MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM (MPDES) PERMIT

FACT SHEET

Pesticide General Permit (PGP)

FACILITY: Pesticide Application To or Over State Surface Waters

PERMIT NO.: MTG870000

LOCATION: Statewide (Except for within the Boundary of an Indian Reservation)

CONTACT: Applicant

RECEIVING WATER: Statewide

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I. Status of Permit

The Pesticide General Permit (PGP) is a new general permit which is being proposed to authorize application of pesticides to or over, including near state surface waters in Montana. The PGP is designed to cover pesticide applications in which it is unavoidable that some of the pesticides will be deposited in water in order to effectively target pests.

The PGP will cover only specific pesticide use patterns as defined in Part III of this Fact Sheet. Pesticides that are prohibited from entering surface water by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) are not covered under the PGP.

A. Federal Background

The Environmental Protection Agency (EPA) has never issued a National Pollutant Discharge Elimination System (NPDES) permit for the application of a pesticide to target a pest that is present in or over, including near, the water. Instead, EPA has been regulating these types of applications through FIFRA. EPA regulates the sale, distribution and use of pesticides under FIFRA to ensure that when used in conformance with FIFRA labeling directions, pesticides will not pose unreasonable risks to human health and the environment.

Over the past ten years, several courts addressed the question of whether the Clean Water Act (CWA) requires NPDES permits for pesticide applications. These cases resulted in some confusion about the applicability of the CWA to pesticides applied to state surface waters.

On November 27, 2006, EPA issued a final rule clarifying two specific circumstances in which an NPDES permit was not required to apply pesticides to or around water. They were: 1) the application of pesticides directly to water to control pests; and 2) the application of pesticides to control pests that are present over, including near, water where a portion of the pesticides will unavoidably be deposited to the water to target the pests. In both instances, the application must be consistent with relevant FIFRA requirements.

On January 9, 2009, the Sixth Circuit Court of Appeals vacated EPA's 2006 NPDES pesticides rule in *National Cotton Council of America v. EPA*, 553 F.3d 927 (6th Cir, 2009). The Court held that the CWA unambiguously includes "biological pesticides" and "chemical pesticides" with residuals within its definition of "pollutant." On June 8, 2009, the Sixth Circuit granted EPA a two-year stay. At the end of the stay, on April 9, 2011, NPDES permits will be required for discharges to state surface waters of biological pesticides, and of chemical pesticides that leave a residue.

Agricultural stormwater runoff and irrigation return flows that are not returned to waters of the U.S. do not require NPDES permits, even when they contain pesticides or pesticide residues, as the CWA exempts these categories of discharges from requiring NPDES permit coverage [33 U.S.C. 1311(a) and 33 U.S.C. 1362].

(However, discharges from the application of pesticides to irrigation ditches and canals that are either waters of the U.S. or convey to waters of the U.S. do require NPDES permit coverage.) Additionally, other stormwater runoff is either: (a) already required to obtain NPDES permit coverage as established in section 402(p) of the CWA or (b) classified as a non-point source discharge for which NPDES permit coverage is not required. Thus, nothing has changed the determination of whether certain types of stormwater runoff are required to obtain permit coverage or under which permit coverage is required. This is true whether the runoff contains pesticides or pesticide residues resulting from the application of pesticides.

In response to the Court's decision, EPA released a draft PGP to cover certain discharges resulting from pesticide applications on June 4, 2010 for public comment. The EPA expects to finalize the federal PGP in January 2011, with an effective date of April 9, 2011.

B. Montana Background

Montana is a delegated state with the legal authority to issue and enforce Montana Pollutant Discharge Elimination System (MPDES) permits. The Montana Department of Environmental Quality (Department) is required to develop a PGP that will be as stringent as the EPA's Pesticide General Permit. Since the EPA does not expect to finalize the federal General Permit before January 2011, the Department has developed this draft PGP based on the draft federal general permit, discussion with EPA as they continue to develop the federal PGP, and working with the Montana Department of Agriculture (MDA) and other stakeholders to ensure that the state's PGP meets the intent of the federal PGP, but is Montana-specific. The Montana-issued PGP effective date will be on or shortly after April 9, 2011.

In addition, since 1993 the Montana Water Quality Act under Title 75-5-308, Montana Code Annotated (MCA) has required Department authorization for short-term exemptions from water quality standards (WQS) for the application of a pesticide… 'when it is used to control nuisance aquatic organisms or to eliminate undesirable and nonnative aquatic species' (308 Rule). However, once the PGP is effective the Department may not issue 308 authorizations for those activities that are required to obtain MPDES permit coverage through this PGP [75-5-308(3), MCA]. Owners/operators with pesticide application projects that are not eligible for coverage under the PGP as discussed in Part III will still be required to obtain either 308 authorization or individual MPDES permit coverage. The exemption under 75-5-605(3), MCA for routine maintenance of irrigation canals that do not cause an exceedence of a water quality standard of any receiving water outside the irrigation system remains in effect.

II. Description of Regulated Discharge

Owners/operators that apply pesticide to or over, including near state surface waters and exceed the threshold of one of the *pesticide use patterns* identified in this Fact

Sheet in Part III are covered by the Montana PGP. Each specific pesticide use pattern will have varying degrees of impact on the state surface water body, depending on the type of pesticide application, which in general will be:

- *Direct Chemical Pesticide Application*: For pesticides applied directly to waters, it is the pesticide residue, including excess pesticide that is present outside of the treatment area or within the treatment area once the target pests have been controlled, that is considered a "pollutant" under this permit.

- *Unavoidable Discharge of Chemical Pesticides*: A second general type of pesticide use is the application of chemical pesticides to control pests that are present on or over surface water, including near such waters, where a portion of the pesticides will unavoidably be deposited into waters of the state. For example, while spraying target plants growing along a river's edge, pesticides will unavoidably be deposited into the water. For this general type of pesticide application, the discharge of chemical pesticides into the water is not the intent but cannot be avoided.

  Any pesticide or pesticide residue that is deposited in state surface waters 'incidently,' since the intended purpose of the application is to target pests above the water, is considered a "pollutant." The concentrations of "pollutants" will be no higher, and in many instances significantly lower, than the product concentrations considered by EPA when registering these products under FIFRA.

  It is up to the owner/operator (and applicator, if separate) to determine whether their pesticide application will be close enough to any surface water that pesticide will be considered unavoidably discharged to the water. The PGP does not include "spray drift" – the airborne movement of pesticide sprays away from the target application site into a water of the state-- or application of pesticides to terrestrial agriculture crops. As non-point sources, spray drift and stormwater runoff are not covered by the PGP. In addition, any pesticide that is prohibited from use in water is excluded from the PGP and cannot be considered "unavoidable discharge" since its use in this manner is illegal.

- *Biological Pesticide Control*: the application of biological pesticides (also called biopesticides) include microbial pesticides, biochemical pesticides and plant-incorporated protectants (PIP). An example is the application of *bacillus thuringiensis israelensis* (Bti) and *bacillus sphaericus* (Bs) used against mosquito larvae. The Sixth District Court decision identified biological pesticides as a pollutant discharge that needs to be regulated under the NPDES program.

An owner/operator who applies pesticides to or over, including near state surface water must either obtain coverage under the PGP if they meet the eligibility provisions described in Part III of this Fact Sheet, or obtain another permit (including either an individual MPDES permit or a 308 Authorization); otherwise they will be in violation of the CWA.

III. Coverage

A. Coverage Area

This General Permit applies to all areas of the State of Montana, except for within the boundary of an Indian Reservation.

B. Regulatory Authority

Section 75-5-605(2), MCA, prohibits the discharge of sewage, industrial wastes or other wastes to state waters without a current permit from the Department. The Department issues permits for *'point sources discharging pollutants into state waters'* under Administrative Rules of Montana (ARM) Title 17 Chapter 30 Subchapter 13, "Montana Pollutant Discharge Elimination System (MPDES) Permits." ARM 17.30 Subchapter 13 establishes a common system for issuing surface water discharge permits which is compatible with the NPDES permitting established by the EPA pursuant to section 402 of the CWA [ARM 17.30.1301(1)].

> *Point source* means 'any discernible, confined, or discrete conveyance ... from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff' [ARM 17.30.1304(41)].
>
> *Discharge of a pollutant* and *discharge of pollutants* each means 'any addition of any pollutant or combination of pollutants to state waters from any point source...' [ARM 17.30.1304(16)].
>
> *State waters* means 'any body of water, irrigation system, or drainage system ...' It does not apply to ponds or lagoons used solely for treating, transporting, or impounding pollutants or to irrigation waters where the waters are used up within the irrigation system and said waters are not returned to any other state waters [75-5-103(33), MCA and ARM 17.30.1304(59)].
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> *Surface waters* means 'any waters on the earth's surface including, but not limited to, streams, lakes, ponds, and reservoirs; and irrigation and drainage systems discharging directly into a stream, lake, pond, reservoir, or other surface water. Waterbodies used solely for treating, transporting, or impounding pollutants shall not be considered surface water' [ARM 17.30.602(33) and 17.30.702(23)]. See Part IV for a more detailed discussion on WQS for state surface water.

Therefore, discharges from pesticide application activities to or over, including near, state surface waters are subject to regulation under the MPDES, Title 17, Chapter 30, Subchapters 12 and 13.

The Department may issue general permits to cover point source discharges that meet the criteria in 40 CFR 122.28 [75-5-401(9), MCA, ARM 17.30.1303 and 17.30.1341]. They include operations that:

- Are the same or are substantially similar,

- Discharge the same types of wastes,
- Require the same effluent limitations or operating conditions,
- Require the same or similar monitoring requirements,
- Are more appropriately controlled under a general permit than under individual permits.

Pursuant to 75-5-401(9), MCA, the Board is allowed to adopt rules authorizing general permits for categories of point source discharges. The rules may authorize discharge upon issuance of an individual authorization by the Department or upon receipt of a notice of intent to be covered under the general permit.

C. Sources Eligible for Coverage under this General Permit

Montana is the fourth largest state, with a total of 94 million acres (of which 8 million is within the boundaries of an Indian Reservation and regulated by EPA, and the remaining 86 million acres regulated by the Department) ("*The Tribal Nations of Montana, A Handbook for Legislators*," March 1995). The 56 counties in Montana range from 460,000 acres up to 3.6 million acres of total area (NRIS, 2010).

Montana is third in total stream miles for the lower 48 states. As a headwaters state, Montana has more than 170,000 miles of streams (53,000 miles are perennial streams that flow year round and 117,000 miles are intermittent). There are more than 10,000 lakes and reservoirs, and thousands of smaller wetlands, stock ponds, and other waterbodies ("*Water Availability in a Nutshell*," Montana State University). The amount of water area varies by county from 448 acres up to 116,000 acres -- in general the western counties have much more waterbody area.

Review of districts and other organizations potentially responsible for implementing pest control in Montana include:

- Mosquito Control: 32 Mosquito Districts and 24 Mosquito Areas (ranging from 17 acres to 2.6 million acres);
- Weed Control: 56 County Weed Coordinators and various Extension Agents and Conservation Districts (Montana Weed Control Association list);
- Irrigation Canals: at least 50 irrigation districts (per 2008 US Census, but a January 2009 DNRC report included 229 Ditch & Canal Companies);
- Federal Land Managers – Bureau of Land Management (BLM - 10 Field Offices), and US Forest Service (USFS – 10 Forest & Grassland Offices);
- Eight National Parks & 15 Wilderness areas [Outstanding Resource Waters (ORW) as defined in 75-5-103(24), MCA. See Part IV for a discussion of ORW];
- Montana Department of Agriculture Pesticide Applicator Licenses, including: 6,360 private agricultural, 622 agricultural plant pests, 474 regulatory weed, 122 aquatic pest control, 70 mosquito, and 26 piscicide.

This is a tremendous amount of area, water, and potential owners/operators to regulate, and highlights the need for appropriately scaled annual thresholds in order to design an effective PGP.

The intent of the PGP is to capture all applications made directly to state surface waters in order to control pests in or over the water, or applications to control pests near water in which pesticides will make unavoidable contact with the water. As described in Part II of this Fact Sheet, the general methods of pesticide application (direct, indirect with unavoidable discharge, and biological) were considered in developing the pesticide use patterns that are included for coverage under the PGP. The resulting pesticide use patterns and thresholds were developed to include discharges that are similar in type and nature and therefore represent the type of discharges and expected nature of the discharges covered under this permit. The **pesticide use patterns** are:

1. **Piscicides and Other Nuisance Animal Control**

   This use pattern includes the application of pesticides into waters for purposes such as fisheries management, including invasive species eradication, as well as to control a range of other animals. Piscicide applications are usually made over an entire waterbody as the target pests are mobile. Treatments are generally made several years apart. Other nuisance animal control could include non-fishery invasive species eradication or equipment maintenance (such as zebra mussel control). Applications of this nature are usually made in more discrete areas, although they may be made over an entire waterbody. Note: direct application of chemical pesticides to control larvae of mosquito and other flying insects is considered under Pattern Use #4.

2. **Weed and Algae Control**

   This use pattern includes the application, by any means, of contact or systemic herbicides to control vegetation and algae in water and at water's edge where the pesticide would be unavoidably discharged, including irrigation ditches and/or irrigation canals unless the irrigation water is exempt because it is used and not returned to waters of the state. This is consistent with 75-5-605(3), MCA which exempts routine maintenance of irrigation channels from permitting if the activities do not result in an exceedence of a water quality standard in any receiving water outside the irrigation canal.

   Applications of this nature may be single spot treatments of infestations or staged large scale treatments intended to clear several acres of waterway. Treatments may be singular or occur several times per year.

3. **Aerial Pest Control**

   This use pattern includes aerial pest control projects, typically in and over forest canopies and possibly other widespread areas where there are waters of the state below the pesticide application. Applications of this nature usually occur over

large tracts of land, and are typically made in response to specific outbreaks. Note: mosquito adulticides are not included under this use pattern; they are considered under Pattern Use #4.

