

# Logan City's Pesticide Discharge Management Plan

Adapted July 1, 2012

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## Introduction

The Pesticide General Permit (PGP) for point source discharges to waters of the State of Utah from the application of pesticides covers any qualified “operator” that meets the eligibility requirements identified in Part 1.C.1 and 1.D.1, and if so required, submits a Notice of Intent (NOI) in accordance with Part 1.A.3.

As a Mosquito Abatement District (activity covered in Part 1.C.1), the City of Logan Mosquito Abatement District (LMAD) is eligible for coverage under the PDP. Also as an “Operator Group 2” defined in Part 1.D.1, the LMAD has to submit an NOI regardless of the size of the area to be treated. The NOI was submitted to the Department of Environmental Quality on May 28, 2012.

The PGP requires any “operator” that is required to submit an NOI and comply with the water quality based effluent limitations to also develop a written Pesticide Discharge Management Plan (PDMP) to document measures taken to meet the effluent limits.

The PDMP requires that the following be documented:

1. Pesticide discharge management team information.
2. Pest management area description.
3. Control measure description.
4. Schedules and procedures pertaining to control measures used to comply with the effluent limitations.

The City of Logan must keep the PDMP up-to-date for the duration of coverage under the PGP. The PDMP may contain other documents to describe how the City of Logan will comply with the effluent limitations of the permit. A copy of any documents that the City will use must be attached to the PDMP.

You will find in the next pages the description of the different control measures implemented.

## Pesticide Discharge Management Team Information

All persons can be contacted at:

City of Logan  
Environmental Department  
Forestry Division  
450 North 1000 West  
Logan, Utah 84321  
Telephone: 435-716-9749  
Email: [joe.archer@loganutah.org](mailto:joe.archer@loganutah.org)

Person responsible for managing pests in relation to the pest management area:

Joe B. Archer  
Logan City Forester

Person responsible for developing and revising the PDMP

Joe B. Archer  
Logan City Forester

Person responsible for developing, revising, and implementing corrective actions and other effluent limitation requirements:

Joe B. Archer  
Logan City Forester

Person responsible for pesticide applications (mix, load, apply):

Vacant Position  
Logan City Mosquito Technician

# **Pest Management Area Description**

## **General Description and Location**

Logan is the largest municipality in Cache County. Cache County lies in the northern part of Utah and is bounded by mountains with the Bear River Mountains on the east and the Wellsville and Clarkston Mountains on the west. The main valley is about fifty miles in length from north (which is in southern Idaho) to south and about 20 miles wide at its widest point. The valley floor is predominately privately owned and is primarily used for agriculture. The eastern benches hold the majority of the population.

Cache County, Utah has a total area of 1,174 square miles (751,360 acres). The City of Logan has a total area of 17 square miles (10,880 acres).

Logan City's population is 48,174. Average temperature ranges from 24 degrees Fahrenheit in the winter to 71 degrees Fahrenheit in the summer. Logan averages 18 inches of precipitation annually with 13.5 inches in the form of rain and 61.7 inches of snow (melted this equals 4.5 inches of water).

## **Natural Environments**

The City of Logan concentrates its mosquito abatement on the south and west sides of the City. The Logan River and the Blacksmith Fork River join to form the Logan River in the southern part of the City. Also in this area the elevation gradient declines causing flooded areas in the spring which become mosquito breeding areas after the high waters have passed.

## **Man-Made Environments**

Shallow roadside ditches and irrigation ditches without a flow are sources of mosquito generation. Even a small "mud puddle" can be a site for mosquitoes to reach adulthood.

In the west portion of the City there are some agriculture lands which are primarily watered by flood irrigation. The resulting pools formed by this form of irrigation results in mosquito problems. Livestock pastures pose an additional problem with a ready supply of a blood meal for female mosquito and hoof prints which can form numerous mosquito egg laying opportunities. Livestock are usually watered in troughs which are often sites for mosquito production.

Places for development of mosquitoes within the boundaries of Logan City are endless. Anywhere there is standing water there is a site for mosquito production. This includes wading pools, unused boats, bird baths, old tires and water catchment containers.

## **Pest Problem Description**

The City is known to contain five genera of mosquitoes. The City of Logan conducts control efforts primarily on two species: *Culex tarsalis* and *C. pipiens*. The *Culex* genus is known to be a carrier of the West Nile Virus. By August, *Culex* is the primary genus of mosquitoes found in the traps. *Ocherotatus*, *Aedes*, *Anopheles*, and *Ocherotatus* are all found in the Logan area but in very small numbers.

