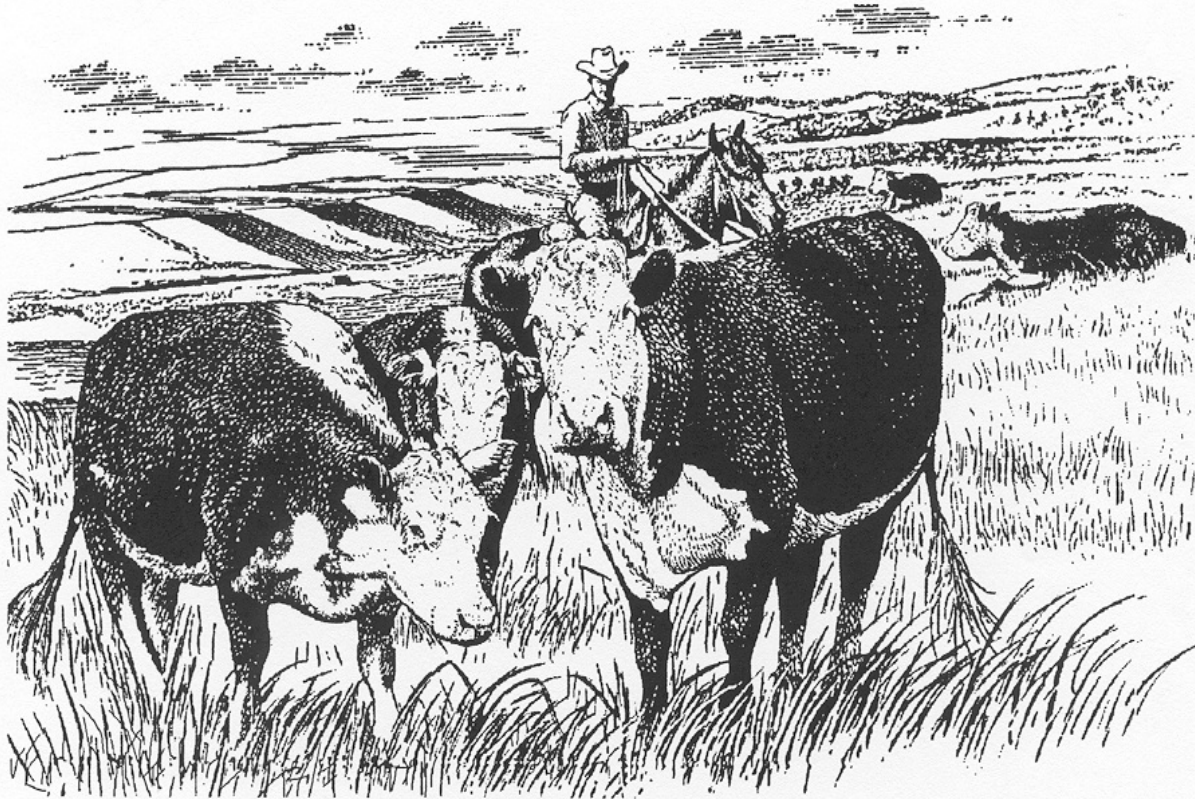


INSECT AND RELATED PESTS OF LIVESTOCK IN WYOMING

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The University of Wyoming
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**INSECT AND RELATED PESTS
OF LIVESTOCK IN WYOMING**

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INSECT AND RELATED PESTS OF LIVESTOCK IN WYOMING

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SECTION I - Introduction

Control or management of insects is important to the progressive livestock producer. Insect control may be accomplished through the use of practices that will avoid or reduce insect problems and it may involve the use of an insecticide that will alleviate or prevent a pest problem. Insecticides available to the livestock industry in the United States today must be used with maximum benefit to society and minimum risk to human health and the environment.

Insecticides available to the livestock industry in the United States today must be used with maximum benefit to society and minimum risk to human health and the environment. The applicator can utilize in order to safely and effectively control insect and related pests of livestock. The applicator should learn three things: (1) recognition of insect problems; (2) biological features of the insect that may be utilized in successful control; and (3) proper control techniques. Specific insecticides will not be discussed because

States today must be used with maximum benefit to society and minimum risk to human health and the environment.

The objective of this manual is to provide information that the potential

of the frequent changes in insecticide registrations. The reader is urged to consult Agricultural Experiment Station and Cooperative Extension Service Bulletins for current insecticide recommendations.

SECTION II - Insecticide Application

Methods of Insecticide Application

Application techniques commonly utilized in the control of several different livestock insect pests are discussed here. The purpose is to familiarize the reader with common application techniques and terminology. A number of application methods have been developed for application of animal systemic insecticides. These insecticides are either injected or are absorbed through the skin and carried by the blood system to kill blood-sucking insects as well as those that live internally in the host.

High Pressure Spray

This is a method for applying dilute insecticides to livestock. It is used for penetrating dense wool or a thick haircoat and for wetting the skin of the treated animal. Spray is applied by means of a high-pressure livestock sprayer at 300-350 psi. High pressure is important in the use of systemic-type insecticides because wetting of the skin, not just the hair, is necessary. Several animals can be sprayed at a time by working them back and forth in a small pen.

To calibrate the sprayer determine the delivery in gallons per minute for the particular spraying disc in the spray gun, usually a number 4, 5 or 6, and the pressure. The amount of spray per head will vary with size of the animals, and thickness of hair coat or fleece. Experience in Wyoming indicates that for thorough coverage of cattle 1 1/2 to 3 gallons of spray per cow and 1 to 2 gallons per calf are required. Depending on wool length, from 1 to 2 gallons of spray per animal will be required to completely soak sheep.

Low Pressure Spray

Tractor-mounted and other low-pressure sprayers are satisfactory equipment for applying dilute sprays at low pressure, i.e., 50-70 psi. Apply 1 to 2 quarts of spray per animal. This spray will not soak an animal but is sufficient to wet the hair or fleece.

Compressed Air Spray

One of the easiest methods of spraying a small number of animals for fly or louse control is with a hand-held, compressed-air sprayer. The sprayer is especially useful for treatment of horses because it makes little noise and does not frighten them.

Sponge Method

This is an effective method if treating one or two animals. Wet a sponge, cloth or special glove made for this purpose, and rub onto the animal's body. When not using the special gloves, be sure to wear other protective gloves. This method is especially useful for applying insecticides to horses that react to sprayer noises.

