



Lolo Mosquito Abatement District

Mosquito Abatement Plan

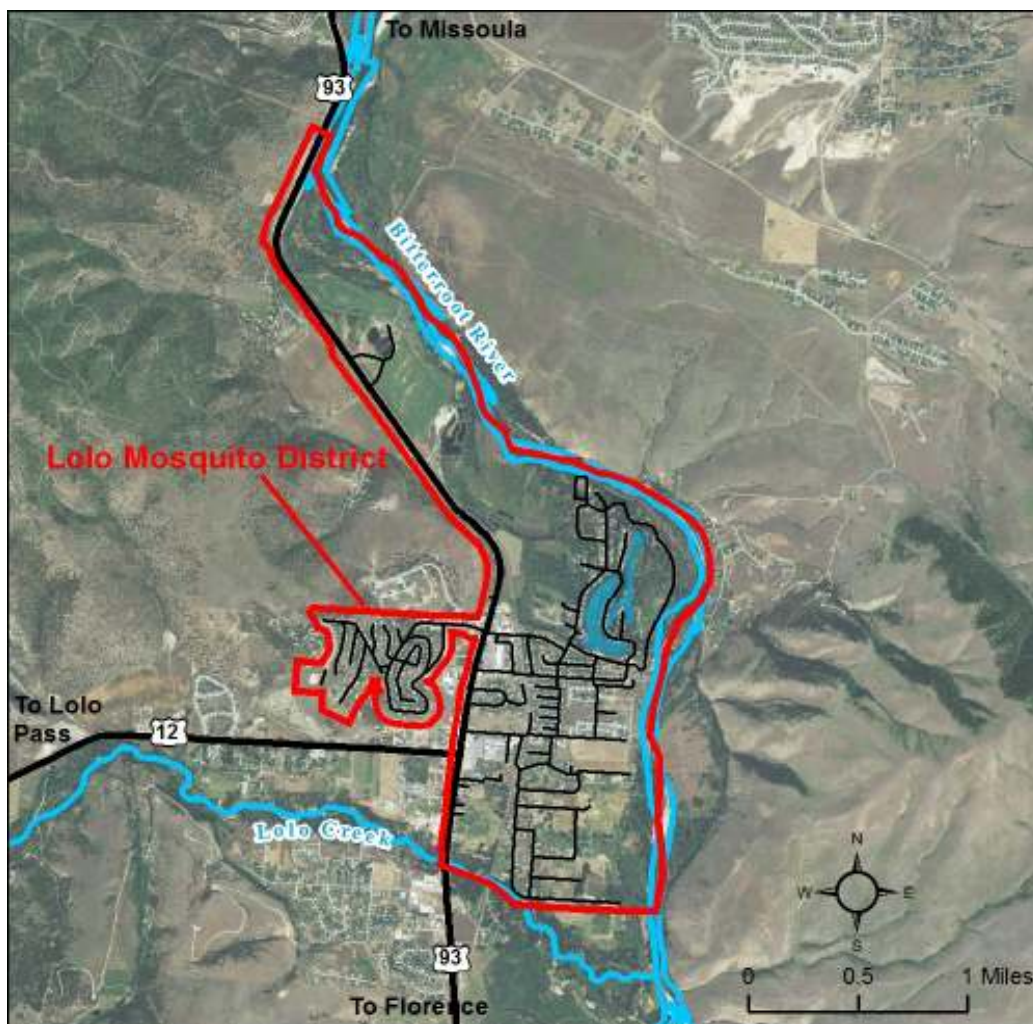
Adopted 2017

PURPOSE

To provide a framework for rational and effective mosquito management in the Lolo District. To comply with the creation and governance of special districts. Act MCA, Title 7, Chapter 22, Sections 7-11-1001 through 7-11-1029.

BACKGROUND & GEOGRAPHIC INFORMATION

The Missoula County Commissioners approved the expansion of the Lolo Mosquito Abatement District September 6, 1978. The County Commissioners appoint an administrative board of five members to oversee the program. The County Extension Office provides accounting and advisory support. On May 6, 1979 the County Commissioners conducted a public hearing to finalize boundaries of the District. Lolo Mosquito Abatement District boundaries are depicted on the map below.



LOLO DISTRICT MOSQUITO HABITAT

Mosquitoes live in a wide range of environments but prefer wetland habitat such as lakes, ponds, swamps, marshes, floodplains, moist meadows and irrigated pastures. Within the Lolo Mosquito District, spring snowmelt affects the Bitterroot River and the Lolo Creek at different times, frequencies and rates. Localized spring rain can raise stream levels quickly. Typically, high water takes place the last week of May/first week of June. During this time, low areas and manmade depressions become filled with water, creating mosquito habitats.