*Culex pipiens* are found throughout the world and are a common pest mosquito in urban and suburban areas. This mosquito is regularly in homes usually above the 39 degrees latitude. Adults are generally active only during the warmer months of July, August and early September. They prefer to bit birds rather than mammals. These are “bridge” vectors, because they maintain the viruses within bird populations and then transmit viruses between birds and mammals. *Culex pipiens* is a carrier of Saint Louis Encephalitis (SLE), West Nile Virus (WNV), Western Equine Encephalitis (WEE), Heartworm in dogs, and bird Malaria.

*Culex tarsalis* is present in the City of Logan. They prefer the agricultural and industrial portions of Logan. It is the most common vector to humans and horses of West Nile Virus. In early spring infected mosquitoes may be found. This would be the result of infected females overwintering.

## **Action Threshold**

The City of Logan uses an integrated pest management method to control mosquitoes. Surveillance, the use of larvicides, and adulticide fogging are combined to give the best possible reduction of nuisance and/or possible disease vector mosquitoes.

Larvicide treatment is the principle form of mosquito abatement. The type of larvicide is dependent on the size of the pool in which the larvae are found. The larger the pool and the greater the possibility that the water will remain over an extended period of time dictates that a larvicide with a longer life be used. And conversely the smaller and shorter life of a pool results in the use of a larvicide with a life of an equal time as the pool. Most of the breeding sites have been mapped so checking and treating of these sites is done on a schedule. When the technician is not checking and treating the stagnate pools of water, he is searching for new pools which could have developed due primarily to construction and agriculture.

Surveillance entails the use of mosquito traps to determine the number of adult mosquitoes. This allows the technician, as well as the person responsible for mosquito abatement to track the numbers and assess the effectiveness of fogging. Surveillance allows for the determination of species present in the area. Part of this portion of mosquito

abatement is the maintenance of two flocks of five chickens. These birds are maintained for the purpose of blood testing. Blood is drawn weekly and tested for West Nile Virus.

Surveillance triggers in part the use of adulticide fogging.

1. More than 50 mosquitoes.
2. Complaint calls. If this is in an area where a threshold has not been reached or recorded, a trap will be set up and numbers assessed to determine if treatment is necessary.
3. Observation that there has been a larvicide failure
4. Limited area treatments may be conducted prior to special events or community functions

## **General Information**

Control of mosquitoes is done, with the majority of the labor, in the larval stage. The mosquito technician surveys potential larval habitats and uses larvicides when larvae are found. Larval habitat changes throughout the season but there are locations that are larvae producing locations throughout the season. Larvicides are pesticides that are placed in mosquito egg laying locations in order to kill or keep the mosquito larvae in that particular stage. In Logan the products are placed by hand. The main pesticides used for larviciding include bacterial products, surface agents and growth regulators.

Adult mosquito control is used to rapidly knock down biting adult mosquitoes. This can become necessary when larvae control is no longer effective or when adult populations from adjoining districts become a problem in Logan City. Logan City uses ultra-low volume (ULV) spraying or fogging. ULV spraying is the process of putting very small amounts of liquid into the air as a fine mist of droplets. These droplets float on the air currents and quickly kill the adult mosquitoes that comes in contact with these droplets. ULV adulticides are applied from 8:00 P.M. to 2 A.M when mosquitoes are most active and people are generally in their homes as well as bees and other pollinators are typically in their shelter. ULV applications are only done when environmental conditions are favorable.

Labels and Material Safety Data Sheets (MSDS) of all larvicides and adulticides used by the City of Logan are posted on the City's website and available to the public. The modes of action of the different groups of products are also described on the website.

The United States Environmental Protection Agency (USEPA) approves the use of pesticides nationally. Before pesticides are registered by the USEPA, they must undergo laboratory testing for acute and chronic health effects. In these tests, laboratory animals are purposely given a pesticide at high doses for an extended period of time to see if

toxic effects occur. These tests help scientists assess how these chemicals might affect humans, domestic animals and wildlife when exposed to these chemicals.

## **Water Quality Standards**

Waterways in Logan are not impaired with any pesticides used by the City of Logan.

## **Control Measure Description**

A brief explanation of the control measures to demonstrate how to meet the applicable technology based or water quality based effluent limitations. The control measures used at the site to reduce pesticide discharge include evaluation and implementation of management tools.