Dip

Dipping of cattle or sheep is a method for obtaining thorough coverage. Large numbers of animals may be treated fairly rapidly. The dip vat method requires a large initial expenditure for construction and materials as well as chemicals.

Pour-on

The pour-on method is a quick and simple method of applying animal systemic as well as certain non-systemic insecticides to cattle and sheep. The pour-on liquid, either an oil or an emulsion, is applied from a calibrated dipper or other

device at the correct rate, evenly, along the animal's back or in a single spot so that none of the liquid drips off.

Injection

Several systemic insecticides are administered with standard automatic or single dose syringes. The recommended route of administration is by subcutaneous injection.

Residual Premise Spray

For fly control in and around buildings make application at low pressure, e.g. 80 psi, to produce a coarse spray.

Apply to walls and ceilings of buildings but avoid spraying feed and water. One application may give protection for an entire season.

Space Spray or Aerosol

This is an effective method for quickly clearing indoor spaces of flies. A machine is used that produces a very fine mist that remains suspended in the air for several hours. Usually the application must be repeated daily.

Dusting

If only a small number of animals is to be treated for parasites such as lice, flies, ticks or keds, hand dusting is both inexpensive and effective.

SECTION III - Biology and Control of Insects and Related Pests of Livestock

General Pests

Biting Flies and Nuisance Flies

Flies are familiar to everyone. Biting flies that are particularly bothersome to livestock in Wyoming are stable flies, horn flies, horse flies, deer flies, mosquitoes, and black flies. The face fly and house fly are examples of nuisance flies. They are very bothersome even though they do not bite and draw blood.

Both biting and nuisance flies affect the production and performance of livestock. Flies will hinder grazing and resting and even force animals to run about in order to be momentarily freed from annoyance. In addition to their annoyance, many flies are important in transmission of disease-causing organisms.

Horse Flies and Deer Flies (Figure 1)

Horse flies and deer flies belong to the same insect family and have quite similar biologies. Deer flies are usually the size of house flies and have patterns on their wings. Horse flies are larger and generally darker in color than deer flies.

Most adult flies lay their eggs near the damp or wet soil of streams, marshes, lakes, or ponds. After a short incubation period of approximately 1 week, larvae hatch, then develop in the soil. Later in the season, or the following year, the full grown larvae migrate to drier soil. Each forms a pupal case, from which an adult fly emerges in a few weeks. The adult flies of different species appear in peak numbers at certain times during the season.

Only the female horse fly and deer fly attack animals. The bite is extremely painful and causes the flow of blood, much of which is not even ingested by the fly. Frequently clusters of house flies or face flies, which cannot draw blood themselves, are seen around pools of blood formed by the feeding of horse flies.

Mosquitoes (Figure 2)

Adult mosquitoes are small (body length about 1/4 inch), delicate organisms with a conspicuous long proboscis. Mosquitoes have four life stages: egg, larva, pupa and adult. The eggs are laid on or near water. When in contact with water the eggs hatch and produce the aquatic immature stages. The larvae or "wigglers," named after the manner of swimming, must have standing water with relatively little movement or wave action. Water in puddles and roadside ditches as well as water along the edges of vegetation-choked channels is ideal. It is in the larval stage that the mosquito attains most of its growth by feeding on microorganisms and organic matter in the water. After four wiggler stages of increasing size which usually occupy 10 or more days, mosquito larvae reach a length in excess of 1/2 inch. They then molt to the pupal or "tumbler" stage. Unlike most insect pupae, the tumbler as its name implies, is active. The tumbler appears to consist of large "head" with a "tail", and moves about in the water by a tumbling action when disturbed. No further growth is accomplished in the tumbler stage because it does not feed. After a period of more than 4 days, the pupa rises to the surface of the water, and the adult mosquito emerges from a slit in the "back" of the pupa.

Usually adult male mosquitoes emerge first and remain near the breeding site in order to fertilize females. Newly emerged males may form tall columns of mosquitoes into which females fly for mating. Most fertilized female mosquitoes then require a blood meal before egg-laying. Although the males do not fly great distances, the females of some species have been reported to fly 10 or 20 miles.

Mosquitoes that bother livestock in Wyoming may be divided into two groups: those belonging to the genus Aedes, and those belonging to Culex and Culiseta.

Aedes (e.g. flood water mosquitoes) - These mosquitoes annoy livestock to the greatest extent in Wyoming. They are produced in large numbers in inundated areas, such as

marshes, flood plains of rivers, and irrigated fields. The eggs are laid singly on moist surfaces subject to flooding and in areas where the female mosquitoes are protected from the wind. The eggs, if unflooded, can survive several years. Aedes mosquitoes overwinter in the egg stage, then hatch the following spring after flooding due to runoff of melted snow and irrigation. Depending on the species of Aedes, additional flooding may produce additional broods of mosquitoes.

Culex and Culiseta - Many species of these mosquitoes will feed on livestock and are either known to be, or suspected to be, important as vectors of arboviruses that cause the encephalitides. The eggs of these genera are laid in groups called "rafts" on the surface of water and they hatch shortly thereafter. These mosquitoes, therefore, may not require flooding for egg hatching. Culex and Culiseta overwinter in sheltered areas as adults.

Black Flies (Figure 3)

Black flies are among the smallest of the biting flies attacking livestock. They are frequently called buffalo gnats because of their "humped back" appearance. Black fly may be a misnomer because these insects are frequently light brown or yellow in color.

Larval and pupal black flies spend their lives in rivers or streams where running water provides sufficient aeration. These aquatic stages are attached to objects such as submerged or trailing vegetation, stones, and logs. Adult flies are capable of moving great distances from the streams of their origin. Females are blood suckers and may occur in large swarms. Several hundred eggs may be deposited on or in the water.

Black flies feed either on exposed areas of skin or deep within the hair coat where they must bury themselves in order to obtain a blood meal. Black flies bite in the daytime or dusk but not after dark. The reaction to bites may be quite severe. Some species appear to ignore man completely in favor of animals such as horses and cattle.

Stable Fly (Figure 4)

The stable fly looks much like a house fly except that it has a slightly more robust body and a prominent beak or proboscis.