4. Mosquito and Other Flying Insect Pest Control

These pests are detrimental to industry, the environment, and public health. There are three main methods for controlling mosquitoes and other flying insects: chemical larval control, chemical adulticide, and biological control.

a. Larval Chemical Control

This use pattern includes the application, by any means, of chemical larvicides into water to control insects that breed or live in, over, or near water. Applications of this nature usually involve the use of granular larvicides discharged over large swaths of mosquito breeding habitat and may occur several times per year.

b. Chemical Adulticide

This use pattern includes the application, by any means, of chemical insecticides into or over water to control insects that breed or live in, over, or near water. Applications of this nature usually involve the use of ultra low volume sprays discharged over large swaths of mosquito breeding habitat and may occur several times per year.

c. Biological Control

This use pattern includes the application, by any means, of biological insecticides and larvicides into or over water to control insects that breed or live in, over, or near water.

5. Research & Development.

This use pattern includes application, by any means, of chemical and biological pesticides into or over water to control an invasive species or some other pestilence that is currently an unknown. Since it is important to eradicate invasive species as soon as practicable, this pattern use is designed to be general in order to cover unexpected situations.

Owners/operators in any of the *pesticide use patterns* that apply pesticide to or over, including near, state surface waters are subject to the Montana PGP if they exceed the following annual thresholds in any calendar year of the permit cycle:

Pattern Use #	Pesticide Use	Treatment Area Annual Threshold[1,2]
1	Piscicides and Other Nuisance Animals (i.e. zebra mussels)	> 0 acres
2	Weeds and Algae	64 acres
3	Aerial Pest Control	640 acres
4.	*Mosquito and Other Flying Insect Pests*	
4a.	Larvae chemical control	64 acres
4b.	Chemical adulticide	640 acres
4c.	Biological control	6,400 acres
5.	Research & Development	> 0 acres

Footnotes:
1 Calculations should include the area of the applications made to: (1) state surface waters and (2) conveyances with a hydrologic surface connection to state surface water *at the time of pesticide application.* For calculating annual treatment area totals, count each pesticide application activity as a separate activity. For example, applying pesticides twice a year to a ten acre site should be counted as twenty acres of treatment area.
2 Any chemical treatment in waterbodies classified A-closed has a threshold of > 0 acres.

For each pesticide use pattern, the owner/operator must determine the amount of area where pesticide application can be expected to enter surface water (either directly or unavoidably discharged) for each application expected in a calendar year. If this area cumulatively exceeds any one of the above thresholds they are responsible for submitting a complete Notice of Intent (NOI) and complying with the PGP for *all* use categories (regardless of whether the threshold for the additional categories is exceeded). Any pesticide application covered by another General Permit (such as Fish Farms) is not subject to the PGP and would not be included.

Owner/operator means 'a person who owns, leases, operates, controls, or supervises a point source' [75-5-103, MCA and ARM 17.30.1304(38)]. This could include:

- Entity with control over the financing or decision to perform pesticide applications, or
- Entity with day-to-day control (pesticide applicators).

The Department typically requires the operator to be the responsible party when there are separate owners and operators [ARM 17.30.1322(2)]. However, in the case of the PGP, the Department recognizes that it could be either the financing/decision-maker (such as a mosquito control district) or the pesticide applicator's role to be the primary responsible party. It will be it up to the regulated community to determine, through contractual and other arrangements, who will carry primary responsibility.

In general, entities under the following Standard Industrial Classification (SIC) Codes may be subject to the PGP:

Category	SIC	NAICS	Examples
Agricultural parties – general agricultural interests, farmers/producers, forestry, and irrigation	01 - 08	111 Crop Production	Producers of crops mainly for food and fiber
	0811	113110 – Timber Tract Operations	Operating timber tracks for selling standing timber
	0831	113210 – Forest Nurseries Gathering of Forest Product	Growing trees for reforestation and/or gathering forest products
Public Health Parties (includes mosquito or other vector control districts and commercial applicators that service these)	4971	221310 – Water Supply for Irrigation	Operating irrigation systems
	9431	923120 – Administration of Public Health Programs	Government establishments
Resource Management Parties (includes FWP, environmental agencies, and universities)	9511	924110 – Administration of Air, Water Resource, and Solid Waste Management Programs	Government establishments
Public Health Parties	9431	923120 – Administration of Public Health Programs	Government Establishments
	9512	924120 – Administration of Conservation Programs	Government Establishments
Utility Parties	41 - 49	221 – Utilities	Provide electric power, natural gas, steam supply, water supply, and sewage removal through a permanent infrastructure

D. Sources Excluded from Coverage under this General Permit

1. This permit does not address stormwater discharges associated with pesticide activities, because stormwater is considered a nonpoint discharge.
2. This permit does not allow authorization of pesticide application to water that is impaired for that specific pesticide or degenerates of that pesticide. In such a case, the owner/operator would have to choose between requesting coverage under an individual permit or selecting some other means of pesticide management (e.g., using mechanical means or some other pesticide product).

   Impaired waters are those which have been identified pursuant to Section 303(d) of the CWA as not meeting applicable water quality standards. Impaired waters include both waters with Total Maximum Daily Loads (TMDL) and those for which a TMDL is not yet established. Endosulfan is the only currently registered pesticide listed as a cause of 303(d) impairment in Montana. The only area listed as impaired for Endosulfan is the 3,800 acres of Hauser Lake.
3. This permit does not allow discharge of a pesticide that is prohibited by FIFRA from use in water.
4. An owner/operator that is currently covered by either an individual or general MPDES permit for the discharge of pesticides is precluded from submitting an NOI for the PGP.

E. Other Permitting Requirements

Submittal of the NOI, and receipt of an acknowledgement letter from the Department recognizing the pesticide application under the PGP does not eliminate a permittee's obligation to obtain other necessary permits. Specifically, any pesticide applicator must ensure pesticide use is in conformance with the requirements of the Montana Pesticides Act. That act authorizes the Montana Department of Agriculture (MDA) to adopt rules incorporating regulations adopted by EPA under FIFRA, which generally prescribe methods of registration, application, and the sale or use of pesticides.

F. Continuing Coverage of Existing Sources.

The PGP is a new General Permit, so any owner/operator will be considered "new" for purposes of obtaining permit authorization.

G. New sources seeking coverage under the new General Permit

New dischargers seeking to obtain coverage under the PGP must submit a complete Notice of Intent (NOI) submittal package, including:

- Applicable Form (NOI); and
- Fee (includes both permit application fee and first annual fee) as required under ARM 17.30.201.

The complete NOI package must be submitted prior to the discharge of any pesticide over the threshold as presented in Part III of this Fact Sheet. Note that submittal of the PDMP to the Department is not required. However, the PDMP must be completed and available upon Department request. Once the threshold for one pesticide use pattern is exceeded, the NOI package must request coverage for any pesticide use patterns that are the responsibility of the owner/operator in that area. The Department will issue a letter of acknowledgement to the owner or operator after receiving a complete submittal.

An owner/operator may chose to obtain coverage at any number of locations within the boundaries of one county ("single county"), or any number of locations in multiple counties that are located within one of the five districts ("multiple county"). See Figure 1 in the PGP for a map of the districts.

Coverage under the PGP is renewable on a five-year basis. The owner/operator is required to comply with all requirements contained in the PGP until they are required to renew or they request to terminate the permit.

H. Termination of Permit Coverage

Unless they terminate the permit as described below, permittees are authorized to operate for the duration of the permit (five years or until the General Permit is again renewed). Annual fee payments will be required.

Permit authorizations remain in effect unless the Department receives a complete Notice of Termination (NOT). This notice must be signed and certified in accordance with the signatory requirements in Part V.G of the PGP. All applicable annual fees (i.e., calendar year fees through the most recent year the authorization was in effect) are required to be paid. Failure to submit an NOT shall result in accrual of annual fees until such notice is received by the Department.

In addition to the ability to request a termination, the owner or operator of a facility covered under this General Permit may request to be excluded from coverage under this General Permit by applying for and obtaining an individual MPDES permit pursuant to ARM Title 17, Chapter 30, Subchapter 13. If an individual MPDES permit is issued to the owner or operator of the facility, coverage under this General Permit is terminated on the effective date of the final individual MPDES permit.

I. Transfer of Coverage

The Department may transfer authorization to a new owner or operator under this General Permit in conformance with Part V.M. of the PGP.

IV. Applicable Water Quality Standards

This General Permit applies only to state surface water. As stated in Part III.B, surface water means any waters on the earth's surface including, but not limited to, streams, lakes, ponds, and reservoirs; and irrigation and drainage systems discharging directly into a stream, lake, pond, reservoir, or other surface water. Water bodies used solely for treating, transporting, or impounding pollutants are excluded from the definition of surface water [ARM 17.30.602(33)]. Irrigation waters where the waters are used up within the irrigation system and are not returned to any other state waters are also excluded from this definition [ARM 17.30.1304(59)]. However, the definition does include ephemeral and intermittent drainages.

Pesticide discharges to state surface water are subject to surface water quality standards in Montana Surface Water Quality Standards and Procedures in ARM Title 17 Chapter 30 Subchapter 6. Part of Subchapter 6 references water quality standards for chemical pesticides in Circular DEQ-7 (http://deq.mt.gov/wqinfo/Standards/default.mcpx). Circular DEQ-7 contains surface water quality standards for nearly 100 active chemical pesticide ingredients (and their break-down products). Whenever a new active pesticide ingredient is found during testing, the MDA requests the Department to update Circular DEQ-7.

As mentioned previously, the Department may, if necessary, authorize short-term exemptions from the water quality standards for application of a pesticide that is registered by the EPA pursuant to 7 U.S.C. 136(a) when it is used to control nuisance aquatic organisms or to eliminate undesirable and nonnative aquatic species because it promotes the public interest [75-5-308(1)(b), MCA]. However, the Department may not authorize an exemption from water quality standards for an activity that requires a discharge permit under rules adopted by the Board pursuant to 75-5-401, MCA [75-5-308(3), MCA].

The Board rules must allow the issuance of a permit only if the Department finds that operation consistent with the limitations of the permit will not result in pollution of any state waters, except that the rules may allow the issuance of a temporary permit under which pollution may result if the Department ensures that the permit contains a compliance schedule designed to meet all applicable effluent standards and water quality standards in the shortest reasonable time [75-5-401(2)].

Water Use Classifications

ARM 17.30 Subchapter 6 includes water use classifications in order to establish maximum allowable changes in surface water quality and to establish a basis for limiting the discharge of pollutants which affect prescribed beneficial uses [ARM 17.30.603(1)].

1. **Outstanding Resource Waters (ORW)**. State surface waters located wholly within the boundaries of areas designated as national parks or national wilderness areas as of October 1, 1995 are defined as Outstanding Resource Waters (ORW) [75-5-103(24), MCA and ARM 17.30.617]. There are eight National Parks & 15 Wilderness areas within Montana that are considered ORW and may contain 'state surface waters located wholly within the boundaries'. The Department may not grant an authorization to degrade under 75-5-303 in outstanding resource waters (see Part IX of this Fact Sheet); or allow a new or increased point source discharge that would result in a *permanent* change in the water quality of an outstanding resource water [75-5-316(2), MCA and ARM 17.30.638].

   The Department considers pesticide application to be a temporary change and therefore recognizes that discharges of pesticides to water bodies within the National Parks and Wilderness Areas are eligible for coverage under the PGP.

2. **A-Closed Classification Waters** – "No increases of carcinogenic, bioconcentrating, toxic or harmful parameters, pesticides, and organic and inorganic materials, including heavy metals, above naturally occurring concentrations, are allowed" [ARM 17.30.621(3)(h)].

   Montana currently has 15 waters in three drainages classified as A-Closed: Clark Fork Columbia River Drainage except the Flathead and Kootenai River at seven locations (ARM 17.30.607); Flathead River Drainage at four locations (ARM 17.30.608); and Missouri River Drainage at four locations (ARM 17.30.610).

Because of the requirement for "no increase" under ARM 17.30.621(3)(h), the PGP does not contain a threshold for chemical pesticide application that occurs in or over water within these areas. The Board allows the Department to authorize short-term exemptions from the water quality standards for application of a pesticide that is registered in the United States pursuant to 7 U.S.C. 136(a) under 75-5-308, MCA. The Department finds that authorization under the PGP satisfies this requirement. Biological pesticide applications in the A-Closed classification are not prohibited. If the owner/operator applies a biological pesticide above the annual threshold, they must obtain permit coverage through the PGP or individual permit.

3. **Remaining Waters** – For all remaining waters, the owner/operator will be required to obtain authorization under the PGP if above the threshold.

   Pesticide application to ephemeral streams is only required to be permitted under the PGP when surface water is present during application. Since the discharge from the ephemeral waterbody with standing water has the capability to discharge to other waters of the state, this classification of waterbody will be treated as the receiving waterbody's classification.

V. Proposed Effluent Limitations and Special Conditions

Section 402 of the WQA authorizes the Department to issue, suspend, revoke, modify or deny a permit to discharge waste pursuant to rules adopted by the Board of Environmental Review. These rules require that waste receive, as a minimum, treatment equivalent to the best practicable control technology currently available (BPCTCA) as defined in 40 CFR Subchapter N Effluent Limit Guidelines (ELGs), and the applicable surface water quality standards contained in ARM Title 17, Chapter 30, Subchapter 6.

A. Technology-Based Effluent Limitations (TBELs)

1. *TBEL Regulatory Requirements*

All MPDES permits are required to evaluate applicable technology-based effluent limitations (TBELs). TBELs represent the minimum level of control that must be imposed by a permit issued under the MPDES program, as stated at 40 CFR 122.44(a) and adopted by reference in ARM 17.30.1344(2)(b).

There are no federal ELGs that apply to pesticide application. When EPA has not promulgated an ELG for an industry, permit limitations may be based on the best professional judgment (BPJ) of the permit writer [40 CFR 125.3(c)]. The TBELs in this permit are based on BPJ.

TBELs contained in the PGP are non-numeric and constitute the level of control that reduce the area and duration of impacts caused by the discharge of pesticides to state surface waters. Non-numeric effluent limitations are authorized in lieu of numeric limitations, where "[n]umeric effluent limitations are infeasible" [40 CFR 122.44(k)(3) and adopted by reference in ARM 17.30.1344(b)].