No action or delayed action when large portions of Logan have been inundated with water. This is because few larvae habitats can be treated in a manner which will prevent adult emergence and adult mosquitoes will be migrating from the surrounding district.

Prevention can be as basic as simply emptying water from containers or as complex as repairing broken water lines. Mechanical/physical and cultural methods manipulate larval habitat to prevent favorable conditions for mosquitoes to complete their aquatic development.

Educational programs allow the opportunity to suggest ways that residents can assist in the prevention of mosquito problems by removing containers and articles which can hold water from their yards that provide larval habitat. These programs can also remind residents to be mindful that birdbaths, pet water bowls, and livestock water troughs can serve as great mosquito development sites if not properly maintained.

Biological controls can be used for the control of larval stage of mosquitoes. Formations containing *Bacillus thuringiensis israelensis* can be used to treat flood water and other larval sites. Goldfish placed in water troughs which always contain water is an excellent way to prevent larvae. Chemical pesticides are often an abatement agency's last choice of control measures.

These products are applied as directed by their label, and all equipment used in this process is closely monitored and calibrated by certified personnel.

A list of all insecticides (labels and MSDS) used in the past or present is provided on the City of Logan website. These are also posted at the end of this document.

Operators must consider impact to non-target organisms, impact to water quality, pest resistance, feasibility, and cost effectiveness when evaluating and selecting the most efficient and effective means of pest management to minimize pesticide discharge to



waters of the U.S. Control measures are evaluated separately on the basis of mosquito life stage as follows:

1. Adult Control efficacy is determined from pre and post treatment trap counts when a trap site is located within the sprayed block. Landing rates taken by staff are used to supplement this data when trap sites are not located near a treated area.
2. Larval control efficiency is more difficult to access, as our primary larvicide is a growth hormone that does not cause mortality until the later stages of larvae's development. Often a failure is not realized until numerous adults are found emerging after their pupal stage.

## **Schedules and Procedures**

### **Control measures used to comply with the effluent limitations**

- A. Application rate and frequency procedures
  1. Application rate determination
  2. Determine species and age of target mosquito
  3. Evaluate environmental conditions
  4. Consider target area flora and fauna
  5. Determine appropriate application rate based on pesticide label recommendations, previous experience, and efficacy tests
- B. Frequency determination
  1. Determine target site treatment history with selected pesticide
  2. Evaluate effect of selected pesticide use on frequency and quantity thresholds for active ingredients
  3. Consider alternate treatment options
- C. Resistance considerations
  1. Consider documented resistance of target species to selected pesticide and/or any other compounds that are in the same class or exhibit similar modes of action. Also consider the possibility of cross resistance.
  2. Consider the use of alternate control options.
- D. Spill prevention procedures
  1. Perform weekly inspections of chemical warehouse. Maintain building.
  2. Keep OSHA requirements log ( spill response supplies, PPE locations, chemical list) up to date.
- E. Pesticide application equipment procedures
  1. Ground adulticiding
    - a. Operations
      - (1) A 10 gallon trailer mounted ULV sprayer is used for adult mosquito control

- (2) Application equipment must be calibrated annually to confirm the Volume Median Diameter is according to the label of the pesticide being used.
- (3) A visual inspection of equipment for leaks or wear to the lines, tanks and nozzle is done prior to the start up of the equipment.
- (4) Cleaning and maintenance of the spray system is performed to ensure that the system is operating properly.
- b. Maintenance
  - (1) Daily checks – Visually check the fog generator each day before use and make any necessary adjustments and/or repairs. Before making any repairs ensure that the required PPE is being worn.
    - (a) Check all gasoline hoses, insecticide lines and fittings for cracks, leaks or wear. Replace if needed.
    - (b) Check all bolts and fasteners and tighten as necessary.
    - (c) Ensure that pesticide tanks have sufficient chemicals for assigned spray mission.
    - (d) Check all nozzle parts for wear or damage. Replace if needed.
    - (e) Inspect blower air filter for cleanliness and serviceability.
    - (f) Check engine oil and add if needed.
    - (g) Check fuel level and add if needed.
    - (h) Start engine, listen for any unusual noises and watch for excessive smoke or oil leaks.
  - c. Repairs and services – Repairs and services on ULV equipment will be performed by appointed mechanic only.
- 2. Ground Larviciding
  - a. Ground larviciding is conducted by the City of Logan Mosquito Control staff in a number of situations using various products.
  - b. Hand larviciding is conducted by a licensed technician using his/her best professional judgment. The treatments occur on a daily basis. Sites are visited regularly and surveyed for the presence of larvae. Some sites are pretreated when the site has a historic record of larvae.