Eggs of the stable fly are deposited in wet and decaying organic matter. Piles of grass clippings, hay contaminated with manure and urine, and wet feed are particularly good media for development of stable fly larvae or maggots. In areas where bodies of water occur, stable flies may be abundant because piles of decaying "seaweed" are good media. Within 5 days after egg hatching, the larvae or maggots pass through three larval stages. After the larval stage a pupal stage is formed. In a period of 1 1/2 to 2 weeks, an adult fly emerges from the pupal case. Stable flies can produce several generations per season.

Both male and female stable flies have a stout proboscis with which they pierce the skin and suck blood. The bite is painful. Stable flies are found indoors as well as out-of-doors.

Horn Fly (Figure 5)

The adult horn fly looks like a small stable fly. Both sexes have beaks which they utilize to obtain blood meals. Horn flies may reach very large populations, i.e., thousands of flies per animal, on the preferred host, which is cattle. Horn flies in many areas of the country are considered the most serious pest of range cattle. Horn flies have been reported as pests of sheep and horses as well as cattle.

Unlike other flies that come to livestock only to feed, horn flies remain with the cattle at all times, leaving only to visit fresh dung and lay eggs. Horn fly larvae develop within the dung over a period of about a week. Following the pupal stage of about another week, newly emerged adults seek out cattle. The flies on a bovine host do not feed constantly, but usually at certain times during the day.

Face Fly and House Fly (Figure 6)

The primary non-biting, nuisance-type flies affecting Wyoming livestock are the face fly and the house fly. The two species are similar in appearance and are difficult to distinguish from one another in all but the pupal stage, which is reddish-brown in the case of the house fly and white in the case of the face fly.

The life histories of the face fly and house fly are egg, larva, pupa, and adult. The adult female face fly lays its eggs in fresh cow dung. The eggs hatch within a day or two, and the larvae or maggots grow rapidly within the manure. After a period of 4 to 5 days, including three molts to permit body growth, the maggots seek a drier location at the edge of the dung pat and form a pupal case. After a week or more the adult fly emerges from the pupal case. The face fly is a strong flier and can travel several miles. Individual face flies do not remain with cattle and horses at all times and do not generally enter darkened buildings. Due to the short life cycle, many face fly generations can be produced in one season. The adult face fly passes the winter in the adult stage within shelters such as attics of homes and is frequently a household pest in the spring when the flies emerge from their indoor hibernation quarters.

The face fly has the annoying habit of landing on the face and probing the eyes and nostrils of the host. It is involved in the transmission of the disease known as pink eye. Although it is primarily a pest of cattle, it is also very annoying to horses.

The house fly is a pest closely associated with man's activities. It is able to utilize all sorts of excrement and fermenting organic material. It is primarily a pest in and around buildings, and can be very annoying to animals and humans when present in great numbers. It has been implicated in the transmission of several parasites and diseases of public health importance.

Control of Flies

Although control of flies may be difficult, horn flies because of their constant association with cattle are easily

controlled by a variety of methods, including spray, dip, backrubber, dust bag, insecticide ear tag, feed through and sustained release bolus. These techniques will also provide relief from the annoyance of some other biting and nuisance flies.

Oil solutions of insecticides can be applied by means of a commercially produced oiler or a homemade backrubber. The backrubber is a far less expensive method but must be recharged more frequently.

The backrubber consists of a length of cable, chain, or wire around which burlap is wrapped. The completed backrubber is then attached to two posts approximately 15-20 ft apart and should sag to about 18 to 24 inches from the ground at the center. The backrubber should be recharged frequently enough to keep it moist and effective. Backrubbers are placed in an area where cattle loaf, e.g., near water or a salt lick.

The dust bag is a simple method developed primarily for horn fly control. Dust bags are heavy burlap sacks filled with an insecticide dust and suspended below backline height in outdoor areas where cattle are likely to pass. When an animal bumps against the bag a small quantity of dust sifts through the fabric and is deposited on the animal. Ready-made dust bags can be purchased. These generally consist of a grommeted burlap sack and a plastic hood to protect the bag from rain. A less expensive way is to purchase a heavy burlap sack and insecticide dust and make your own dust bags.

Water tanks or salt blocks may be fenced, and dust bags installed in a gate so that cattle are forced to use the bags. Frequently, cattle will use the bags after a short period of adjustment if they are located in a favorite loafing place.

Insecticide ear tags are easy to use and in the past have provided excellent, season-long horn fly control. These ear tags perform by dispensing insecticide continuously over a period of several months. The insecticide diffuses to the tag surface and is brushed onto the animal's body through normal body movement. Most of the original fly tags contained "pyrethroid" insecticides. The pyrethroid family of compounds is effective against flies at very low dosages and provides quick knock-down. Unfortunately, strains of horn flies resistant to pyrethroids have resulted from the continuous exposure to the ear tags. Where this has occurred producers should consider switching to an alternative method of control or to a different ear tag. If the decision is to switch to a different ear tag, the producer has the choice of selecting either a more potent pyrethroid tag or one with a different family of insecticide, e.g., an organophosphate.

Several products are on the market for control of the larval stage of dung-breeding flies. These products may be administered in a number of ways. Sustained release boluses, which are administered by means of a balling gun, continuously release a compound that prevents fly development in cattle dung. Several feed-through type materials, both insecticides and insect growth regulators, are

incorporated into salt blocks, mineral mixes, feed supplements, etc. Certain other compounds, i.e., some of the animal systemics applied as a pour-on or injection, are known to appear in feces at levels that are larvicidal for a period of time.

Protection of livestock through frequent applications of fast acting insecticides or insecticide-repellent combinations is often the only method of protection from adult flies other than horn flies. This method is practical only for animals that must be handled frequently, e.g., dairy cows, or companion animals.

Relief from stable fly and house fly may be achieved through sanitation in and around livestock buildings and/or the application of residual wall sprays. Use of fly screens on windows may be helpful. Most flying insects can be controlled temporarily in confined spaces through the use of space sprays or aerosols. Out-of-doors, mist sprays and fogs will produce only very temporary relief.

Mosquito annoyance may be reduced through elimination of standing water which provides a suitable habitat for mosquito larvae. Mosquito larvae can also be controlled through the removal of protective emergent vegetation from irrigation ditches and the edges of ponds and lagoons. Large scale larval and adult control programs utilizing larvicides and/or adulticides may be conducted by communities against mosquitoes as well as blackflies.