The TBELs in this permit are non-numeric based on the following facts:

- It may not be possible to determine exactly when a numeric effluent limitation would apply. For example, a "discharge" from direct chemical application to water is the residual remaining after the pesticide is no longer serving its intended purpose -- after the pesticides have performed their intended function for pest control, dissipated in the waterbody, and broken down into other compounds to some extent. This discharge also will have combined with any other discharges to that waterbody. Given this situation, it is not clear what would be measured for a numeric limit or when.
- There are often many short duration, highly variable, pesticide discharges to surface waters from many different locations for which it would be difficult to establish a numeric discharge limitation at each location. In this situation, requiring the use of standard control practices (i.e., narrative non-numeric effluent limitations), provides a reasonable approach.
- It is not clear where a numeric effluent limitation would apply. Discharges from the application of pesticide are different from discharges of process wastewater from a stationary facility where the effluent is more predictable and easily identified as an effluent from a conveyance (e.g., pipe or ditch).
- Information needed to develop numeric effluent limitations is not available at this time. To develop numeric TBELs, factors outlined in 40 CFR 125.3 must be fully evaluated, such as the age of equipment and facilities involved, the process employed, the potential process changes, and non-water quality environmental impacts. In addition, more than 400 pesticide active ingredients contained in over 3,500 pesticide products may be covered under this permit.

The non-numeric effluent limitations in this permit are expected to minimize environmental impacts by reducing the discharge of pesticides to state surface waters, thereby protecting the receiving waters. The Department has determined that the pollution prevention approaches required by these limits are the most environmentally sound way to control the discharge of pesticide pollutants to meet the effluent limitations.

2. *TBEL Control Measures*

The PGP requires owners/operators to implement site-specific control measures as a non-numeric TBEL. Control measures are actions (including processes, procedures, schedules of activities, prohibitions on practices and other management practices), to prevent or reduce water pollution. Use of the term control measure is intended to describe the range of pollutant reduction practices that may be employed, and includes Best Management Practices (BMPs) as one of the components.

The Department recognizes that not all of these considerations will be applicable to every site. The key is determining what measure is appropriate for the specific pesticide application. If owners/operators find their control measures are not

minimizing discharges of pesticide adequately, the control measures must be modified as expeditiously as practicable. For example, the PGP requires mosquito control owners/operators to consider mechanical/ physical methods of control to eliminate or reduce mosquito habitat. How this is achieved will vary. For some, this many be achieved through regular mowing while for others mowing will not be feasible.

Owners/operators must properly manage the application of pesticide, consistent with both minimizing discharge and reducing the potential for development of pest resistance. The PGP emphasizes effective "low-tech" approaches, including accurately identifying the pest problem, selecting optimal pest management strategy(s), using the optimal effective amount of pesticide product, applying at appropriate frequencies, and performing regular equipment maintenance and calibration.

Owners/operators must comply with all applicable statutes, regulations and other requirements including, but not limited to requirements contained in the labeling of pesticide products approved under FIFRA ("FIFRA labeling"). Although the FIFRA label and labeling requirements are not effluent limitations, it is illegal to use a registered pesticide inconsistent with its labeling. The Department considers many provisions of FIFRA labeling -- such as those relating to application sites, rates, frequency, and methods, as well as provisions concerning proper storage and disposal of pesticide wastes and containers -- to be requirements that affect water quality. For example, if a pesticide applicator decides to use a pesticide with a FIFRA label that says, "Apply this product at a rate not to exceed one pound per acre" at a rate higher than the allowable rate, this would result in excess product being discharged into state surface waters. The Department would find that this application was a misuse of the pesticide under the FIFRA label and because of the misuse; the Department would determine that the effluent limitation that requires the owner/operator to properly manage the application of pesticide products to state surface waters was also violated. Therefore, pesticide use inconsistent with certain FIFRA labeling requirements could result in the owner/operator being held liable for a CWA violation as well as a FIFRA violation.

3. *TBELs - Pesticide Application*

The permit requires the owner/operator to achieve all of the limitations relating to pesticide application as described below. These effluent limitations are generally preventive in nature, and are designed to minimize pesticide discharges into state surface waters. All owners/operators under the PGP are required do the following:

a. Manage the amount of pesticide product per application and frequency of pesticide applications as necessary to control the target pest with the minimal amount of pesticide discharge, consistent with reducing the potential for development of pest resistance.

As noted earlier, it is illegal to use a pesticide in any way prohibited by the FIFRA labeling. Also, use of pesticides must be consistent with any other applicable state or federal laws. To minimize the total amount of pesticide discharged, owners/operators must consider lower application rates, frequencies, or both as part of proper management. Proper management ensures maximum efficiency in pest control with the minimum quantity of pesticide. It also reduces the amount of pesticide available that is not performing a specific pest-control function and can result in cost and time savings to the user. To minimize discharges of pesticide, owners/operators should base the rate and frequency of application on what is known to be effective against the target pest or necessary for resistance management.

Resistance can result in the loss of effectiveness of a pesticide with relatively favorable environmental and human health risks, and increase reliance on riskier pesticides. Pesticide applicators should be aware of the potential for pest resistance to develop by considering the pest, the pesticide and its mode of action, the number of applications and intervals, and application rates.

Pest resistance develops because intensive pesticide use kills the susceptible individuals in a population, leaving only the resistant ones to reproduce. Several pest management tactics help prevent or delay the occurrence of pesticide resistance. See *National Pesticide Applicator Certification Core Manual, Chapter 1 – Pest Management* for information on pesticide resistance (National Association of State Departments of Agriculture Research Foundation).

b. Perform regular maintenance activities to minimize potential for leaks, spills, or other unintended discharges of pesticides associated with the application of pesticides covered under this permit.

Common-sense and good housekeeping practices enable pesticide users to save time and money and reduce the potential for unintended discharges of pesticides to state surface waters. Regular maintenance activities should be practiced and improper pesticide mixing and equipment loading should be avoided. When preparing the pesticides for application be certain that you are mixing them correctly and preparing only the amount of material that you need. Carefully choose the pesticide mixing and loading area and avoid places where a spill will discharge into state surface waters. Some basic factors owners/operators should consider are:

- Inspect pesticide containers at purchase to ensure proper containment;
- Maintain clean storage facilities for pesticides;
- Regularly monitor containers for leaks;
- Rotate pesticide supplies to prevent leaks that may result from long term storage; and
- Promptly deal with spills following manufacturer recommendations.

c. Maintain application equipment in proper operating condition by adhering to any manufacturer's conditions and industry practices, and by calibrating, cleaning, and repairing such equipment on a regular basis to ensure effective pesticide application and pest control.

Owner/operators must ensure that the equipment's rate of pesticide application is calibrated to deliver the precise quantity of pesticide needed to achieve greatest efficacy against the target pest. To minimize discharges of pesticide, owners/ operators must ensure that the rate of application is calibrated (i.e. nozzle choice, droplet size, etc.) to deliver the appropriate quantity of pesticide needed to achieve greatest efficacy against the target pest.

When done properly, equipment calibration can assure uniform application to the desired target and result in higher efficiency in terms of pest control and cost. It is important for applicators to know that pesticide application efficiency and precision can be adversely affected by a variety of mechanical problems that can be addressed through regular calibration. Sound calibration practices to consider are:

- Choosing the right spray equipment for the application;
- Ensuring proper regulation of pressure and choice of nozzle to ensure desired application rate;
- Calibrating spray equipment prior to use to ensure the rate applied is that required for effective control of the target pest;
- Cleaning all equipment after each use and/or prior to using another pesticide unless a tank mix is the desired objective and cross contamination is not an issue;
- Checking all equipment regularly (e.g., sprayers, hoses, nozzles, etc.) for signs of uneven wear (e.g., metal fatigue/shavings, cracked hoses, etc.) to prevent equipment failure that may result in inadvertent discharge into the environment; and
- Replacing all worn components of pesticide application equipment prior to application.

d. TBELs - Integrated Pest Management (IPM) practices.

The Department believes requiring IPM practices in this permit will reduce discharges of pesticide to state surface waters. IPM, as defined in FIFRA, is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks (FIFRA, 7 U.S.C. 136r-1). IPM is not a single pest control method but, rather, a series of pest management evaluations, decisions and controls (*National Pesticide Applicator Certification Core Manual*).

In order to comply with the PGP, owners/operators must prepare a Pesticide Discharge Management Plan (PDMP) as detailed in Appendix A of this fact sheet. The PDMP includes the following IPM steps: identify the pest problem; evaluate

and implement pest management; and conduct pest surveillance and ensure proper pesticide use. Requirements for documentation of the specific measures implemented are contained in Part V.C and Appendix A. Furthermore, Appendices B-F contain detailed descriptions of specific requirements under each pesticide use pattern. The Department expects that many owner/operators are already performing some IPM practices, and documentation from their existing programs can be used to meet the relevant PDMP documentation requirements.

In general, each owner/operator must:

i. Identify the Problem

Owners/operators are required to identify the pest problem, identify the target pest, and establish an action threshold. Understanding the pest biology and ecology will provide insight into selecting the most effective and efficient pest management strategies (pesticidal or non-pesticidal methods).

An action threshold is a point at which pest populations or environmental conditions indicate that pest control action must be taken. Action thresholds help determine both the need for control actions and the proper timing of such actions. Often the action threshold is expressed as the number of pests per unit area.

In some situations, the action threshold for a pest may be zero (i.e., no presence of the pest is tolerated). This is especially true when the pest is capable of transmitting a human pathogen (e.g., mosquitoes and the West Nile virus). In areas where aquatic weeds are problematic, it may be preferable to use an aquatic herbicide as a preventive measure rather than after weeds become established. Sometimes pre-emergent pesticide application is needed, as preventive measure to deter aquatic weeds.

Action thresholds can vary by pest, by site, and by season. Owners/operators may use existing data to identify the problem at a treatment area. For example, a mosquito district may use surveillance data from an adjacent district to identify mosquito species at their pest management area. Owners/ operators may also use relevant historic site data. As owners/operators gain insight and experience into specific pest management settings, the action levels can be revised up or down.

ii. Evaluate and Implement Pest Management

Owners/operators are required to evaluate and implement the most efficient and effective means of pest management that minimizes discharges to state surface waters while accomplishing their pest management goal. Owners/ operators must evaluate both pesticide and non-pesticide methods.

Owners/operators must consider and evaluate the following options: no action, prevention, mechanical/physical methods, cultural methods, biological control agents, and pesticides. In the evaluation of these options, they must consider impacts to water quality, impacts to non-target organisms, pest resistance, feasibility, and cost effectiveness. Combinations of various management methods are frequently the most effective pest management strategies over the long term. The goal should be to emphasize long-term control rather than a temporary fix.

iii. Conduct Pest Surveillance and Ensure Proper Pesticide Use

Owners/operators are required to conduct pest surveillance to reduce the impact on the environment. Pest surveillance is important to properly time the need for pest control. To reduce the impact on the environment and non-target organisms, owners/operators are required to apply pesticide when the action threshold has been met.

Owners/operators are required to perform each of these permit conditions prior to the first pesticide application covered under this permit and at least once each calendar year thereafter. However, owners/operators whose discharges of pesticides to state surface waters are solely from pesticide research and development activities do not have to comply with these additional technology-based effluent limitations to the extent the limits may compromise the research design. For additional information and other limits on problem identification, pest management, and pesticide use, see specific discussion under each use pattern in Appendices B - F.

B. Water Quality-Based Effluent Limitations

State MPDES rules implementing the federal CWA require permits to include technology-based effluent limitations for all discharges and, if necessary for a specific discharge, water quality-based effluent limitations (WQBELs) that ensure compliance with state-adopted water quality standards [40 CFR 122.44(d)(1)]. In developing WQBELs, permit writers must consider the potential impact of the proposed surface water discharge on the receiving stream. Unlike individual permits that include requirements tailored to site-specific considerations, general permits, while tailored to specific industrial processes or types of discharges (e.g., from the application of pesticides), often do not contain site-specific WQBELs. Instead, the Department will include a narrative statement that addresses WQBELs, as follows:

Your discharge must be controlled as necessary to meet applicable numeric and narrative water quality standards.

The Department has determined that owners/operators should be able to meet water quality standards based on the following four considerations:

1. *FIFRA Compliance*

By complying with the pesticide label requirements, the Department assumes that the owner/operator will meet water quality standards. It is a violation under FIFRA sec. 12(a)(2)(G) (FIFRA's "misuse" provision) to use a registered pesticide inconsistent with its labeling.

EPA regulates the use of pesticides under FIFRA federally. In Montana, the Montana Department of Agriculture (MDA) regulates the use of pesticides. In general, FIFRA authorizes EPA to register each pesticide product intended for distribution or sale in the U.S. To register a pesticide, the Agency must determine that its use in accordance with the label will not cause "unreasonable adverse effects on the environment" (see, e.g., FIFRA sec. 3(c)(5)).

In making decisions on whether to register a pesticide, EPA considers the proposed product labeling use directions and evaluates data on product chemistry, human health, ecological effects, and environmental fate to assess the potential risks associated with the use(s) proposed by the applicants for registration and expressed on the labeling. Among other things, the Agency evaluates the risks to human health and the environment (including water quality) posed by the use of the pesticide.

EPA also implements risk mitigation measures by placing use restrictions and warnings on labeling to ensure the use of the pesticide (under actual use circumstances and commonly accepted practice) will not cause any "unreasonable adverse effects on the environment." Mitigation measures may include limits on the amount and frequency that a pesticide may be applied. Mitigation may also limit the geographical areas to which a pesticide can be applied or may include mandatory buffer distances from sensitive habitats. Mitigation measures are implemented through product labeling instructions, with which pesticide users are required to comply.

In some cases, EPA restricts the use of a pesticide so that levels of pesticide predicted by the model to reach water are below the relevant aquatic benchmarks. In other cases, using the FIFRA risk-benefit balancing standard, EPA may permit the use of a pesticide even though estimated water concentration might exceed a relevant aquatic benchmark. In such cases, the decision incorporates consideration of the benefits of the pesticide use and other lines of evidence.