Many man-made mosquito habitats exist within the Lolo District as well. Standing water in yards commonly accumulates in wheel barrows, buckets, kiddie pools, abandoned hot tubs and uncovered boats. Other examples of man-made habitats include retention ponds, sewage treatment facilities and tire piles.

Most years, adult mosquitoes appear in significant numbers starting about the middle of June. Over the course of the summer, as sites that held water in the spring dry up, mosquito populations naturally decline.

MOSQUITO SPECIES

The Lolo Mosquito Abatement District is primarily concerned with mosquito species that are known to transmit disease or cause severe nuisance problems. Of the many species of mosquitoes common within the Lolo District, those of greatest concern are:

Aedes vexans, often referred to as the floodwater mosquito, is common in the Lolo area and throughout Montana. *Ae. vexans* eggs are laid singly on soil substrate that commonly floods in the spring. Eggs will overwinter and must go through a complete drying process before hatching. The return of water to the site in the spring will stimulate the larvae to hatch. In the absence of flooding, eggs can remain viable for a number of years. *Ae. vexans* is a known vector for canine heartworm but not considered a competent vector of western equine encephalitis or west Nile because it rarely feeds on birds which are the reservoir and amplifying host of the viruses. It's a very aggressive biter of people, livestock and wildlife.

Aedes increptus, known as the woodland mosquito, is found throughout the western United States and southwest Canada. Common in the Missoula area, the larvae develop in pools along streams left when floodwaters subside and in depressions filled by irrigation water, heavy rains, and melting snow. The species is usually confined to river valleys and to moderate elevations in mountainous areas. The eggs tend to hatch in March, April, or May depending on altitude. The adults are often encountered in large numbers in wooded areas near their larval habitats in the late spring and early summer. Females persist well into July and August in mountainous areas. *Ae. increptus* is a persistent biter - a nuisance to cattle, wildlife and people - but is not known to be associated with disease transmission.

Aedes trivitattus larvae are often found in a variety of freshwater habitats. Flooded woodlands, marshes, open pools and woodland pools are attractive breeding grounds. *Ae. trivitattus* develop very fast in hot summer sun. When daytime temperatures of 80° and 90° F. are accompanied by warm nights, the larvae can proceed from hatching to adulthood in as little as five days. Adult *Ae. trivitattus* tend to stay relatively close to their breeding areas, causing severe nuisance problems when they encounter human populations within a half mile of their emergence site. They are persistent aggressive biters, often attacking the victim in a swarm-like manner. The bite of *Ae. trivitattus* is much more painful and irritating than other mosquitoes. The species is suspected to transmit canine heartworm but has not been associated with west Nile virus or encephalitic viruses.

Culex pipiens, known as the Northern House Mosquito, is a vector for western equine encephalitis, St. Louis encephalitis, canine heartworm, and is the principal vector for west Nile virus. The mated females pass the winter in diapause and are common in basements, buildings and subterranean places that stay above freezing. In the spring, females lay their eggs in stagnant water polluted with organic waste that has collected in tin cans, discarded tires, untended bird baths, plastic wading pools, clogged rain gutters, storm drains, septic seepage and other catch basins. Eggs are laid on the water's surface in rafts containing up to 200-300 eggs. *Cx. pipiens* is normally considered to be a bird feeder but will feed on humans and other mammals, especially after the young birds have left the nest. Flight range is generally one-half mile or less.

Culex tarsalis, known as the Western Encephalitis Mosquito, is also a primary vector for west Nile and many other encephalitic viruses. Mated females spend the winter carrying undeveloped eggs which require a blood meal to mature in the spring. Females oviposit egg rafts containing 50 - 150 eggs in newly flooded freshwater substrates. Developmental sites vary from small man-made containers to large ponds. Larvae can tolerate a range of water conditions, but not high levels of organic pollution. Developmental periods range from seven days to almost four weeks, depending on temperature and food availability. *Cx. tarsalis* feeds on both birds and mammals. In the spring, most females tend to feed on birds. In late summer, birds will learn to avoid these mosquitoes causing the mosquitoes to seek mammalian hosts including rabbits, horses, cattle and humans. *Cx. tarsalis* is most active in the few hours after sunset and has been recorded to disperse up to 17 miles on host-seeking flights.

