning area in trees. Multiple coverage, or rows of trees allow for extended training periods. If the shaded area is large enough you might be able to work dogs for on hour or more after the sun is too hot in open areas. Older larger trees hold the cooler night temperatures longer.

***This poplar** tree was planted 52 days before the **photo** was taken. It was received from the nursery and was a whip with no limbs.* You *could practically see it grow.*

Tethering dogs in the trees while waiting to train, can assist in keeping the dogs cool and refreshed before exercise.

can purchase the trees as rooted stock for $1.50 each up to 49 trees. The price drops with increasing numbers. 100 unrooted trees costs only $30.00 this Spring. Our experience was with 4 foot rooted stock at $5.00 each. The Frysville nursery will replace any stock that, does not live for the first year. A good deal. They don't require any special handling. They have two basic varieties, one for cold temperatures, the other for warmer climates.

We have taken the low branches off. However the wind bends some trees near the dogs. This waiving action has increased with the branch size. Some of these were grabbed and yanked into the areas: Pups also mutilated one tree. You might note the trees should be given enough space. Most of these trees will be over twenty feet high in less then three years.