Lice

Lice are serious wintertime pests of livestock. Livestock producers' losses to lice have been estimated between 5 and 6 million dollars per year. Two types of lice infest livestock in the United States, the biting or chewing lice (Figure 7) and the sucking lice (Figure 8). Chewing lice have mandibles for chewing on skin surface. They also crawl over the skin between the hairs or feathers. The skin becomes irritated and the animals rub themselves trying to relieve the itching. Sucking lice derive nutrition from the host animal by sucking blood. Sucking lice are irritating because they pierce the skin. Extremely heavy infestations may produce anemia.

Lice are extremely injurious to livestock. They help create open sores which may provide entrance for infectious agents. Animals may become nervous and edgy and may go off feed and fail to gain at their normal rate. Lack of stamina may make them susceptible to respiratory infections.

Lice are a problem on all kinds of livestock in Wyoming. Each livestock species has its own host-specific species of lice. They are transferred between animals by contact.

Cattle Lice

Cattle lice infestations are easy to recognize. Bluish or gray colored patches appear on heads, necks, dewlaps and shoulders of cattle. Lice may climb about on the host's facial hairs. Cattle scratch and rub against objects and remove hair in an attempt to relieve itching due to lice. All of these signs mean that the lice have reached serious levels and will cause a substantial monetary loss unless controlled.

Losses to cattle lice are many. In addition to the more obvious death losses and lost weight, impaired feed conversion, carcass and hide blemishes, and damaged fences must also be considered.

Studies showing the effect of cattle lice on weight gains of cattle are available from many parts of the world. The benefit derived from controlling lice is from 0.1 to 1.2 lb. per animal per day depending upon the severity of the infestation and the condition of the cattle. The most severely affected animals are those under stress, that is, under extremely severe winter conditions and receiving poor feed.

Four different species of lice are important parasites of cattle in North America. Only one of the four species is a chewing louse. The cattle biting louse is a little, red-colored louse about 1.5 mm in length. These lice in great numbers produce skin lesions and cause hair to fall out in clumps.

Three sucking lice species are also abundant in Wyoming. The short-nosed cattle louse is about 4mm long, the long-nosed cattle louse is about 2 mm long, and the little blue cattle louse is about 1.5 mm in length.

All four cattle lice species have similar life cycles. The adult female produces eggs which hatch to immature stages known as nymphs. All stages are found exclusively on the host animal.

The eggs are glued to hairs, and in severe infestations, are very noticeable. The duration of the egg stage varies, but usually they hatch after 1 to 2 weeks. Nymphal lice look very much like the adults except that they are smaller. There are three nymphal instars which last between 2 to 3 weeks. Adults may live approximately 2 weeks, producing one to two eggs per day.

Although lice can be found on cattle at any time of the year, the most severe infestations occur during the winter and early spring months. Populations tend to build up in the fall and decline with warm weather in the spring.

Although lice are considered by many the most serious insect pests of livestock on the North American continent, they are among the easiest to control. Treatment with any of the approved insecticides will reduce a population to an insignificant level. If practical, cattle should be treated in the fall before louse populations have had a chance to build up. Usually louse damage has already started before warning signs are visible. Early treatment, perhaps combined with cattle grub control, will eliminate this loss. Research has shown that if treatment is delayed until cattle are obviously lousy, gains will be less than those of similar animals treated earlier.

Insecticides may be applied in a number of different ways. Dips and sprays give excellent control because of thorough coverage of the animal and some effect against eggs or against nymphs that hatch shortly after treatment. Pour-on and injectable formulations of animal systemic insecticides as well

as pour-on formulations of some of the non-systemics have become popular for control of cattle lice. These methods of application are less laborious and much less stressful to the animals. The injectables, however, are not recommended for control of the cattle biting louse.

Sheep Lice

Although lice are not often seen on sheep in Wyoming, two species, the sheep biting louse and the sheep foot louse, may infest sheep at times.

The sheep biting louse is a small species up to 1.8 mm in length with a pale abdomen, darker thorax, and reddish head. The preferred location on the host is along the back and the upper sides, but in heavy infestations may be found anywhere on the body.

Sheep biting lice cause intense irritation which sheep relieve by biting and pulling the wool and by rubbing against posts and other objects. The fleece of heavily infested sheep becomes ragged and torn.

Female sheep biting lice attach eggs to the wool fibers. The egg stage lasts about 10 days, the nymphal stages about 20 days, and the adult stage around 25 days. It has been estimated that a female will live for 20 to 30 days and will lay one egg every 1 to 2 days.

Populations of sheep biting lice are heaviest during winter and early spring. They are transmitted by direct contact. Lambs become infested readily from their mothers.

The sheep foot louse feeds on blood. The adult is 2 mm long, and the abdomen is covered with long bristles. It is widely distributed in North America. This louse is not considered very injurious since feeding occurs on the hairier parts of the sheep's body and the animal exhibits little discomfort. In severe infestations, however, it may cause some lameness.

Light infestations of the sheep foot louse occur as small colonies of lice between and around the accessory digits. In heavy infestations not only the legs support heavy numbers of lice but also the scrotum of rams. The egg stage lasts 17 days, and each of the three nymphal stages requires 7 days.

The sheep foot louse has a pronounced seasonal fluctuation in populations, numbers being greatest in winter and early spring and lowest in summer. Lambs may become infested from their mothers within a few hours after birth. Younger sheep are most susceptible. Older sheep carry only light infestations. Infestations may be acquired either by direct contact with infested sheep, or from an infested pasture.

Sheep lice are usually controlled by means of dip, high pressure spray, pour-on, or dust.

Horse Lice

Horses are occasionally infested with the horse sucking louse which is about 3 mm in length, and the horse biting louse

which is about 1.5 mm in length. Horse lice are usually discovered after the infestation has become sufficiently severe to cause annoyance.

Louse populations are most numerous and severe in the winter. This is also the time of year when the animals are under additional stress due to cold weather and possibly poor nutrition. The combination can produce an unhealthy, anemic, and unthrifty horse. The sucking louse of horses is said to be more irritating and more important than the biting louse because it feeds by sucking blood from the host.

The lengths of various life stages of horse lice vary, being 1 to 2 weeks for eggs, 2 to 3 weeks for nymphs, and 2 weeks or longer for adults.