PREVENTION ---

Prevention is the first step in a successful, integrated mosquito control plan. In order to limit mosquito habitat and restrict population expansion, homeowners should commit to the following precautions:

- Remove all water-collecting containers such as buckets, cans, wheelbarrows, junk vehicles, uncovered boats and discarded tires
- Fill in land depressions, tree holes, and rain water ponds – all that can periodically hold water
- Clean bird baths weekly
- Clean rain gutters every spring or as needed
- Water lawn in the morning (6 am – Noon) so wet areas dry out during the day
- Dump the “kiddie” and/or “pet” pool often
- Keep lawn mowed
- Trim brush and tall grass in and around your yard
- Weed and thin flower beds and gardens

SURVEILLANCE & MONITORING ---

The Lolo Mosquito Abatement District surveys probable breeding grounds for mosquito eggs and larvae. Board Members respond to complaints of mosquito problems and visit areas of concern to assess the issue. The Board reports on nuisance mosquito population levels. Monitoring traps are used to measure mosquito populations and test for the presence of disease.

LARVICIDES

Larvicides are used to control mosquito populations by targeting the breeding habitat and preventing larvae from maturing into adult mosquitoes. Bacteria, growth regulators, and larviciding oils are all options for controlling mosquito larvae. Larviciding oils can also be used to control mosquito pupae. Areas of standing water (not including lakes or fish bearing ponds) are sought out throughout the spring and treated with larvicide. See Appendix A for a list of larvicides used by the Lolo District.

ADULTICIDES

Adulticides target adult mosquitoes and are applied as ultra-low volume sprays that kill mosquitoes upon contact. Adulticides are used to reduce high populations of adult mosquitoes during June and July. The District only applies adulticides that are registered with the Montana Department of Agriculture and labeled for that purpose. See Appendix A for adulticides used within the District.

SUMMARY

The Lolo Mosquito Abatement Plan is an integrated management strategy that begins with prevention and surveillance. Limiting mosquito habitat is essential to keeping populations to a minimum. Both homeowners and mosquito abatement district members need to be proactive in reducing probable breeding habitat. When nuisance problems are observed, the Board will assess the issue and determine the proper management solution. Larvicides will be used each year, targeting breeding sites to prevent population expansion. Adulticides may be used during peak mosquito season to combat severe nuisance problems or disease carrying populations.

APPENDIX A

LARVICIDES

The District will rotate between the following larvicides annually or every two years:

Bacillus thuringiensis israelensis (Bti)

Bti is a bacterium found naturally in soils that has been used as a biological pest control agent worldwide for several decades. Bti is applied directly to water infested with mosquito larvae in the form of a floating, doughnut shaped dunk. The bacteria produce a protein crystal, toxic only to mosquitoes and blackflies. When ingested, the toxic protein destroys the wall of the larvae's stomach, causing them to stop feeding and die within days.