EPA's Office of Pesticide Programs derives aquatic benchmarks by multiplying the most sensitive toxicity values (i.e., the lowest acceptable toxicity value for the most sensitive species within a taxonomic group) by their respective level of concern. These taxon-specific benchmarks, based on toxicity data used by EPA in assessments for pesticide registration decision-making, are considered estimates of the concentrations below which pesticides are not expected to have

the potential for adverse effects for the particular taxon for which those data serve as surrogates.

2. *Ambient monitoring*

Since available monitoring data indicates that water quality standards are not being routinely exceeded for pesticide residuals, the Department contends that this is further evidence that owner/operators should be able to meet water quality standards when complying with FIFRA and the PGP.

Nationally, in 2006 the USGS released a 10-year (1992-2001) study of 51 major river basins and aquifer systems at 186 stream sites. USGS compared the sample concentrations (most samples were analyzed for 75 pesticides and eight degradation products) with two types of aquatic life benchmarks (1) ambient water quality criteria for the pesticide and (2) benchmarks derived from the lowest acute and chronic ecological effects endpoint for the pesticide (OPP benchmarks). Overall, the assessment indicates that surface and ground water are generally not being adversely affected by pesticide applications. A total of 20 pesticides or degradates exceeded an EPA benchmark in one or more agricultural streams and/or urban streams. (It should be noted that pesticide concentrations in agricultural streams most often originate from terrestrial agricultural activities exempted under the CWA from NPDES permit requirements.) However, EPA has since taken regulatory action against all 20 pesticides found to be in excess of a benchmark and many of their uses have been canceled (several detections were of pesticides no longer in use prior to the start of the study).

Montana conducts its' own monitoring of pesticides in state water. The focus is on protecting groundwater. The MDA and the DEQ are the two Montana agencies primarily involved in ground water protection through the management of agricultural chemicals, including pesticides. The MDA and DEQ, jointly, are required to conduct monitoring to determine ground water quality, assess the presence of agricultural chemicals in ground water, determine the vulnerability and sensitivity of Montana aquifers, and evaluate the effectiveness of management plans implemented for the protection of ground water resources (80-15-104, MCA).

MDA has overseen a state-wide pesticide monitoring program (surface water as well as groundwater) since the 1980's. Whenever MDA monitoring results detect a new pesticide compound in state water, MDA is required to request the Department develop Water Quality Standards (WQS) for the protection of human health. Montana currently has WQS for nearly 100 pesticide active ingredients or degenerates as contained in Circular DEQ-7.

MDA develops a specific agricultural chemical ground water management plan for any pesticide found at >50% of the WQS (80-15-212, MCA). The generic management plan can be found at http://agr.mt.gov/pestfert/groundwater/grndWtrProt.asp.

In the past three years, MDA obtained nearly 20,000 data points from approximately 750 sampling sites. Of these, there were 983 data points that were above "non-detect." Any pesticide ingredient or degradate that had a "hit" above non-detect either already had a WQS in Circular DEQ-7, or (in the case of four new pesticide "hits": bromoxynil, dimethoate, fluroxypyr, and pyroxsulam) the Department is in the process of developing them. It is important to note that review of the data for the last three years shows that Montana did not exceed a pesticide WQS.

All states, including Montana, are required by the EPA to identify waterbodies that are not attaining water quality standards under CWA Section 303(d) and develop a Total Maximum Daily Load (TMDL) for these parameters. States also must include a priority ranking for developing those TMDLs. A critical component in the TMDL process is to identify the sources of each parameter for which the waterbody is listed. Then, the State must develop waste load allocation(s) for point source(s) and load allocation(s) for nonpoint source(s).

Montana listed four pesticides as probable causes of impairment in the most recent 303(d) lists (2008 and draft 2010):

- **Endosulfan Sulfate** -the only currently registered pesticide listed as a cause of 303(d) impairment in Montana (listed as affecting the 3,800 acres of Hauser Lake from *c.*1996 data).
- **DDE, DDT, and Endrin Aldehyde** – these three other pesticides listed as causes of 303(d) impairment have had their uses cancelled: DDE and DDT were cancelled in 1972 and Endrin Aldehyde was cancelled in 1995.

Furthermore, the most recent Montana Water Quality Assessment Report to the EPA (for Reporting Year 2008) shows the relative lack of priority for addressing pesticides as a cause of impairment:

- Threatened and Impaired Rivers & Streams – out of 16,157 miles impaired, there was 21.6 miles (= 0.1%) impaired based on pesticides (DDE – use cancelled).
- Threatened and Impaired Lakes, Reservoirs, and Ponds – out of 499,020 acres impaired, there was 3,800 acres (= 0.8%) impaired based on pesticides (DDT and Endrin Aldehyde (uses cancelled) and Endosulfan).

The Department recognizes that monitoring of pesticide levels in water has limitations in its ability to identify whether use of specific pesticides may adversely affect water quality. The product monitoring data give only a "snap shot" of the concentration in a particular waterbody at a particular time, and collecting a sample when pesticide concentrations are at peak levels (or even present in the water) may not occur.

Moreover, if monitoring detects the presence of a pesticide, the data usually do not identify the source or if the pesticide residue is actually still a product serving its intended purpose. Ambient monitoring cannot determine whether the contamination was due to lawful use (and if so, which one) or unlawful pesticide use, an accidental spill or discharge, or whether the residues detected were from runoff, or from aquatic uses such as those to be included in the general permit.

Although monitoring data are limited and are often difficult to interpret, it appears from the available data that pesticides are not causing widespread impairment to water quality in Montana.

3. *Technology-based effluent limitations*

Another reason the Department expects the proposed general permit will protect water quality with only non-numeric limits is the permit contains sufficient technology-based effluent limitation requirements as described in Part V.A of the Fact Sheet. The Department expects the TBEL requirements will reduce discharges of pesticides to state surface waters from the use patterns covered under this permit.

4. *Biological pesticides do not work through a toxic mode of action.*

Discharges from the application of both chemical and biological pesticides are covered under this PGP consistent with the Sixth Circuit Court's reading of the CWA term "pollutant" in *National Cotton Council v. EPA*.

Discharges of biological pesticides require permit coverage regardless of whether or not a residue exists. Biological pesticides or biopesticides are certain types of pesticides derived from natural materials such as animals, plants, bacteria, and certain minerals. Two classes of biopesticides are relevant to this permit, microbial pesticides and biochemical pesticides:

- Microbial pesticides consist of a microorganism (e.g., a bacterium, fungus, virus or protozoan) as the active ingredient. The most widely used microbial pesticides are subspecies and strains of *Bacillus thuringiensis*, or Bt.
- Biochemical pesticides, as defined at 40 CFR 158.2000(a), are naturally occurring substances that control pests by non-toxic mechanisms. Biochemical pesticides include substances, such as insect sex pheromones that interfere with mating, as well as naturally-occurring repellants and attractants.

Biopesticides are usually inherently less toxic than conventional pesticides and generally only affect the target pests and closely related organisms. Often, they are effective in very small quantities and decompose quickly thereby resulting in lower exposures and largely avoiding the pollution problems caused by chemical pesticides. When used as a component of IPM programs, biopesticides can greatly decrease the use of chemical pesticides; however, use of biopesticides effectively requires users to have a very good understanding of pest management.

Since biochemical pesticides, by regulatory definition, do not work through a toxic mode of action they may be less likely to result in an excursion of a water quality standard.

C. Special Conditions

1. Pesticide Discharge Management Plan (PDMP)

Any owner/operator who is subject to this permit is required to develop a Pesticide Discharge Management Plan (PDMP) as follows:

- Operators who know or should have reasonably known prior to commencement of discharge, that they will exceed an annual treatment area threshold for that year (as listed in Part III.C of this Fact Sheet), must develop a PDMP prior to first pesticide application covered under this permit.
- Operators who do not know or would reasonably not know until after commencement of discharge, that they will exceed an annual treatment area threshold for that year, must develop a PDMP prior to exceeding the annual treatment area threshold.
- Operators commencing discharge in response to a declared pest emergency situation as defined in Part VI of the PGP, that will cause the owner/operator to exceed an annual treatment area threshold, must develop a PDMP no later than 90 days after responding to the declared pest emergency.

Once the owner/operator meets the requirement to prepare a PDMP, they must maintain the plan thereafter for the duration of coverage under this general permit. This means even if the annual treatment area subsequently falls below the annual treatment area threshold, the plan must be kept up-to-date.

Developing a PDMP helps owner/operators ensure they have (1) taken steps to identify the pest problem, (2) evaluated pest management options, and (3) selected appropriate control measures to control pesticide discharges. Operators who exceed an annual treatment area due to a declared pest emergency do not need to include activities in their PDMP that were conducted in response to that declared pest emergency. Their PDMP, however, must address any future pesticide application covered under this permit.

The PDMP is a tool to assist the owner/operator in documenting what control measures it is implementing to meet the non-numeric effluent limitations, and to assist the permitting/compliance authority in determining whether the effluent limitations are being met. A PDMP is a "living" document that requires periodic reviews and must be kept up-to-date. Where control measures are modified or replaced, such as in response to a triggering condition, such changes must be documented in the PDMP. The Department is not proposing to require the submittal of a PDMP on a routine basis; however, the PDMP must be available to

the Department upon request. If an owner/operator fails to develop and maintain an up-to-date PDMP, they will have violated the permit. This recordkeeping violation is separate and distinct from a violation of any of the other substantive requirements in the permit (e.g., effluent limitations, corrective action, monitoring, reporting, and state-specific requirements).

Owners/operators may choose to reference other documents, such as a pre-existing IPM plan or spill prevention and response plan, in the PDMP rather than recreating the same text in the PDMP. It is not required that an owner/operator must have authored the pre-existing plan in order to use it. When referencing other documents, they are responsible for ensuring their PDMP and the other documents together contain all the necessary elements for a complete PDMP. In addition, the owner/operator must ensure that a copy of relevant portions of those referenced documents is attached to the PDMP and is located on-site and it is available for review.

a. Contents of Your PDMP

The PDMP prepared under this permit must meet specific requirements under Part II.B of the permit, in conformance with the appropriate appendices in this Fact Sheet. Generally, owners/operators must document the following: (1) a pesticide discharge management team; (2) a description of the pest management area and the pest problem; (3) a description of control measures; (4) schedules and procedures for application rate and frequency, pest surveillance, assessment of environmental conditions, spill prevention and response, equipment maintenance, adverse incident response, and pesticide monitoring; and (5) any eligibility considerations under other federal laws. See Appendix A of this Fact Sheet for more detail on the PDMP.

b. Signature Requirements

The PDMP must be signed and certified in accordance with the signatory requirements in the PGP Standard Permit Conditions Part V.G. This requirement is consistent with standard MPDES permit conditions described in ARM 17.30.1323(1) and is intended to ensure that the owners/operators understand their responsibility to create and maintain a complete and accurate PDMP. The signature requirement includes an acknowledgment that there are significant penalties for submitting false information.

c. Pesticide Discharge Management Plan Modifications.

This permit requires that the PDMP be updated whenever any of the triggering conditions for corrective action occur, or when a review following the triggering conditions requires the owner/operator to revise their control measures as necessary to meet the effluent limitations in this permit. Keeping

the PDMP up-to-date will help the owner/operator ensure that the condition that triggered the corrective action does not reoccur.

Owner/operators are also required to review the PDMP at least once a year or whenever necessary to update the pest problem description and pest management strategies at the pest management area.

It is important to note that failure to update the PDMP is a recordkeeping violation, not a violation of an effluent limit. For example, if the owner/operator changes its maintenance procedures, but fails to update its PDMP to reflect these changes, a recordkeeping violation will result. The owner/operator must revise its PDMP to reflect the new maintenance procedures and include documentation of the corrective action to return to full compliance.

d. Pesticide Discharge Management Plan Availability.

This permit requires that a copy of the current PDMP, along with all supporting maps and documents, be maintained by the owner/operator. The PDMP and all supporting documents must be immediately available to representatives of the Department or an authorized representative at the time of an on-site inspection or upon request. This requirement is consistent with standard MPDES permit conditions described in ARM 17.30.1342(9). The Department may provide access to portions of your PDMP to a member of the public upon request. Confidential Business Information (CBI) may be withheld from the public, but consistent with 40 CFR Part 2, may not be withheld from the Department.

2. *Corrective Action*

Corrective actions in this permit are follow-up actions a permittee must take to assess and correct problems. The permittee is expected to assess why a specific problem has occurred and document what steps were taken to eliminate the problem. Compliance with many of the permit's requirements -- for instance, those related to reporting and recordkeeping and some of those related to operation and maintenance -- can be accomplished immediately, and therefore, are not considered problems that trigger corrective actions.

It should be noted that a situation triggering corrective action is not necessarily a permit violation and, as such, may not necessarily trigger a modification of control measures to meet effluent limitations. However, failure to conduct (and document) corrective action reviews in such cases does constitute a permit violation.

a. Situations Requiring Revision of Control Measures.

Permittees are required to review and, as necessary, revise their control measures to eliminate any of the following situations:

- an unauthorized release or discharge;
- the permittee becomes aware, or the Department determines, that control measures are not stringent enough for the discharge to meet applicable water quality standards;
- an inspection or evaluation by a Department representative determines that modifications are necessary to meet the non-numeric effluent limits detailed in Part II.A of the PGP; or
- the permittee observes or is otherwise made aware (e.g., a third party notification) of an adverse incident for which symptoms are unusual or unexpected during the normal course of treatment.

The Department considers the above situations to be of significant concern. Thus, the Department requires permittees to assess the cause of these situations and to take any necessary steps to eliminate it and ensure that the situation will not be repeated in the future. This corrective action assessment must be kept with the other recordkeeping documentation required by this permit.

b. Corrective Action Deadlines.

The permit requires that corrective action be completed "before the next pesticide application that results in a discharge, if practicable, or if not, as soon as practicable thereafter."