Horse lice are pests of closely related hosts such as horses, mules, and asses. Horse lice spend their entire lives on their host animals and spread from one animal to another when the hosts are in close contact.

Horse lice are easy to control with a variety of spray materials. Remember that a new horse or one that has not been treated with the others may reinfest a herd. The use of an application mitt or a small hand-held sprayer to treat a horse is usually less stressful to the horse and to the applicator.

Ticks

Livestock in Wyoming frequently become infested with ticks. Ticks are not insects and do not resemble them. Ticks have four developmental stages: egg, larva, nymph, and adult. The larvae, nymphs, and adults can be differentiated according to size. Larval or "seed ticks" are very tiny and they possess six legs, whereas adults and nymphs are larger and have eight legs.

Male and female ticks are obligatory parasites and require blood meals in order to develop. The tick feeds by driving its mouthparts into the skin of the host and feeding for extended periods of time. The feeding of ticks produces wounds, removes large quantities of blood, causes considerable irritation and worry to the host, and may transmit disease organisms or causes paralysis.

Winter Tick (Figure 9)

The winter tick is a frequent and widespread pest of horses in Wyoming. Sometimes it occurs on cattle. Preferred hosts are horses, moose, and elk. Young animals are especially vulnerable to attack and may be killed by heavy infestations. This tick is a pest in the fall, winter, and early spring of the year. The larval or seed ticks spend the summer in clusters on the ground. When the cool weather of fall approaches, the larval ticks become active and seek a host. The tick remains on and feeds on the blood of the same host throughout its life. For this reason the winter tick is called a "one-host tick". The mated, fully blood-engorged female tick drops off the host in early spring. Egg laying takes place on the ground later in the spring.

Rocky Mountain Wood Tick (Figure 10)

The Rocky Mountain wood tick attacks most domesticated animals in Wyoming. In addition to being very pestiferous, toxins secreted by the female tick can paralyze many animals including man, sheep, and horses.

Rocky Mountain wood ticks may cause tick paralysis in animals by the feeding of females and their injection of a toxin into the blood stream of the host. First symptoms are weakness and staggers. In a few hours they are incapable of standing, and finally death ensues. There is no struggling in the later stages and temperature remains normal. Animals can be saved by removing the offending ticks. Recovery may be rapid (within an hour) or it may take up to 2 days. When recovery does not occur within this time, it is an indication that some ticks have been overlooked in the removal.

The Rocky Mountain wood tick transmits the pathogen of tularemia to sheep and may cause epidemics of the disease in bands of sheep of the Western states. It is also a biological vector of anaplasmosis of cattle.

The Rocky Mountain wood tick is troublesome in the spring of the year when adults come out of hibernation. They climb upon vegetation and wait to attach to a suitable large mammal host. Mating and feeding occur on the host, with the female dropping off the host in about 1 to 3 weeks. Egg-laying takes place on the ground in a sheltered location. Over 6,000 eggs can be produced by one female. The larval or seed ticks hatch in a month. These, if fortunate, attach to a small wild mammal host where they feed for a period of 2 to 8 days, then drop off. Nymphs appear 3 weeks after the larvae drop. At this time they may either hibernate that winter as nymphs or find another small mammal host. If another host is found, the tick feeds, drops off, and molts; then spends the winter as an unfed adult. Overwintering nymphs seek small mammal hosts the following summer, feed for about a week, drop off the host, molt, and overwinter as unfed adults.

Spinose Ear Tick (Figure 11)

The spinose ear tick is a pest of many species of domesticated and wild animals in Wyoming. It is considered primarily a pest of warmer climates, but has become firmly established in Wyoming. The larvae and nymphs of this species invade the ears of horses, cattle, sheep, dogs, cats, deer, rabbits, and numerous other domesticated and wild animals. They may be quite abundant during the summer months.

The spinose ear tick causes injury by puncturing the tender skin within the ear and sucking blood. Wounds may become infected with bacteria, giving rise to a condition known as "ear canker". Plugs formed by accumulation of ticks, their excretions, and ear wax may close the ear passage completely. An infested animal with this condition shakes its head and repeatedly turns it from side to side. A tendency for the animal to rub and scratch affected ears may result in extensive lacerations.

Larval ticks hatch from eggs that have been laid on the ground. The larvae climb onto weeds, vegetation, feed troughs, etc. to contact the host animals. After attaching to the host, the larval tick moves to the ear where it attaches to the delicate lining of the ear and engorges. It molts in 1 to 2 weeks to the nymphal stage, which may remain in the ear up to 6 months. The nymphs then drop to the ground, molt to the adult stage, mate, and lay eggs.

Mange Mites (Figure 12)

Several different mite species produce a disease of animals known as mange. The type of mange is named after the mite causing it, e.g. sarcoptic mange and psoroptic mange, which are caused by Sarcoptes and Psoroptes mites, respectively.

Both mite species mentioned are related to and have developmental stages similar to those of ticks, i.e. eggs, six-legged larvae, nymphs, and adults. Mites are nearly microscopic in size and barely visible to the naked eye.

The symptoms of mange are quite obvious and consist of blisters and small bumps in the skin, swelling and inflammation of the skin, and scabs which consist of serum and scurf. In advanced cases, a dry, leathery skin condition may follow.

Positive diagnosis of mange is made by microscopic examination of skin scrapings for mites.

Sarcoptic Mange

Adult sarcoptic mites burrow within the skin of the host and cause severe irritation. Eggs are laid within the burrows. Development of the mite from egg to reproductive adult takes approximately 2 weeks. Lesions usually first appear on the head, neck, and shoulders, then spread to other parts of the body.

As the host scratches to relieve irritation, blisters and small bumps develop. Further scratching causes the blisters to break, forming scabs. In advanced cases the mites become inactive and the affected skin becomes dry, wrinkled, and hairless, and remains so for some time.

Sarcoptic mange of horses can be transmitted to man where it causes transitory itch.

Psoroptic Mange

Psoroptic mange mite life cycles take about 2 weeks. Psoroptic mites do not burrow in the skin of the host. Instead, by pricking the skin to feed, they cause serum to ooze from the wounds. Accumulation of serum causes the formation of scabs which start on the hairier parts of the body. Psoroptes infestations eventually may involve large areas of skin all over the body.

Psoroptes mange is often called "scab" or "scabies," a highly contagious mange of sheep and cattle, respectively.