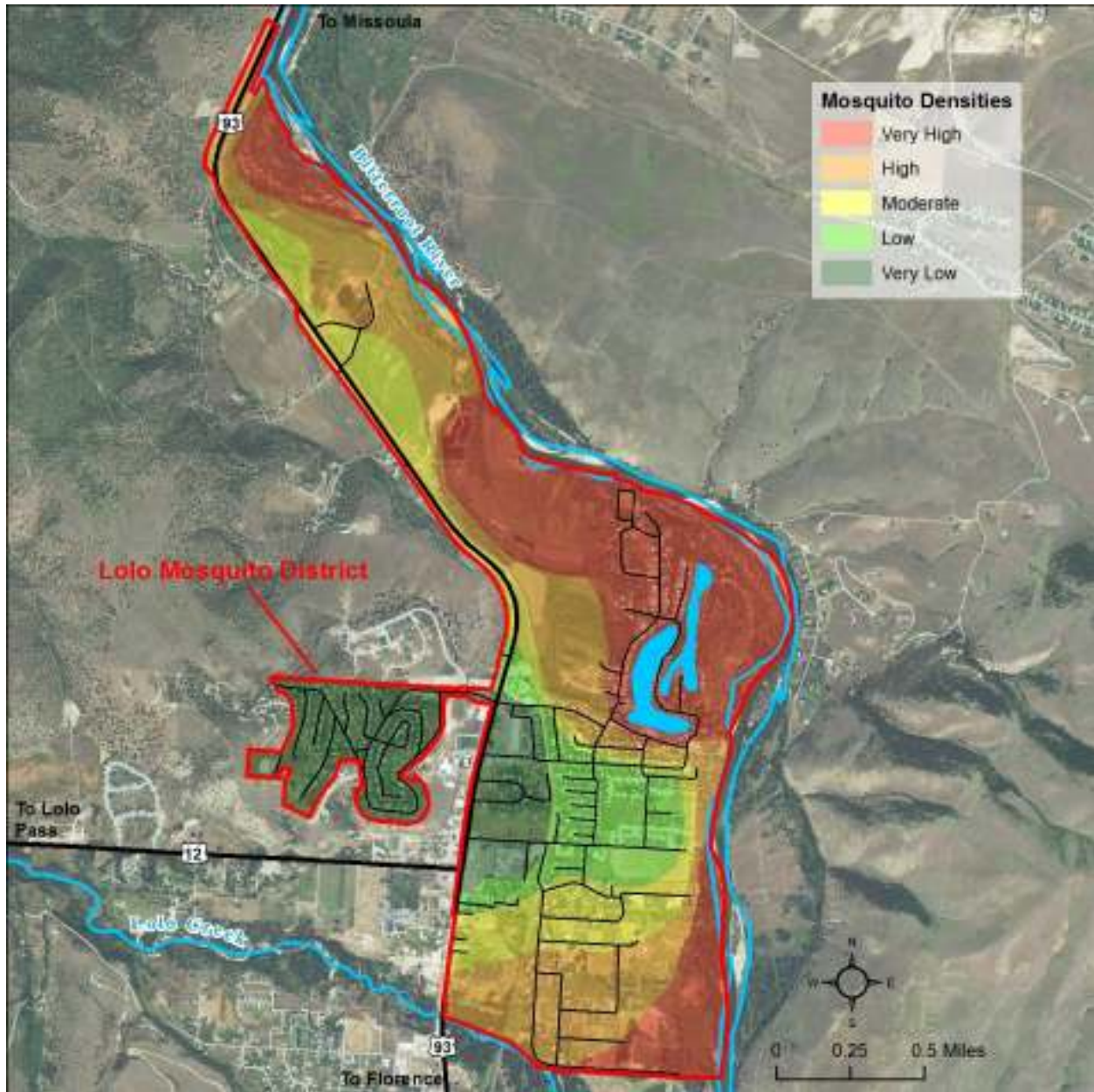
Bti is nontoxic to humans, animals and other organisms. It will affect other aquatic diptera. Bti is used to treat both manmade habitats, such as bird baths, small pools and other containers where water has collected, as well as larger bodies of water (ponds, lakes, irrigation ditches, etc.) The doughnut shaped dunks float on the water's surface, killing larvae for up to 30 days. After 30 days, the dunks are removed from the surface of the water and replaced. A single dunk effectively treats 100 sq. ft. of water, regardless of the depth. Bti is applied beginning in late June and subsequently throughout the summer months.

Methoprene

Methoprene, sold commercially as Altosid, is an insect growth inhibitor. This larvicide interferes with the normal lifecycle of mosquitoes by imitating their natural juvenile hormone, preventing the development of adult mosquitoes from larvae. Altosid is applied to water that has been identified as mosquito habitat in the form of briquets that will slowly release larvicide for 30 days. For control in a no-flow or low-flow zone with a depth of two feet or less, one briquet is applied per 100 sq. ft. For control in water subject to flow and a depth of two feet or more, one briquet is applied per 10 cu. ft. (75 gal of water). Methoprene treatment begins early in the mosquito season and is repeated every 30 days.

ADULTICIDES

Areas within the Lolo Mosquito Abatement District that often experience high mosquito populations and are treated with adulticides are confined to the lower lying areas within the district. Years with higher runoff or wetter springs usually result in higher populations of mosquitos which demand expanded areas receiving adulticides. The following figure presents the mosquito densities across the District. On drier years, and towards the end of a normal season, adulticide treatments would be focused on the road portions of very high and high mosquito density areas. An abnormally wet year could result in a much broader area being treated.



Permethrin

Permethrin is a synthetic chemical insecticide. It is currently the only adulticide used within the Lolo Mosquito Abatement District. Permethrin is dispersed only by trained applicators via truck mounted equipment that is calibrated each year. If a situation arises which warrants adulticiding, it is done in the late evening when mosquitoes are active, but bees and other pollinators are not flying. Wind speed and spray drift is taken into consideration to avoid contact with rivers and streams. Permethrin is applied from about mid-June to late July depending on weather, especially precipitation.