The Department is adopting this flexible deadline to account for the variation in types of responses that may be necessary (e.g., evaluate situation and select, design, install, and implement new or modified control measures). Another possibility is that further monitoring may be needed to pinpoint the source of the problem, and this monitoring may need to be conducted during future pesticide application activities. The Department expects owner/operators to document and justify any schedules for selecting, designing, installing, and implementing new or modified control measures.

When any of the listed situations identified under Part V.C.2.a. of this Fact Sheet occur, such as discovery that water quality standards are being exceeded, the permittee must take steps to ensure the problems causing any violation are eliminated. If the original problem constitutes a permit violation, then that violation is not excused by response within the timeframe the Department has allotted for corrective action, though the Department may consider this when determining the appropriate enforcement response to a violation. The Department

emphasizes that this timeframe is not a grace period within which an owner/ operator is relieved of any liability for a permit violation.

The Department assumes that permittees will need less time to make minor repairs or change practices than to make substantial operational changes or equipment repair. A timeframe, albeit flexible, is included specifically so that problems are not allowed to persist indefinitely. Failure to take the necessary corrective action within the stipulated timeframe constitutes an additional and independent permit violation.

c. Effect of Corrective Action

The occurrence of a situation described in Part V.C.2.a may, but does not implicitly, constitute a violation of the permit. The occurrence of such a situation *does* require the permittee to immediately review and as necessary, revise the selection and implementation of their control measures to eliminate the situation.

Taking corrective action does not absolve the permittee of any liability for a permit violation; however, failure to take required corrective action will constitute a permit violation. The Department will consider the appropriateness and promptness of corrective action in determining enforcement responses to permit violations. The Department or a court may impose additional requirements and schedules of compliance, including requirements to submit additional information concerning the condition(s) triggering corrective action, additional site-specific water-quality based limitations, additional monitoring requirements, or other schedules and requirements more stringent than specified in this permit. Those requirements and schedules will supersede those of Part V.C.2 if such requirements conflict.

d. Adverse Incident Assessment, Documentation and Reporting

The PGP requires permittees to take specific actions in response to adverse incidents which may have resulted from a discharge from the permittee's pesticide application. The Department defines an "adverse incident" in Part VI of the PGP, but generally it is defined as any effect of a pesticide's use that is unexpected or unintended. This includes effects that occur within state surface waters on non-target plants, fish or wildlife that are unusual or unexpected (e.g., effects are to organisms not otherwise described on the pesticide product label or otherwise not expected to be present) as a result of exposure to a pesticide residue, and may include:

- Distressed or dead juvenile and small fishes
- Washed up or floating fish
- Fish swimming abnormally or erratically
- Fish lying lethargically at water surface or in shallow water

- Fish that are listless or nonresponsive to disturbance
- Stunting, wilting, or desiccation of non-target submerged or emergent aquatic plants
- Other dead or visibly distressed non-target aquatic organisms (amphibians, turtles, invertebrates, etc.)

Unexpected effects could also include any adverse effects to humans (e.g., skin rashes) or domesticated animals that occur either directly or indirectly from a discharge to state surface waters that are temporally and spatially related to exposure to a pesticide residue.

i. Adverse Impact Assessment

The Department acknowledges that assessing and correcting adverse incidents from pesticide discharges may be complicated, and it may be difficult to observe adverse effects because of limited visibility or access. However, the Department believes that it is important to identify, to the extent feasible, situations where adverse effects occur.

Immediately observable signs of distress or damage to non-target plants, animals and other macro-organisms within the treatment area indicates that an adverse incident may have occurred. The Department acknowledges that some degree of detrimental impact to non-target species is to be expected during the course of normal pesticide treatment. The Department expects owner/ operators to use their best professional judgment in determining the extent to which non-target effects appear to be abnormal or indicative of an unforeseen problem associated with an application of pesticides.

ii. Adverse Impact Documentation

Observations must be noted unless they are deemed not to be aberrant (for example, distressed non-target fish are to be expected when conducting a treatment with rotenone and non-target vegetation will be stressed near the target of contact herbicides). Observation of adverse impacts does not necessarily imply that a pesticide has been misused or that there has been a permit violation or an instance of noncompliance, but may provide cause for further investigation of local water quality or reconsideration of the IPM practices.

Records of all visual inspections, even for situations that do not require reporting, must be kept on site with the permittee.

iii. Adverse Impact Reporting

Owners/operators are required to provide oral notice to the Department within 24 hours and then follow-up with a written report within five days of becoming

aware of an adverse incident. Not reporting adverse impact incidents is a permit violation.

First, the PGP requires the owner/operator to call the Department of Environmental Quality Enforcement Division Duty Officer soon as possible, but no later than 24 hours of any identified adverse incident. The current phone number is (406) 444-0379 or get more information at http://deq.mt.gov/enf/spill.mcpx. Notification to the National Response Center (NRC) may also be required. The Department is not responsible for making this notification.

The Department does not expect this initial notification to be detailed but merely a reporting of the date of the finding, a general discussion of the incident and a review of the necessity to conduct corrective action. The permit requires owner/operators to document the verbal notification information, including the date, time, and person you notified and a description of any deviations from notification requirements based on nuances of the adverse incident. For example, a permittee may decide to notify multiple contacts because of the severity of the adverse incident. This type of information should be included in the written documentation of the 24-hour notification as described below.

The PGP also requires permittees to provide a written report of the adverse incident to the Department of Environmental Quality Water Protection Bureau within 5 days of discovering the adverse incident. The adverse incident report must include the following information:

- Date, time, and person(s) (including Department(s)) to whom you orally reported the adverse incident;
- Responsible Party information;
- Location of incident, including the names of any waters affected and appearance of those waters (sheen, color, clarity, etc.);
- Date, time, and duration of incident;
- Pesticide involved (Product name, manufacturer, and EPA ID#), pesticide application rate, intended use site (e.g., banks, above, or direct to water), and method of application;
- A description of the circumstances of the incident including species affected, number of individual and approximate size of dead or distressed organisms;
- Magnitude of the effect (e.g., aquatic square area or total stream distance affected);
- Description of the habitat and the circumstances under which the incident occurred (including any available ambient water data for pesticides applied); and
- Actions to be taken to prevent recurrence of the incident.

Reporting of adverse incidents is not required under this permit in the following situations: (1) you are aware of facts that clearly establish that the adverse incident was not related to toxic effects or exposure from the pesticide application; (2) you have been notified in writing by the Department that the reporting requirement has been waived for this incident or category of incidents; (3) you receive information notifying you of an adverse incident but that information is clearly erroneous; (4) an adverse incident occurs to pests that are similar in kind to pests identified as potential targets on the FIFRA label.

VI. Final Effluent Limits and Special Conditions

It is the Department's position that the following limitations and standards, in conjunction with the other terms and conditions of the PGP, represent the practices and prohibitions necessary in order for an eligible pesticide owner/operator to prevent discharges to state waters that would cause an exceedence of a Montana water quality standard.

A. Effluent Limitations and Standards

The effluent limits contained in the PGP are non-numeric and constitute the level of control that reduce the area and duration of impacts caused by the discharge of pesticides to state surface waters. The following requirements are included in the PGP:

1. Your discharge must be controlled as necessary to meet applicable numeric and narrative water quality standards;
2. Manage the amount of pesticide product per application and frequency of pesticide applications necessary to control the target pest with the minimal amount of pesticide discharge, consistent with reducing the potential for development of pest resistance;
3. Perform regular maintenance activities to reduce leaks, spills, or other unintended discharges of pesticides associated with the application of pesticides covered under this permit; and
4. Maintain pesticide application equipment in proper operating condition by adhering to any manufacturer's conditions and industry practices, and by calibrating, cleaning, and repairing such equipment on a regular basis to ensure effective pesticide application and pest control. Owners/operators must ensure that the equipment's rate of pesticide application is calibrated to deliver the precise quantity of pesticide needed to achieve greatest efficacy against the target pest.

B. Special Conditions

1. Owners/operators must implement IPM practices and develop and maintain a written Pesticide Discharge Management Plan (PDMP) to document the plan and

the measures taken. The PDMP must meet specific requirements as detailed in Appendix A of this Fact Sheet. At the minimum, owners/operators must document the following in their PDMP:

- a pesticide discharge management team;
- a description of the pest management area and the pest problem;
- a description of control measures;
- schedules and procedures for application rate and frequency, pest surveillance, assessment of environmental conditions, spill prevention and response, equipment maintenance, adverse incident response, and pesticide monitoring; and
- any eligibility considerations under other federal laws.

The specifics of IPM for each pesticide use category outlined in Appendices B - F. If the discharge of pollutants results from the application of a pesticide that is being used solely for the purpose of "pesticide research and development," as defined in Part VI of the PGP, the owner/operator must implement the PDMP to the extent that its requirements do not compromise the research design.

2. Owners/operators must review and, as necessary, revise the PDMP to eliminate any of the following situations:

   - an unauthorized release or discharge;
   - the permittee becomes aware, or the Department determines, that control measures are not stringent enough for the discharge to meet applicable water quality standards;
   - an inspection or evaluation by a Department representative determines that modifications are necessary to meet the non-numeric effluent limits; or
   - the permittee observes or is otherwise made aware (e.g., a third party notification) of an adverse incident for which symptoms are unusual or unexpected during the normal course of treatment.

3. The owner/operator must ensure that corrective action be completed before the next pesticide application that results in a discharge, if practicable, or if not, as soon as practicable thereafter.

4. Owners/operators are required to provide oral and written notice as described in Part II.B.3 of the PGP, after becoming aware of an adverse incident.

C. Standard Conditions

The standard conditions included in the PGP are based on the standard conditions in ARM 17.30.1342 and include conditions required pursuant to 75-5-402(1), MCA.

It is the Department's position that the effluent limitations and standards listed above, in combination with the other terms and conditions of the PGP, represent the practices and prohibitions necessary in order for an eligible pesticide applicator to comply with Montana's surface water quality standards and with Montana's Water Quality Act.

VII. Monitoring, Recordkeeping and Annual Reporting Requirements

A. Monitoring

Pursuant to CWA section 308 and 402(a)(2), 40 CFR 122.43(a), and ARM 17.30.1344, the monitoring requirements of this permit are narrative and demonstrate compliance with permit conditions by using currently established pesticide use routines for monitoring pest control. Part II.B. of the PGP includes the following monitoring requirements:

1. All permittees must document the rationale for determining the type and amount of pesticide to be used, as well as the amount that was used, to ensure that the optimal amount needed to effectively control the pest is balanced with the potential for development of pesticide resistance.

2. All permittees must monitor their operation to ensure the integrity of application equipment by calibrating, cleaning, and repairing equipment on a regular basis to reduce the potential for leaks, spills, and unintended/accidental release of pesticides to state surface waters.

3. All permittees must conduct appropriate visual monitoring to determine if any pesticide use practices may need to be revised, to ensure that avoidable adverse impacts to the environment do not occur. Visual monitoring assessments are required as a means of identifying, for example, instances of detrimental impact to non-target organisms, disruption or degradation of wildlife habitat, or the prevention of designated recreational or municipal uses of a waterbody that may possibly be related to the owner/operator's use of pesticides in a given area.

   Visual monitoring will consist of spot checks in the area to and around which pesticides are applied for possible and observable adverse incidents, such as fish kills and/or distressed fish or macro-invertebrates.

   Visual monitoring assessments are also required during the pesticide application when feasibility and safety allow. Visual monitoring is not required during the course of treatment when that treatment is performed in darkness as it would be infeasible for the inspector to note adverse effects under these circumstances. Additionally, the following scenarios often preclude visual monitoring during pesticide application:

   a. Applications made from an aircraft

b. Applications made from a moving road vehicle when the applicator is the driver

c. Applications made from moving watercraft when the applicator is the driver

d. Applications made from a moving off-road wheeled or tracked vehicle when the applicator is the driver.

4. All permittees must conduct a visual monitoring assessment during any post-application surveillance to determine the efficacy of the pesticide treatment. Visual monitoring of this type is only required if the owner/operator performs post application surveillance in the normal course of business. The Department expects that visual assessments may reasonably be conducted during applications and efficacy inspections may be conducted on foot or from a stationary vehicle.

B. Recordkeeping

The Department recommends that all owner/operators keep records of acres treated each calendar year for all applicable use patterns covered under this general permit, whether or not they are authorized under the PGP. This record will help owner/operators estimate when they will exceed the annual treatment area threshold. The total acres should not include those acres accounted for in another owner/ operator's NOI.

This permit requires owner/operators that are subject to the PGP to keep records. Owner/operators can rely on records and documents developed for other programs, such as requirements under FIFRA, provided all requirements of the permit are satisfied. The records that must be kept by all owner/operators, specifically the entity who has operational control over the decision to perform pesticide applications, include the following:

- A copy of the PGP (electronic access is sufficient);
- A copy of the NOI submitted to the Department, any correspondence exchanged between you and the Department specific to coverage under this permit, and a copy of the Department acknowledgment letter assigning your permit tracking number;
- A copy of your PDMP, including any modifications made to the PDMP during the term of this permit;
- Pest Information, including:
    - Target pest(s) and their action levels
    - Pest density prior to pesticide application
- Pesticide application information, including:

- Description of treatment area, including location (county and centroid location) and size (acres);
- Identification of any waters, either by name or by location, to which you discharged any pesticide(s);
- Company name and contact information for pesticide applicator;
- Dates of application;
- Name, Manufacturer, and EPA registration number of each pesticide product used;
- Quantity of pesticide applied (and specify if quantities are for the pesticide product as packaged or as formulated and applied).

- Copies of, or access to, equipment maintenance and calibration records (required to be maintained by the entity performing the pest management activity on behalf of self or client);
- Surveillance method(s) used, date(s) of surveillance activities, and findings of surveillance including any unusual or unexpected effects identified to non-target organisms;
- Adverse incident information, including:
  - Adverse incident reports;
  - Rationale for any determination that reporting of an identified adverse incident; and
  - A copy of any corrective action documentation; and
- Spills or leaks that occur.

All required records must be prepared as soon as possible but no later than 14 days following completion of the associated activity. Operators must retain copies of these documents for a period of at least three years from the date their coverage under this permit expires or is terminated.