Mange mites are transmitted by contact with infected animals. Populations are generally greatest in the winter when host hair coats are long and animals are frequently crowded together.

Dipping, thoroughly spraying or injectable treatment with certain animal systemic insecticides are the only treatments for mange control. Current state and federal regulations concerning treatment of Psoroptes infested livestock must be followed.

Pests of Cattle

Cattle Grubs

Two species of cattle grub occur in Wyoming, the common cattle grub (Figure 13), the predominant species, and the northern cattle grub, Hypoderma bovis. Losses due to these insects have been estimated as high as \$10 per head.

The grub-like larvae which appear in the backs of cattle in the spring are familiar to everyone who handles cattle. The adult fly, which somewhat resembles a bee, is less familiar. Frequently one observes the reaction of cattle to egg-laying attacks of the adult fly. This reaction, which involves running with tails in the air, is termed "gadding," hence the term "gad fly".

In the spring both fly species lay eggs on the lower parts of the body of cattle. The eggs hatch in 3 or 4 days into tiny larvae. The grubs burrow into the skin of the animal then wander through the body until they reach the gullet sometime between October and December in the case of the common cattle grub, or the spinal canal in the case of the northern cattle grub. The grubs stay at these locations for a couple of months then migrate to the back. Shortly after they reach the back they cut breathing holes in the hide and in 1 to 2 months grow to full size. After reaching full growth, the larva drops from the back and forms an inactive pupa on the ground. Adult flies emerge from the pupae when weather is sufficiently warm. These flies mate, then seek cattle for egg-laying and the beginning of a new, one year cycle.

Control of cattle grubs in beef cattle and non-lactating dairy cattle is quite simple with the animal systemic insecticides. These chemicals may be applied as a high pressure spray, a dip, a pour-on or injection.

The animal systemic insecticides applied for cattle grub control also provide either suppression or control of cattle lice depending upon the insecticide and the formulation.

Animal systemics should not be used for grub control during the winter months of November through February, unless cattle were treated with a systemic earlier in the fall. Wyoming cattle treated during the winter months may demonstrate a reaction due to the death of grubs in the area of the esophagus or spinal cord. Prior to November 1 grubs are not usually found in these critical areas of cattle that have summered in Wyoming.

Pests of Sheep

Sheep Ked (Figure 14)

The sheep ked, sometimes called sheep "tick", is a common pest of sheep in Wyoming. Sheep keds have a negative effect on wool production and carcass weights.

Sheep grazed through the year on range may acquire heavy infestations during the winter and early spring months. Damage, most evident at these times, may result from loss of blood and from irritation caused by the bites. Many ranchers attribute "back loss" to heavy infestations of this parasite. Also, injury may occur after transfer of large number of keds from ewes to newborn lambs.

Ked bites are the cause of a defect in sheepskin called "cockle." The latter are raised, pimple-like blemishes that cannot be flattened out or covered with dyes. In the United States it is estimated that this defect is responsible for annual losses of about \$4 million. If sheep are freed of the parasite, they spontaneously recover from this effect of ked bites.

The sheep ked is actually a wingless fly which has adapted to a parasitic existence. For an insect it has a remarkable way of reproducing. An egg hatches within the uterus of the female ked, and the young larva develops to maturity on food material secreted by nutritive glands of the mother. Only a single larva develops at a time, the full-grown larva being born after 8 days of feeding and growing in the uterus.

The larva is cemented to the sheep's wool and forms the red barrel-shaped puparium sometimes confused with eggs or nits. The pupal period averages 22 days, after which the young adult keds emerge.

Females live about 100 days and produce 15 or more larvae during a lifetime. Males live about 80 days.

The entire life of a ked is spent in the fleece of the host. Ked populations increase during the fall and winter, reach peak numbers in January and February, then decline until June to low numbers that are carried over the summer.

Sheep producers have a choice of applying approved insecticides as pour-ons, low volume sprays (1/3 oz. per animal), high or low pressure sprays, dips, sprinkles (from sprinkler can) or dusts. The most convenient time to treat is in spring after shearing, when wool is short. Sheep are subject to stress and risk of exposure if dipped or sprayed during the periods of low temperatures. Therefore, sheep should not be sprayed or dipped when daytime temperatures are below 40°F. When animals are sprayed or dipped, enough time should be allowed for their wool to dry before evening. When wool is long, spray penetration is more satisfactory at high pressures, i.e., 300-350 psi.

Sheep Bot Fly (Figure 15)

In Wyoming more than 90% of the sheep are infested with sheep bot fly. Goats are equally subject to infestation. This

pest, known commonly as the sheep bot fly, is found in nearly all parts of the world where sheep are raised.

Sheep bot fly larvae generally do not cause death loss but are detrimental to health, and the persistency of the adult flies in depositing larvae in the nostrils interferes with the grazing of the animals. Presence of a fly excites the sheep. They shake their heads, keep their noses against each other or next to the ground, and in other ways indicate they are attempting to escape something trying to enter their nostrils.

The larvae irritate membranes lining the nasal cavities, and predispose the sheep to bacterial infection. This causes a mucopurulent discharge referred to as "snotty nose." The discharge becomes viscous, making it difficult for the animal to breathe freely.

Small, first-stage larvae are deposited in the nostrils by female flies, each of which produces up to 500 larvae. These larvae remain in the nasal passages for a time, then migrate to the frontal sinuses for further development. After reaching full growth in the sinuses, larvae, now over 1 inch long, work their way out of the nostrils and drop to the ground, where they bury themselves and pupate within a few hours. The pupal period lasts about 1 month.

In Wyoming, larvae overwinter in the sheep as larvae and the larval period lasts from 8 to 10 months. In warm climates, where at least two generations are produced each year, the developmental cycle may be completed in as short a time as 2 to 3 months.

Control of sheep bot fly larvae may be achieved by an oral drench of an approved systemic insecticide, preferably in the fall after cessation of adult fly activity.

Wool Maggots

In spring and early summer, sheep are sometimes infested with masses of maggots, larvae of certain species of blowflies. Infestations begin most often in the crutch area or where neglected wounds exude offensive discharges. Literally thousands of maggots may be found on a single sheep. After hatching from eggs, maggots spread extensively over the body and feed on the skin surface, causing severe irritation.