## **Pest Surveillance Measures**

- A. Adult surveillance
  - a. Service request inspections are taken by telephone and emails. Most of these are requests for treatment. The technician will inspect for mosquito larvae and adult mosquito activity to see if the use of adulticides is necessary.
  - b. Mosquito traps using CO2 are a determining factor for the use of adulticides. We use 3 permanent traps and 2 portable traps in this procedure.
- B. Larval surveillance
  - a. Breeding site inspections are conducted by the City's Mosquito Technician following flooding events such as rains, snow melts, or irrigation. Larval

surveillance entails locating the larvae source (if not already known), sampling for larvae, estimating larval density, and determining larval developmental stage. Other factors considered during larval inspections include the type of environment (pond, ditch, etc.), presence of aquatic vegetation, and if any natural predators (like fish) are present.

- C. Disease surveillance
  - a. The City of Logan maintains two flocks of surveillance chickens located at the north and south ends of Logan on the west boundary of the City. Blood is drawn weekly and submitted to the Utah Diagnostic Lab for testing.

## **Assessing Environmental Conditions Procedures**

- A. General Considerations

Climatic conditions are always checked prior to any ground applications. Wind speed, wind direction, and the possibility or presence of rain must be taken into consideration. Temperature plays a major role in timing of application.
- B. Adult Mosquito Treatments

The treatment area for the City of Logan is almost entirely urban. The applicators are aware of any concerns pertaining to bee hive locations, and organic gardens and turn off the equipment when necessary to avoid drift into these areas. Equipment is turned off when approaching larger bodies of water to avoid any adverse reactions to non-target organisms in these environments.

  - a. Ground adulticiding procedures
    - (1) Apply when mosquitoes are most active and meteorological conditions are conducive to keeping the spray cloud close to the ground.
    - (2) Apply when thermal activity is low. Do not apply when ambient temperature is less than 50 degrees F.
    - (3) Do not apply over bodies of water except when necessary to target areas where adult mosquitoes are present and weather conditions will facilitate movement of applied materials away from the water in order to minimize incidental deposition into the water.
    - (4) To minimize hazard to bees, the product is applied half an hour after sunset and before sunrise, limiting application to times when bees and other pollinators are least active.
    - (5) Bee keepers are notified at the beginning of the season of areas which will probably be sprayed. They then can choose to locate their hives away from these areas.
- C. Larval mosquito treatments.

The only environmental consideration is the amount of aquatic vegetation present within the treatment site. Heavy vegetation within a wetland can interfere with the migration of the larvicide through the water column.

## **Spill Response Procedures**

- A. The suggested guidelines in the event of a chemical spill are known as the 3 Cs: Control the spill, Contain the spill, Clean up the spill. The procedure is described in the National Pesticide Applicator Certification core manual and required by the State of Utah Department of Agriculture and Food for certification.

## **Adverse Incident Response Procedures**

- A. To help avoid or at least minimize adverse incidents, the Logan mosquito technician turns off the sprayer when approaching areas of high human activity, such as outdoor sports games or practices or other outdoor events.
- B. Logan City has a courtesy no-spray request policy available by calling the Logan City Forester's Office at 435-716-9749. This enables people to request no fogging at their address due to health issues, beekeeping, organic gardening, and other concerns. The requests must be renewed yearly.
- C. Logan City also maintains a courtesy call list to inform concerned citizens of when we will be fogging in their area. People on the no-spray list are also included on this list.

## **Pesticide Monitoring Schedules and Procedures**

- A. For application by personnel certified/trained in public health pest control or mosquito control, a record for each application must be kept of:
  - a. Date, time and areas where application occurred.
  - b. Dilution (if applied) and application rate (speed of application vehicle)
  - c. A description of insecticide delivery system used for the specific application.
  - d. Climatic factors (ambient temperatures, wind speed and wind direction) using a reliable means.
  - e. Employees involved in mixing, loading and applying the pesticides.
  - f. These records will be kept by the City of Logan for a minimum of two years.

## **Insecticides – Modes of Action**

How an insecticide works is called a mode of action. An understanding of the mode of action of an insecticide requires knowledge of how it affects a specific target site within an organism. The target site is usually a critical protein or enzyme in the insect. Many insecticides affect a broader target. Although most insecticides have multiple biological effects, toxicity is usually attributed to a single major effect.