C. Annual Reporting

The Department is requiring owner/operators subject to the PGP to submit annual reports that contain basic information on their pesticide discharges to state surface waters. The form (AR-3) can be found @ the Department's website at: http://deq.mt.gov/Permits.mcpx.

The annual report is due by January 28th of each year. The annual report must include information for the previous calendar year, with the first annual report required to include activities for the portion of the calendar year after the effective date of the NOI. If the effective date of the NOI is after December 1, the owner/operator is not required to submit an annual report for that first partial year

but must submit annual reports thereafter, with the first annual report submitted also including information from the first partial year.

When an owner/operator terminates permit coverage, they must submit an annual report for the portion of the year up through the date of the termination. The annual report is due no later than 30 days after the termination date, or January 28th of the following year, whichever is earlier.

The information in the annual report will be used by the Department to assess permit compliance and to determine whether additional controls on pesticide discharges are necessary to protect water quality. For example, this data will help the Department identify where pesticide discharges are occurring and the types of pesticides being discharged.

The annual report is a summary of the pest control activities for each applicable use pattern. The annual report must contain the following information specific to each pest treatment area covered under the permit:

a. Pesticide applicator(s) information, including license number and expiration date;

b. Total amount of each pesticide product applied for the reporting year including Manufacturer, Product Trade Name, and EPA registration number(s), County Applied, Centroid Location applied, amount of pesticide and total acreage treated;

c. Identification of any waters to which you discharged any pesticide(s);

d. If applicable, an annual report of any adverse incidents; and

e. A description of any corrective action(s), including spill responses, resulting from pesticide application activities and the rationale for such action(s).

VIII. Mixing Zone

No mixing zone will be allowed because the water quality standards for pesticides apply throughout the receiving stream [ARM 17.30.507(b)].

IX. Nondegradation

Discharges from pesticide activities authorized under the PGP are considered nonsignificant and, therefore, are not subject to review under Montana's nondegradation statute, § 75-5-303, MCA, for the reasons given below.

- Section 75-5-317(2)(c), MCA, categorically exempts the use of agricultural chemicals in accordance with a specific agricultural chemical ground water management plan, if applicable, or in accordance with an EPA-approved FIFRA label.

- Section 75-5-317(2)(g), MCA categorically exempts short-term changes in existing water quality resulting from activities authorized by the department pursuant to 75-5-308, MCA (application of pesticides registered by the EPA).

- Section 75-5-317(2)(u), MCA, categorically exempts "any other activity that is nonsignificant because of its low potential for harm to human health or to the environment," provided it conforms to the guidance in § 75-5-301(5)(c), MCA. Based on § 75-5-301(5)(c), MCA, the Department has determined that pesticide application discharges regulated under the PGP are nonsignificant because: 1) potential for harm to human health or the environment for all pesticides is regulated by FIFRA and by the Montana Department of Agriculture, 2) the quantity and strength of the pesticide applications are controlled by FIFRA labeling requirements, and 3) pesticide activities are generally short-term.

X. Total Maximum Daily Load (TMDL)

On September 21, 2000, a U.S. District Judge issued an order stating that until all necessary TMDLs under Section 303(d) of the Clean Water Act are established for a particular water quality limited segment (WQLS), the State is not to issue any new permits or increase permitted discharges under the MPDES program. The order was issued in the lawsuit Friends of the Wild Swan v. U.S. EPA, *et al.*, CV 97-35-M-DWM, District of Montana, Missoula Division.

This is a new permit. However, the Department believes that the issuance of this general permit does not conflict with this order because:

- The one 303(d) impairment for a currently registered pesticide in Montana is Hauser Lake for Endosulfan Sulfate. Use of this pesticide at Hauser Lake will not be allowed under the PGP; and

- Application of pesticides is not a new activity and does not allow an increase in pollutant loads over what has historically occurred. The only change is that pesticide applicators to or over, including near waters of the state will now be regulated by the Department under the PGP rather than under the 308 authorization.

XI. Information Sources

Montana Water Quality Act, MCA 75-5-101 *et. seq.*

ARM Title 17, Chapter 30:
Subchapter 5 - Mixing Zones in Surface and Ground Water.
Subchapter 6 - Surface Water Quality Standards.
Subchapter 7 - Nondegradation of Water Quality.
Subchapter 13 - MPDES Standards.

US EPA 2010 Public Notice of "Draft National Pollutant Discharge Elimination System (NPDES) Pesticides General Permit (PGP) for Discharges from the

Application of Pesticides to or over, including near Waters of the U.S. Fact Sheet," Federal Register June 4, 2010.

Federal Water Pollution Control Act, 33 U.S.C. 1251 *et seq.*

40 Code of Federal Regulations (CFR) 122, 125

Clean Water Act § 303(d), 33 USC 1313(d) Montana List of Waterbodies in Need of Total Maximum Daily Load Development, 2008 and 2010 (draft).

FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT [As Amended Through P.L. 110–246, Effective May 22, 2008] (FIFRA, 7 U.S.C. 136, et sec.)

USGS, Gilliom and others 2006. *The Quality of Our Nation's Waters-Pesticides in the Nation's Streams and Ground Water, 1992-2001*: U.S. Geological Survey Circular 1291, 172p.

Natural Resources Information Systems (NRIS)
http://nris.mt.gov/montanafacts/county_areas.asp

"Water Availability in a Nutshell,"
http://water.montana.edu/pdfs/headwaters/headwaters2.pdf

"*The Tribal Nations of Montana, A Handbook for Legislators*," March 1995, Prepared by the Committee on Indian Affairs, Published by Montana Legislative Council

National Pesticide Applicator Certification Core Manual, National Association of State Departments of Agriculture Research Foundation

Prepared by Christine Weaver, December, 2010

APPENDIX A
Pesticide Discharge Management Plan (PDMP)

Any owner/operator who is subject to this general permit is required to develop a Pesticide Discharge Management Plan (PDMP). **The PDMP must be maintained by the owner/operator and made available to the Department upon request.** The PDMP is a tool to assist the owner/ operator in documenting control measures, and to assist the permitting/ compliance authority in determining whether the effluent limitations are being met. A PDMP is a "living" document that requires periodic reviews and must be kept up-to-date. Where control measures are modified or replaced to meet effluent limitations, such as in response to a triggering condition, such changes must be documented in the PDMP.

I. Contents of Your PDMP

The PDMP prepared under this permit must meet specific requirements. Generally, owners/operators must document the following: (1) a pesticide discharge management team; (2) a description of the pest management area and the pest problem; (3) a description of control measures; (4) schedules and procedures for application rate and frequency, equipment maintenance, pest surveillance, assessment of environmental conditions, spill prevention and response, adverse incident response, and pesticide monitoring; and (5) any eligibility considerations under other federal laws.

Pesticide Discharge Management Team

The permit requires that a qualified individual or team of individuals, including the pesticide applicator, be identified to manage pesticide discharge. If the pesticide applicator has not been identified at the time of the plan development, the owner/operator should indicate whether or not a for-hire applicator will be used. Identification of a pesticide discharge management team ensures that appropriate persons (or positions) are identified as necessary for developing and implementing the plan. Inclusion of the team in the plan provides notice to staff and management (i.e., those responsible for signing and certifying the plan) of the responsibilities of certain key staff for following through on compliance with the permit's conditions and limits.

The pesticide discharge management team is responsible for developing and revising the PDMP, implementing and maintaining the control measures to meet effluent limitations, and taking corrective action where necessary. Team members should be chosen for their expertise in the relevant areas to ensure that all aspects of pest management are considered in developing the plan. The PDMP must clearly describe the responsibilities of each team member to ensure that each aspect of the PDMP is addressed. The Department expects most owner/operators will have more than one individual on the team, except for small entities with relatively simple plans and/or staff limitations. The permit requires that team members have ready access to any applicable portions of the PDMP and the permit.

Pest Management Area Description

The pest management area description includes the pest problem description, action threshold(s), a general location map, and water quality standards.

1. Pest Problem Description.

   The PDMP must include a description of the pest problem at each pest management area. A detailed pest management area description assists owner/operators to identify and set priorities for the evaluation and selection of control measures taken to meet effluent limitations and in identifying necessary changes in pest management. The description must include identification of the target pest(s), source of the pest problem, and source of data used to identify the problem.

   The permit allows use of historic data or other available data (eg, from another similar site) to identify the problem at your site. If you use other site data, you must document in this section why data from your site is not available or not taken within the past year and explain why the data is relevant to your site. Additionally, the pest management area descriptions should include any sensitive resources in the area, such as unique habitat areas, rare or listed species, or other species of concern that may limit pest management options.

2. Action Threshold(s)

   The PDMP must include a description of the action threshold(s) established for the target pest, including a description of how they were determined. An action threshold is a level of pest prevalence at which an owner/operator takes action to reduce the pest population.

3. General Location Map

   The PDMP must contain a general location map of the site that identifies the geographic boundaries of the area to which the plan applies and location of the state surface waters that will be impacted. To improve readability of the map, some detailed information may be kept as an attachment to the site map and pictures may be included as deemed appropriate.

4. Water Quality Standards

   Operators must identify the water quality standards applicable to their discharge. This must include a list of pesticide(s) or any degradates for which the water is impaired. Montana water quality standards under Circular DEQ-7 are available at: http://deq.mt.gov/wqinfo/Circulars.mcpx.

Description of Control Measure

The PDMP must include a description of the control measures to demonstrate how the owner/operators plan to meet the applicable technology-based or water quality-

based effluent limitations. The description must include a brief explanation of the control measures used at the site to reduce pesticide discharge, including evaluation and implementation of the six pest management tools:

- no action,
- prevention,
- mechanical/physical methods,
- cultural methods,
- biological control agents, and
- pesticides.

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 state surface waters.

All six pest management tools may not be available for a specific use category and/or treatment area. However, the PDMP must include documentation of how the six pest management tools were evaluated prior to selecting a site specific pest management strategy. For the no action option, owner/operators should document the impact of this option without any current pest management strategy at the site. For the prevention management option, the owner/operator should document the methods implemented to prevent new introductions or the spread of the pests to new sites such as identifying routes of invasion and how these can be intercepted to reduce the chance of invasion. Prevention may include source reduction, using pathogen-free or weed-free seeds or fill; exclusion methods (e.g., barriers) and/or sanitation methods, like wash stations, to prevent reintroduction by vehicles, personnel, etc. Some prevention management methods may fall under mechanical/physical or cultural methods as well.

For the pesticide management option, owner/operators must include a list of active ingredient(s) evaluated. Discussion should also identify specific equipment or methods that will prevent or reduce the risks to non-target organisms and pesticide discharges to state surface waters.

Schedules and Procedures

The following schedules and procedures, used to comply with the effluent limitations, must be documented in the PDMP:

1. Application Rate and Frequency Procedures

   Procedures developed for managing the amount of pesticide product per application and frequency of pesticide applications necessary to control the target pest with the minimal amount of pesticide discharge, consistent with reducing the potential for development of pest resistance.

2. Pesticide Application Equipment Procedures

   Preventive equipment maintenance program to keep the pesticide application equipment in proper operating condition, including how and when the following will be addressed: calibration, regular inspections, and cleaning/repairing of the application equipment to avoid situations that may result in leaks, spills, and other releases.

3. Pest Surveillance Procedures

   Pest surveillance programs assessing the pest treatment area, to determine when the action threshold(s) is met. The discussion should also include surveillance method(s) selected.

4. Environmental Conditions Assessment Procedures

   Discussion of procedures and methods to assess environmental conditions in the treatment area.

5. Pesticide Monitoring Schedules and Procedures

   Description of procedures for monitoring consistent with the requirements in Part II.C of the PGP including:

   - The process for determining the location and timing of monitoring;
   - A schedule and procedures for monitoring;
   - The person (or position) responsible for conducting monitoring; and
   - Procedures for documenting any observed impacts to non-target organisms resulting from your pesticide discharge.

6. Adverse Incident Response Procedures

   Document appropriate procedures for responding to an adverse incident resulting from pesticide applications. Operator must identify and document the following:

   - Course of action or responses to any incident resulting from pesticide applications;
   - Chain of command notification for the incident, both internal to your agency/organization and external;
   - State/Federal contacts with phone numbers;
   - Name, location, and telephone of nearest emergency medical facility; and
   - Name, location, and telephone of nearest hazardous chemical responder; (including police and fire department).

7. Spill Prevention Procedures

   Owners/operators must describe the spill prevention program for their pest management area. The program should address areas and activities at the site that typically pose a high risk for spills including loading and unloading areas, storage areas, process areas, and waste disposal activities. It should also address appropriate material handling procedures, storage requirements, and containment or diversion equipment that will minimize the potential for spills, or in the event of a spill, enable proper and timely response.

   - Any spills or leaks that occur while covered under this permit must be documented.
   - Documenting spills does not relieve owner/operators of any reporting requirements established in 40 CFR 110, 40 CFR 117, and 40 CFR 302, or any other statutory requirements relating to spills or other releases of oils or hazardous substances.

8. Spill Response Procedures

   The PDMP must document procedures for expeditiously stopping, containing, and cleaning up leaks, spills, and other release. In addition, the PDMP must include documentation of the procedures for notification of appropriate facility personnel, emergency response agencies, and regulatory agencies.

II. *Signature Requirements*

The PDMP must be signed and certified in accordance with the signatory requirements in the Standard Permit Conditions part of the permit. This requirement is consistent with standard MPDES permit conditions described in ARM 17.30.1323(1) and is intended to ensure that the owner/operator understands their responsibility to create and maintain a complete and accurate PDMP. The signature requirement includes an acknowledgment that there are significant penalties for submitting false information.

APPENDIX B
Pattern Use Specific IPM – Piscicide Use and Other Nuisance Animal Control

I. *Background*

Nuisance animals, such as fish, mollusks, and (in some areas) lampreys, negatively affect aquatic biodiversity, human health, and economic stability. Nuisance animals decrease populations of native aquatic species including threatened and endangered species. Nuisance animals can reduce aquatic biodiversity by preventing desirable species growth and unbalancing desirable aquatic species populations and development. Social, economic, and human health are all affected by a lower aesthetic appeal of waterbodies, an increased cost of agricultural irrigation water, and an increase in the risk of human diseases by providing ideal vector breeding grounds.