Infested animals show characteristic symptoms. Sheep become restless, stamp their feet, constantly wag their tails, and bite at the site of the trouble. As the condition worsens, sheep may leave the flock to hide in secluded places. Badly infested sheep, if untreated, become weak and may die.

Life histories of the several species of wool maggots are similar. The usual breeding places are in carrion, but under certain conditions they find a favorable environment for development on living sheep. Attracted by foul odors emanating from soiled, wet wool, or running wounds, female blow flies deposit hundreds of eggs on an animal.

Eggs hatch in a few hours and maggots develop rapidly, completing growth in 3 to 4 days. They then drop from the host and enter the ground, where they transform to the pupal stage. After 7 to 10 days adult flies emerge from pupal cases. Several generations develop each year. Depending on the species, blow flies overwinter as larvae, pupae, or adults.

Much can be done to avoid maggot infestation of animals through flock management. Sheep should be kept as clean as possible. If the breech area becomes saturated with urine and feces during the blow fly season, the animals should be "crutched" by clipping wool from the crutch and from the area above the tail down the back of the hind legs to the hocks.

Wounds should be prevented by handling sheep gently and by providing safe chutes and corrals. protruding nails and sharp splintered boards should be removed.

Shearing early in spring before the blow fly season is a good practice. It removes soiled or fermenting wool, making sheep less attractive to blow flies. It also permits shear cuts to heal before the blow fly season.

Lambing early is advisable for protection of both ewes and lambs, since wool of ewes soiled from afterbirth and exposed umbilical cords of lambs may attract flies. When lambing occurs early, docking and castrating often can be performed before blow flies become abundant.

Insecticides are useful not only to control maggot infestations but also to prevent them. When sheep have accidental wounds or when necessary operations are performed during the blow fly season, timely applications will do much to prevent blow fly injury.

If sheep are unshorn in late spring, or if they scour during warm months, preventive application of insecticidal sprays or dips may be advisable. Spraying or dipping with a recommended insecticide effectively prevents blow fly injury.

Pests of Horses

Horse Bot Flies

Three species of bot flies infest horses in Wyoming. Two of them, the nose bot fly and the throat bot fly have received names based on the egg-laying habits of the female flies. The third species is simply called the horse bot fly. Adult bot flies are large flies which frequently are seen laying eggs on horses. The larval or bot stage is attached to the lining of the stomach or intestines.

Horse bots cause injury in several ways. Since the mouthparts of the adult flies are non-functional, they can not bite. However, the egg laying habits of flies annoy or terrorize horses and cause them to mill or run, thus interfering with work and grazing. First stage larvae or bots penetrate and irritate submucosal tissues of the inner lip, mouth, and tongue; and induce horses to rub their mouths on objects, causing additional sores. Second and third stage larvae attach to the lining of the stomach and intestines removing nutrients and

causing ulceration and inflammation. Heavy infestations hinder passage of food through the alimentary canal and impair digestion of food.

Horse Bot Fly

Female horse bot flies may lay up to 1,000 eggs. The eggs are usually attached to the hairs of the forelegs or in other places the horse can reach with its mouth. After a 5 day incubation period, heat caused by licking of the horse stimulates the eggs to hatch. Young larvae are taken into the mouth, where they burrow into the surface of the tongue. After 3 to 4 weeks in the subepithelial layer of the mucous membrane of the tongue, the larvae pass to the stomach where they attach to the lining and pass their lives as second and third larval stages. The larvae remain in the stomach for 10 months (until the following spring) when they pass out with the feces. Pupation takes place in soil or ground litter. The pupal period lasts from 3 to 5 weeks. Individual adult flies may live for about 3 weeks but because larvae continue to drop from the host over a long period of time, flies can be found annoying horses in Wyoming from June through September.

Throat Bot Fly

Eggs of the throat bot fly, which are attached to hairs of the lower jaw of the horse, apparently require no stimulus to hatch. One female can lay from 300 to 500 eggs. Within 6 days after egg-laying, newly hatched larvae migrate to the lips, then to the inside of the mouth, and burrow into the tissue lining the mouth. After 3 to 4 weeks they move back to the pyloric portion of the stomach and the anterior portion of the duodenum. The rest of the life cycle is similar to that of the horse bot fly.

Nose Bot Fly

The eggs of the nose bot fly, which are laid mainly on the hairs of the upper lip, require an incubation period of approximately 2 days. Moisture provided by licking may be necessary for hatching. The larvae penetrate the lips and migrate into and invade tissue of the mouth. This species attaches to the stomach and duodenum in the second and early third larval stage. Unlike the other species, however, it then detaches and reattaches in large numbers in the rectum, very close to the anus, before dropping out with the feces. The rest of the life of the nose bot fly is similar to that of the other two species.

Chemical control of bot flies is directed against the larvae. A number of chemicals that are available for control of bots will also control parasitic worms. The simplest control technique is the use of an oral paste or gel or feeding of an approved insecticide formulation.

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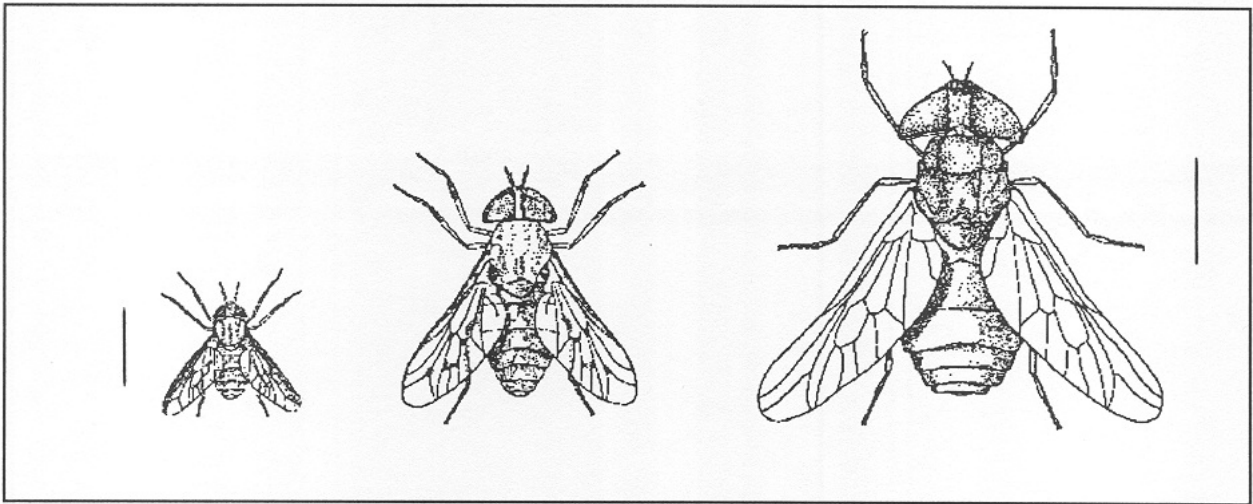


Figure 1. From left to right deer fly, horse fly, horse fly.