- A. Larvicides and adulticides – Organophosphates  
Organophosphorus insecticides affect the nervous system. These insecticides are synaptic poisons. The synapse is a junction between two nerves or a nerve connection point. Organophosphorus insecticides bind an enzyme found in the synapse called acetylcholinesterase. This enzyme is designed to stop a nerve impulse after it has crossed the synapse. Organophosphorus insecticides bind to and prevent the enzyme from working. Therefore poisoned synapses cannot stop the nerve impulse. Consequently continued stimulation of the nerve occurs

as observed with pyrethroids. Poisoned insects exhibit tremors and uncoordinated movement.

B. Larvicides – growth regulators

These chemicals are referred to as insect growth regulators or IGRs. IGRs act on the endocrine or hormone system of insects. These insecticides are specific for insects, have very low mammalian toxicity, are not persistent in the environment and cause death slowly. Most of the currently registered IGRs mimic the juvenile hormone produced in the insect brain. Juvenile hormone tells the insect to remain in the immature state. When sufficient growth has occurred, the juvenile hormone production ceases triggering the molt to the adult stage. IGR chemicals, such as methoprene, mimic the action of juvenile hormone and keep the insect in the immature state. Insects treated with these chemicals are unable to molt successfully to the adult stage and cannot reproduce normally.

C. Larvicides – Bacteria

*Bacillus thuringiensis var. israelensis (Bti)* is a naturally occurring bacterium that produces a crystalline protein toxin (crystal) and a spore. The larval activity of Bti formulations is due to the presence of the protein toxin. The spore has no larvicide activity. For mosquito larvae many factors are necessary to produce the toxic effects of Bti crystals. If the crystals are available in sufficient quantity, to suffer toxicity and die a larva must: 1) Capture and ingest the crystal; 2) Possess a digestive tract with a highly alkaline Ph; 3) Possess the enzymes capable of liberating the toxic proteins; and 4) Possess the gut membrane receptors compatible with the solubilized toxins. Bti-based products are not insecticides of contact. The active ingredient (crystals) must be ingested to show a toxic activity. The very specific mode of action makes it very safe for no-target organisms present in the same environment.

D. Larvicides/Pupicides

Very refined oil or surfactants can be used as larvicides/pupicides. These products have the ability to kill both larvae and pupae. Using conventional spraying methods the highly refined oil quickly spreads over standing water. The film reduces the surface tension of the water making it difficult for the mosquito larvae and pupae to attach to the surface which causes them to drown. Emerging mosquitoes are unable to fully emerge and will drown. Mosquito larvicide and pupicide are effective on all species of mosquitoes that breed in standing water and require the air/water interface in their lifecycle. Changing the surface tension also affects the adult mosquito. Females are unable to land on the water and lay their eggs; instead they sink and drown.

E. ULV Adulticides – Pyrethroids

Pyrethroids are synthetic chemicals whose structures mimic the natural insecticide pyrethrin. Pyrethrins are found in the flower heads of plants belonging to the family Compositae (e.g. chrysanthemums). These insecticides have a unique ability to knock down insects quickly. Synthetic pyrethrins (also known as pyrethroids) have been chemically altered to make them more stable. Pyrethroids are axonic poisons (they poison the nerve fiber).

They bind to a protein in nerves called the voltage-gated sodium channel. Normally this protein opens causing stimulation of the nerve and closes to terminate the nerve signal. Pyrethroids bind to this gate and prevent it from closing normally which results in continuous nerve stimulation. This explains the tremors exhibited by poisoned insects. They lose control of their nervous system and are unable to produce coordinated movement.

Pyrethroids are most often used with piperonyl butoxide (PBO) which is a synergist that is usually incorporated within the final products. PBO enhances the effect of pyrethroids by inhibiting an enzyme (cytochrome P450) produced by the insect to break down the pesticides. The PBO allows the insecticides to be effective with less active ingredient than would otherwise be required.

### **Pesticides used by Logan City**

- A. Pesticides used in the past or currently in use by the City that are used to control mosquito larvae (larvicides) or adult mosquitoes (adulticides).
  - a. Larvicides - growth regulators
    - Altosid Pellets
    - Altosid Briquets
    - Altosid XR Briquets
  - b. Larvicides – Pupicides
    - Agnique MMF G
    - Agnique MMF
  - c. Larvicides – Bacteria
    - VectoBac 12 AS
    - VectoBac G
    - VectoLex CG
  - d. ULV Adulticides – Pyrethroids
    - Kontrol 4-4
    - Omega Mist OFC