In addition, the reduction in the utility of water can have social and economic impacts due to reduced hydroelectric operations, impeded opportunity for recreational activities (e.g., fishing, boating, and swimming), and disruption of water transport (e.g., agricultural irrigation), to name a few. As a result, if or when nuisance animals become established in the waters of the state and impede the environmental stability and use goals for a body of water, control measures will become necessary.

The requirements in this appendix apply to pesticide discharges into or on state surface waters, associated with management of nuisance animals including, but not limited to, fish, lampreys, and mollusks. Nuisance animal control includes management of nuisance species in state surface waters including but not limited to lakes, ponds, rivers, and streams. As a part of an aquatic nuisance animal control program, a pest management strategy should consider mechanical, biological, and chemical controls. Details for identifying nuisance animals and developing a pest management strategy can be found online through the Aquatic Nuisance Species Taskforce (http://www.anstaskforce.gov/default.php).

Fish

Reasons for applications of piscicides in state surface waters for controlling nuisance species of fish may include, but are not limited to, restoration of threatened and endangered species; fish population management; restoration of native species; and aquaculture. A pest management strategy for fish should consider mechanical, biological, and chemical controls.

Mollusks

Nuisance mollusks including, but not limited to, zebra and quagga mussels, may cause damage to freshwater ecosystems, degrade drinking water, clog water-intake/discharge pipes for utilities and industries, and negatively impact commercial and recreational activities. Use of molluscicides is one of several methods of control for these aquatic nuisance animals; however, it is important to consider the impacts of

mechanical, biological, and/or chemical pesticide use for control of mussels and other aquatic nuisance mollusk species.

Lampreys

There are approximately 40 species of lamprey in the US, although none are currently found in Montana. Lampreys are aquatic vertebrates, which may be managed using lampricides that are applied directly to the surface waters of the state. Several effective management techniques such as mechanical and biological methods are available for lamprey control in addition to lampricides and should be considered when developing a pest management strategy.

Other Nuisance Animals

There may be other nuisance animals of concern including, but not limited to, crustaceans, which are found to be a nuisance and require management with mechanical, biological, and/or chemical pesticides.

The appropriate type of control for aquatic nuisance animals is dictated by the biology of the target species and by environmental conditions and concerns for a specific area. "Control" means, as appropriate, eradicating, suppressing, reducing, or managing invasive species populations, preventing spread of aquatic nuisance animals from areas where they are present, and taking steps such as restoration of native species and habitats to reduce the effects of aquatic nuisance animals and to prevent further invasions. [Source: *www.invasivespeciesinfo.gov/laws/execorder.shtml#sec1*] Numerous strategies are used to reduce the impact of aquatic nuisance animals, but a pest management strategy should be the basis for any pest control program. This is a comprehensive approach for managing pest populations using a variety of control methods.

II. Nuisance Animal IPM Practices

Identify the Problem

Prior to the first pesticide application covered under this permit that will result in a discharge to state surface waters, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, the owner/operator must do the following for each pest management area.

- Identify the pest problem in the pest management area.
- Identify areas with nuisance animal problems and characterize the extent of the problems, including, for example, water use goals not attained (e.g. wildlife habitat, fisheries, vegetation, and recreation). Operators must be well-acquainted with the unique regional conditions of their sites and available methods for controlling the pest species present. Intended use goals for the waterbodies that are being impeded because of nuisance pest infestation must also be considered based on the control site.

The use of the best available mapping information to aid in identifying the problem areas is suggested. Mapping may include aerial photo assessments, topographic maps, and satellite imagery where available and/or practicable. Mapping can be essential to identify problem areas which can and cannot be controlled using non-pesticide preventative measures (e.g., mechanical control). Mapping can also be used in plotting the regional distribution of desired aquatic species, as well as water use goals and complaints or reports of aquatic nuisance animals from the public.

- Identify target nuisance animal species. Positive identification of the aquatic nuisance animal is required because many species within the same genus may require different levels and types of control measures. Nuisance animal identification is important when determining the best pest management strategy for each particular species and for determining application areas. Operators must develop a detailed pest management strategy based on identification of the targeted pest species which occur in their area.

- Identify possible factors causing or contributing to the problem (e.g., nutrients, invasive species). While there may not be reasonable means to control and/or stop the introduction and occurrence of some nuisance species infestations, the identification of possible sources (e.g., outflows from other water systems/bodies) may help in minimizing the need for control measures. Potential factors which could lead to establishment of nuisance animal populations in state surface waters, such as accidental or intentional introduction of exotic species, must be identified before control measures are implemented.

- Establish past or present nuisance animal densities to serve as action threshold(s) for implementing pest management strategies. An action threshold should be established before implementing a pest management strategy. Any data and/or information regarding pest densities can serve as an action threshold.

  In the event there are no data for your pest management area in the past calendar year, provide documentation regarding why current data are not available and the data you used to meet the permit conditions. Owners/ operators may use historical data or neighboring district data to identify the species and establish action thresholds.

Pest Management

Prior to the first pesticide application covered under this permit that will result in a discharge to state surface waters, and at least once each year thereafter prior to the first pesticide application during that calendar year, you must select and implement, for each pest management area, efficient and effective means of pest management that minimize discharges resulting from application of pesticides to control aquatic nuisance animals. In developing these pest management strategies, you must evaluate the following management options, considering impact to water quality, impact to non-target organisms, pest resistance, feasibility, and cost effectiveness: No action; Prevention; Mechanical/physical methods; Biological control agents; and Pesticides.

As noted above, combinations of various management methods are frequently the most effective control strategies over the long term. The goal should be to emphasize long-term control rather than a temporary fix. Owners/Operators must reevaluate every year prior to the first pesticide application for that calendar year. All control measures must be conducted in a manner that minimizes impacts to non-target species. The following describes the management options that must be evaluated.

No Action

No action is to be taken, although an aquatic nuisance animal problem has been identified. This may be appropriate in cases where, for example, available control methods may cause secondary or non-target impacts that are not justified or no available controls exist.

Prevention

Preventing introductions of possible nuisance species is the most efficient way to reduce the threat of aquatic nuisance animals . Identifying primary pathways of introduction and actions to cut off those pathways is essential to prevention. Through a better understanding of the transportation and introduction of aquatic nuisance animals, private entities (aquaculturists) and the public have the necessary knowledge to assist in local aquatic nuisance animal control by reducing conditions that encourage the spread of aquatic nuisance animals in their immediate surroundings. For example, recreational water users provide a pathway of unintentional introductions. Increasing public awareness of aquatic nuisance species, their impacts, and what individuals can do to prevent their introduction and spread is critical for prevention. Other examples of prevention include: better design of water holding sites, better management and maintenance of potential problem sites, and volunteer removal of pest species (e.g., fishing). Monitoring and detection also play important roles in the prevention of the spread and introduction of aquatic nuisance animals.

Mechanical

Mechanical controls will be the appropriate methods in some cases, or a part of a combination of methods. Mechanical control techniques will vary depending on the pest. Examples include fishing, dewatering, netting, electrofishing, pressure washing, use of electric fences and abrasive scrubbing.

Biological Control

Biological control of aquatic nuisance animals may be achieved through the introduction of diseases, predators, or parasites. While biological control generally has limited application for control of aquatic nuisance animals, owner/operators should fully consider this option in evaluating pest management options.

Cultural Method

Cultural controls require altering the habitat such that it is unsuitable for the aquatic nuisance animals. This is an unlikely method of control for aquatic nuisance animal control.

Pesticide

Chemical and biological pesticides such as lampricides, molluscides, and piscicides, are registered for use to control aquatic nuisance animals. These pesticides are specifically formulated for use in water where aquatic nuisance animals occur. In some cases, pesticide use may impact non-target species. As described below, once the determination is made to use pesticides, additional requirements must be met.

Pesticide Use

Conduct surveillance prior to each application to assess the pest management area and to determine when the action threshold is met that necessitates the need for pest management. Often, each aquatic nuisance animal and pest management area warrants a different IPM plan, tailored to the regional conditions. The IPM practices should consist of combinations of mechanical, biological, and/or pesticidal control methods. All control measures must be conducted in a manner that minimizes impacts to non-target species.

Operators may apply chemical pesticides only after considering the alternatives and determining those alternatives not to be appropriate control measures. In some instances, the need for chemical pesticide use in and adjacent to the affected habitat can be reduced or virtually eliminated with proper execution of alternative strategies and proper best management practices. If pesticides are used, they must only be used as needed as determined by an action threshold, and proper best management practices must be adopted, including use of the minimum effective application rate. Also, the owner/operator must conduct surveillance (e.g., pest counts or area survey) prior to application of pesticides to determine when the action threshold is met that necessitates the need for pest control measures.

Surveillance may include the relatively sophisticated transect method used in ecological studies to evaluate species distribution, or it may consist of simply conducting visual observations in the treated area to verify the eradication or reduction in populations of aquatic nuisance animals following pesticide application (Getsinger et al. 2005, pp 23-25).

Reduce the impact on the environment and non-target organisms by evaluating site restrictions, application timing, and application method in addition to applying the pesticide only when the action threshold has been met. Aquatic nuisance animal species and site restrictions (water use, water movement, etc.) must be identified when choosing an appropriate pesticide. Environmental factors such as temperature as well as biological factors such as migration timing should be considered when

deciding on application timing. Partial site treatments over time may be considered to minimize risk to non-target organisms.

Pesticide application must be limited to the appropriate amount required to control the target pests. Methods used in applying pesticides must minimize the impact to non-target species.

Recommended Aquatic Nuisance Animal Control References

EPA recommends the following sources for additional information on IPMs and BMPs for ANS control:

Aquatic Nuisance Species Taskforce. Online: http://www.anstaskforce.gov/default.php.

Aquatic Plant Management, Best Management Practices in Support of Fish and Wildlife Habitat. January 2005. Aquatic Ecosystem Restoration Foundation. Project Leader Kurt Getsinger, (http://cenapa.ucdavis.edu/files/54815.pdf

APPENDIX C
Pattern Use Specific IPM – Weed & Algae Control

I. *Background*

Weeds and algae that negatively affect aquatic biodiversity, human health, and economic stability are considered to be pests. Weeds and algae can decrease populations of native aquatic species including threatened and endangered species. Weeds and algae can reduce aquatic biodiversity by preventing desirable species growth and unbalancing desirable aquatic species populations and development.

Social, economic, and human health are all affected by a lower aesthetic appeal of a waterbodies, an increased cost of agricultural irrigation water, and an increase in the risk of human diseases by providing ideal vector breeding grounds. In addition, the reduction in the utility of water can have social and economic impacts due to reduced hydroelectric operations, impeded opportunity for recreational activities (e.g., fishing, boating, and swimming), and disruption of water transport (e.g., agricultural irrigation) to name a few. As a result, if weeds and algae become established and impede the environmental stability and use goals for a body of water, control measures will be necessary. Pest control may be necessary before the pests become established.

The requirements in this appendix apply to pesticide discharges associated with management of weed and algae in, but not limited to, lakes, ponds, rivers, streams, irrigation canals, and drainage systems. Irrigation and drainage systems differ in the type and disposition of the water that they convey; these systems may consist of earthen or concrete lined canals or combinations of the two.

Most plants and algae are largely beneficial to water quality, especially when present in the appropriate densities. However, overabundant native algae and aquatic vegetation, as well as introduced, exotic species can decrease water quality and utility. Dense plant or algae growth can interfere with recreational activities (e.g., fishing, boating, and swimming), disrupt water transport, reduce aquatic biodiversity by preventing desirable plant growth and unbalancing fish populations, lower the aesthetic appeal of a waterbody, and increase the risk of human diseases by providing ideal vector breeding grounds.

Weeds

Weeds include floating, emergent, or submerged plants that negatively impact the quality and utility of state surface waters. Aquatic systems need plant materials as an important part of the systems ecology; however, when vegetation becomes established to the point of impeding the use goals for a body of water, control measures become necessary. As a part of such aquatic weed control programs a pest management strategy should consider mechanical, biological, and/or chemical controls. Details for developing an integrated aquatic weed pest management

strategy can be found in the document *Aquatic Plant Management, Best Management Practices in Support of Fish and Wildlife Habitat* (January 2005. Aquatic Ecosystem Restoration Foundation. Project Leader Kurt Getsinger, Ph.D.).

The appropriate type of control for weeds and algae is dictated by the biology of the target species and by environmental conditions and concerns for a specific area. "Control" means, as appropriate, eradicating, suppressing, reducing, or managing invasive species populations, preventing spread of aquatic nuisance plants from areas where they are present, and taking steps such as restoration of native species and habitats to reduce the effects of aquatic nuisance plants and to prevent further invasions [source: www.invasivespeciesinfo.gov/laws/execorder.shtml#sec1]. Numerous strategies are used to reduce the impact of aquatic weeds and algae, but a pest management strategy should be the basis for any pest control program. This is a comprehensive approach for managing pest populations using a variety of control methods.

Algae

Algae are non-vascular plant that do not have true roots, stems, leaves, or vascular tissue and have simple reproductive systems. Some macroscopic algae may resemble a plant in appearance. Algae are an important aquatic food source for many animals. However, excess algae growth such as algae blooms, frequently caused by unbalanced or elevated nutrients, can be damaging to aquatic ecosystems. Control options include mechanical, biological, and chemical methods.

II. Weed and Algae Control IPM Practices

Identify the Problem

Prior to the first pesticide application covered under this permit that will result in a discharge to state surface waters, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, the owner/operator must do the following for each pest management area.

- Identify the pest problem in the pest management area.

- Identify areas with weed or algae problems and characterize the extent of the problems, including, for example, water use goals not attained (e.g. wildlife habitat, fisheries, vegetation, and recreation). Owners/operators must be well-acquainted with the unique regional conditions of their sites and available methods for controlling the pest species present. Intended use goals for the waterbodies that are being impeded because of nuisance pest infestation must also be considered based on the control site.