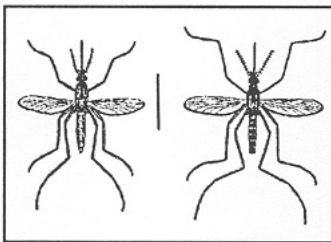


Figure 2. Mosquitoes; left Aedes, right Culex.



Figure 3.
Black fly.



Figure 5.
Horn fly.

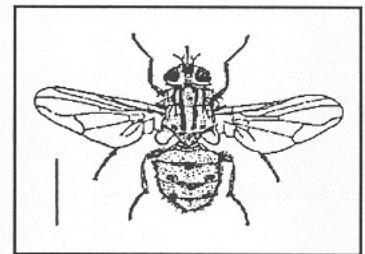


Figure 4. Stable fly.

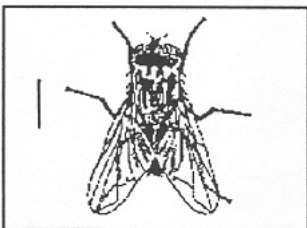


Figure 6. House fly.

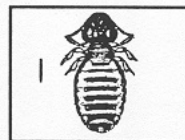


Figure 7.
Biting louse.



Figure 8.
Sucking louse.

*Line next to drawing shows actual size of arthropod.

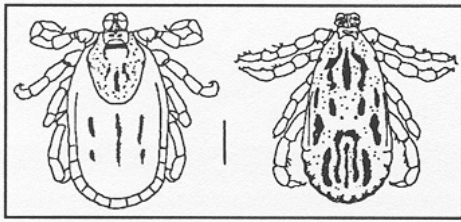


Figure 9. Winter tick. Female left, male right.

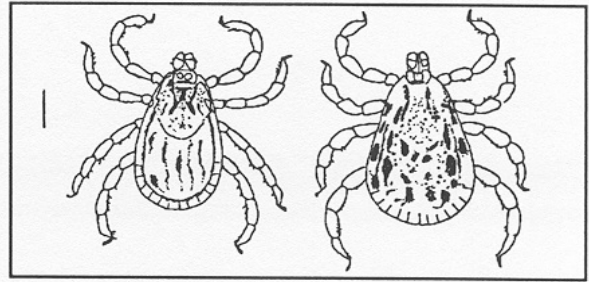


Figure 10. Rocky mountain wood tick. Female left, male right.

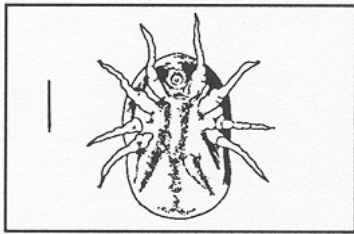


Figure 11. Spinose ear tick, nymphal stage.

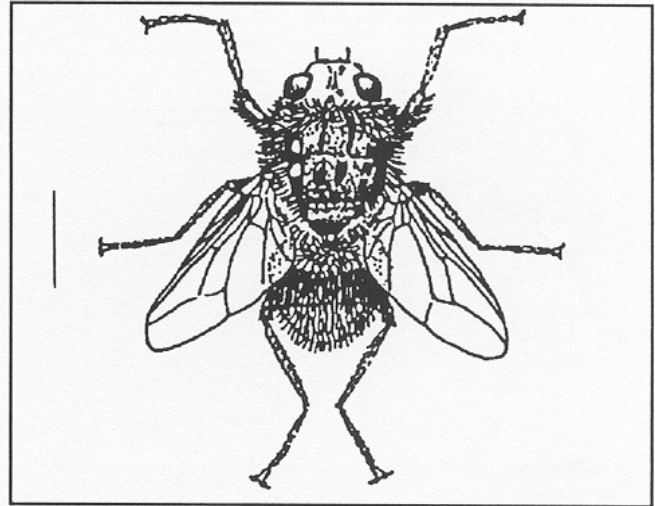


Figure 13. Cattle grub, adult.

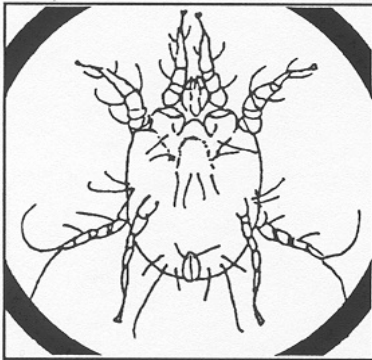


Figure 12. Mange mite. (microscopic in size)

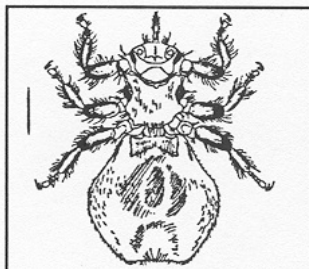


Figure 14. Sheep ked.

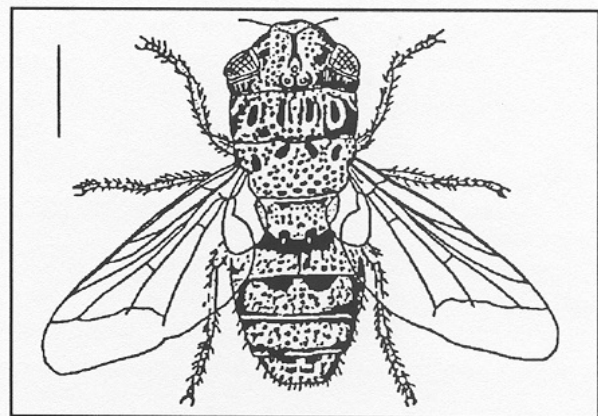


Figure 15. Sheep bot fly, adult.

*Line next to drawing shows actual size of arthropod.