  The use of the best available mapping information to aid in identifying the problem areas is suggested. Mapping may include aerial photo assessments, topographic maps, and satellite imagery where available and/or practicable. Mapping can be essential to identify problem areas which can and cannot be controlled using non-pesticide preventative measures (e.g., mechanical control).

Mapping can also be used in plotting the regional desired aquatic species, as well as water use goals and complaints or reports of aquatic weeds and algae from the public.

- Identify target weed species. Positive identification of the weed or algae is required because many species within the same genera may require different levels and types of control measures species. Weed and algae identification is important when determining the best pest management strategy for each particular species and for determining application areas. Owners/operators should develop a detailed pest management strategy based on identification of the targeted pest species which occur in their area.

- Identify possible factors causing or contributing to the weed or algae problem (e.g., nutrients, invasive species, etc). While there may not be reasonable means to control and/or stop the introduction and occurrence of some nuisance species infestations, the identification of possible sources (e.g., outflows from other water systems/bodies) may help in reducing the need for control measures. Potential weed and algae sources, such as changes in nutrient levels or accidental or intentional introduction of exotic species, must be identified before control measures are implemented

- Establish past or present weed or algae densities to serve as action threshold(s) for implementing pest management strategies. Any data and/or information regarding pest densities can be used to establish an action threshold. Determining increases in pest densities may indicate a need for action. An action threshold must be established before implementing a pest management strategy. However, action thresholds will be species specific.

In the event there are no data for your pest management area in the past calendar year, provide documentation regarding why current data are not available and the data you used to meet the permit conditions. Owners/ operators may use historical data or neighboring district data to identify the species and establish action thresholds.

Pest Management

Prior to the first pesticide application covered under this permit that will result in a discharge to state surface waters, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, you must select and implement, for each pest management area, efficient and effective means of pest management that minimize discharges resulting from application of pesticides to control aquatic weeds or algae. In developing these pest management strategies, you must evaluate the following management options, considering impact to water quality, impact to non-target organisms, pest resistance, feasibility, and cost effectiveness: No action; Prevention; Mechanical/physical methods; Cultural methods; Biological control agents; and Pesticides.

As noted above, combinations of various management methods are frequently the most effective pest management strategies over the long term. The goal should be to emphasize long-term control rather than a temporary fix. Owners/operators must reevaluate every year prior to the first pesticide application for that calendar year. All control measures must be implemented in a manner that reduces impacts to non-target species. The following describes the management options that must be evaluated.

No Action

No action is to be taken, although a weed or algae problem has been identified. This may be appropriate in cases where, for example, available control methods may cause secondary or non-target impacts that are not justified, no available controls exist, or the pest population is stable at a level that does not impair waterbody uses.

Prevention

Preventing introductions of possible weeds and algae to waters of the state is the most efficient way to reduce the threat of nuisance species (ANS Task Force, 2009). Identifying primary pathways of introduction and actions to cut off those pathways is essential to prevention. Through a better understanding of the transportation and introduction of weeds and algae, private entities (aquaculture) and the public have the necessary knowledge to assist in local weed and algae control by reducing conditions that encourage the spread of weeds and algae in their immediate surroundings.

For example, recreational water users provide a pathway of unintentional introductions. Increasing public awareness of aquatic weeds and algae, their impacts, and what individuals can do to prevent their introduction and spread is critical for prevention. Other examples of prevention include: better design of water holding sites, better management and maintenance of potential problem sites, and volunteer removal of pest species (e.g., hand weeding). Monitoring and detection also play important roles in the prevention of the spread and introduction of aquatic weeds and algae.

Cultural Method

Cultural techniques include the use of pond dyes and water-level drawdown. Use pond dyes to manage filamentous algae and submersed (underwater) vegetation. Several pond colorants and one or two dyes are EPA-registered for aquatic-weed control. Pond dyes and colorants can be effective if there is little water outflow from the pond. Dyes and colorants intercept sunlight needed by algae and other underwater plants for photosynthesis. Therefore, they are generally ineffective on floating plants like duckweed and water lilies and emergent (growing above the surface) plants like cattails and bulrushes. Dyes and colorants are nontoxic and do not kill the plants, and they are safe for use in ponds for irrigation, fishing and livestock. However, they are not intended for use in large lakes with a lot of water flow or lakes used for public water supplies.

Mechanical and Biological Control

Mechanical and biological controls will be the appropriate method in some cases, or a part of a combination of methods. In some instances, the need for chemical pesticide use in and adjacent to the affected habitat can be reduced or virtually eliminated with proper execution of alternative strategies and proper best management practices.

Mechanical control techniques will vary depending on the pest. Examples include dewatering, pressure washing, abrasive scrubbing, and weed removal by hand or machine.

Biological control of aquatic weeds and algae may be achieved through the introduction of diseases, predators, or parasites. While biological controls generally have limited application for control of aquatic weeds and algae, the owner/operator should fully consider this option in evaluating pest management options.

Pesticide

Aquatic herbicides are chemicals specifically formulated for use in water to kill or control plants. Aquatic herbicides are sprayed directly onto floating or emergent aquatic plants or are applied to the water in either a liquid or pellet form. Systemic herbicides are capable of killing the entire plant. Contact herbicides cause the parts of the plant in contact with the herbicide to die back, leaving the roots alive and able to regrow. Non-selective, broad spectrum herbicides will generally affect all plants that they come in contact with. Selective herbicides will affect only some plants.

Pesticide Use

Conduct surveillance prior to each pesticide application to assess the pest management area and to determine when the action threshold is met that necessitates the need for pest management. Often, each weed and algae species and pest management area warrants a different pest management strategy tailored to the regional conditions. The pest management strategy should consist of combinations of mechanical, biological, and/or pesticidal control methods. All control measures must be conducted in a manner that minimizes impacts to non-target species.

Owners/operators should apply chemical pesticides only after considering the alternatives and determining those alternatives not to be appropriate control measures. If pesticides are used they must be used only as needed as determined by the action threshold, and proper best management practices including use of the optimal effective application rate. Also, the owner/operator should conduct surveillance (e.g., pest counts or area survey) prior to application of pesticides to determine when the action threshold is met and necessitates the need for pest control measures.

Surveillance may include the relatively sophisticated transect method used in ecological studies to evaluate species distribution, or it may consist of simply

conducting visual observations in the treated area to verify the eradication or reduction in populations of aquatic weeds and algae following pesticide application (Getsinger et al. 2005, pp 23-25).

Reduce the impact on the environment and non-target organisms by applying the pesticide only when the action threshold has been met. Owners/operators must apply pesticide only as indicated by action thresholds for the pest management area. As noted above, action threshold help determine both the need for control actions and the proper timing of such actions. Timing pesticide application can reduce the impact on the environment and on non-target organisms.

Environmental factors such as temperature and dissolved oxygen content, as well as biological factors such as stage of growth should be considered when deciding on application timing. Partial site treatments over time may be considered to reduce risk. Pesticide application must be limited to the appropriate amount required to control the target pests. Methods used in applying pesticides must reduce the impact to non-target species.

Recommended Weed and Algae Control References

EPA recommends the following sources for additional information on IPM's and BMP's for aquatic nuisance plant control:

Aquatic Nuisance Species Taskforce. Online: http://www.anstaskforce.gov/default.php.

Aquatic Plant Management, Best Management Practices in Support of Fish and Wildlife Habitat. January 2005. Aquatic Ecosystem Restoration Foundation. Project Leader Kurt Getsinger, (http://cenapa.ucdavis.edu/files/54815.pdf)

APPENDIX D
Pattern Use Specific IPM – Aerial Pest Control

Identify the Problem

Prior to the first pesticide application covered under this permit that will result in a discharge to state surface waters, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, the owner/operator must ensure proper problem identification. Problem identification is determined through pest identification, delineation of the extent and range of the pest problem, determination of the potential for pest problem expansion, and assessing the economic impact of failure to provide pest control, as follows:

- Identify target species to develop a species-specific pest management strategy based on developmental and behavioral considerations for each species. Pest identification is a key activity for implementation of aerial pest control (typically forest canopy). Pest identification should only be conducted by personnel with adequate training and experience with the pests. While numerous similar pests (insects and/or pathogens) may be present in any given location, only a few of the representative species may constitute a threat which requires control activities.

  Through proper pest identification informed control decisions can be made based on the development biology of the pest (susceptible development stage), pest mobility (potential rate of spread), timing of selected control measures, applicable control techniques, and most effective chemical pesticides for the target species (insecticide class, resistance, etc.). Failure to identify pests can lead to unwarranted control activities and/or the need for chemical application with potential for discharge into state surface waters. Control for each specific pest is also predicated on the status of the pest as native recurring, quarantine restricted, or designated as an invasive species.

- Establish target pest densities to serve as action threshold(s) for implementing pest management strategies. An action threshold is a point at which pest populations or environmental conditions indicate that pest control action must be taken. Action thresholds help determine both the need for control actions and the proper timing of such actions. It is a predetermined pest level that is deemed to be unacceptable.

- Identify current distribution of the target pest and assess potential distribution in the absence of control measures. Control activities are warranted only after exact pest identification and delineation of the extent of the pest infestation.

  As forest canopy pest control can involve treating large expanses of forests, mapping is also an important component in identification of the problem. The distribution of the pest, usually insects, within the area of infestation can impact the selection of treatment activities. In addition, mapping of the pest infestation

will allow evaluation of the actual/potential spread of the infestation (e.g., pest biology, pest mobility, and host availability) and also serve as a tool to evaluate the effectiveness of the control activities. Mapping can also provide essential information for assessment of economic damages that can result from the current and potential pest infestation and failure to control the pest. Management decisions can thereby be based on cost/benefit evaluations based on the current and potential distribution of any pest.

- Determine the potential economic impact of not controlling the pest. By establishing economic thresholds, it is possible to determine pest density action thresholds which warrant control activities. However, control decisions must take into account not only the projected economic impact of the current pest infestation but also the potential of the pest infestation to spread. Therefore, control decisions based on economic impact must in turn rely on proper pest identification, pest biology, and current and potential pest distribution.

In the event there are no data for your pest management area in the past calendar year, provide documentation regarding why current data are not available and the data you used to meet the permit conditions. Owners/ operators may use historical data or neighboring district data to identify the species and establish action thresholds.

Pest Management

Prior to the first pesticide application covered under this permit that will result in a discharge to state surface waters, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, you must select and implement for each pest management area efficient and effective means of pest management that minimize discharges resulting from application of pesticides to control forestry pests. In developing these pest management strategies, you must evaluate the following management options considering impact to water quality, impact to non-target organisms, pest resistance, feasibility, and cost effectiveness: No action; Prevention; Mechanical/physical methods; Cultural methods; Biological control agents; and Pesticides.

Pest control activities in forest canopy management programs may be warranted following problem identification and based solely on pest occurrence (e.g., quarantine pest, invasive species). However, in many instances control activities may only be necessary based on pest population distribution and/or pest densities.

To minimize the need for pest control while also producing the best control results, a pest management strategy appropriate for the specific problem site(s) must be developed. A site-specific management plan will consider biotic (e.g., plant and animal species community structure) and abiotic (e.g., environmental) factors. Combinations of various management methods are frequently the most effective pest management strategies over the long term. The goal of a pest management strategy in forest canopy pest control should be to emphasize long-term control rather than a temporary fix. All control measures must be conducted in a manner that minimizes

impacts to non-target species. The following is a discussion of the relevant management options as they might be implemented for forest canopy pest control.

No Action

No action is to be taken, although a forest canopy pest control problem has been identified. This may be appropriate in cases where available control methods may cause secondary or non-target impacts or where aesthetic/ economic losses are not anticipated.

Mechanical Control

Mechanical controls will be the appropriate method in some cases, or a part of a combination of methods. In some instances, the need for chemical pesticide use in and adjacent to the affected habitat can be reduced or virtually eliminated with proper execution of alternative strategies and proper best management practices. Mechanical control techniques will vary depending on the pest. An example of mechanical control in a forest canopy would be egg mass removal (gypsy moth).

Biological Control

Biological control of forest canopy pests may be achieved through the introduction/enhancement of diseases, predators, or parasites. In addition, forest canopy pest control programs aimed specifically at insects may also utilize sterile insect release, mating disruption, and biological pesticides. While biological controls generally have limited applications for forest canopy pest control programs, they should be fully considered as an option in the development of an IPM plan. The latter two control approaches are often utilized when controlling for gypsy moth.

Cultural Method

Cultural control methods are strategies that make the habitat unsuitable for a pest. An example of a cultural method to manage pests of the forest canopy would be to select a different species of tree to plant, or to plant resistant varieties of trees. Maintaining the trees in good health to discourage pests is another method of cultural control.

Pesticide

Several chemical and biological pesticides are available that may be used to reduce defoliation of the trees. These pesticides are typically used when pest populations are high and the action threshold has been reached. These products are aerially applied. As described below, once the determination is made to use pesticides, additional requirements must be met.

Pesticide Use

Conduct surveillance prior to each application to assess the pest management area and to determine when a pest action threshold is met that necessitates the need for

pest management. Owners/operators must apply pesticides only as needed as determined by pre-established criteria and pest action thresholds.

Owners/operators must establish a pest action threshold that warrants pesticide application based on problem identification and pest surveillance. In order to establish pest densities and determine when pest action thresholds have been met, forest canopy pest control programs must include pest surveillance activities as an integral component of pest management strategies. Pest surveillance is necessary to detect the presence (or confirm the absence) and magnitude of pest populations in a given location and precisely pinpoint zones of infestation. Surveillance activities will vary according to the pest (insect, weed, or pathogen) but in general should include observations of pest numbers, developmental stage of the current infestation, and biotic factors which would enhance development/expansion of pest populations (e.g., weather, crowding, predators, pathogens, etc.).

Pest surveillance will vary according to pest type and species. For insect pests, surveillance activities may include, but not be limited to, pheromone traps, sticky traps, light traps, defoliation monitoring. In some cases, traps used in surveillance activities have been developed to the extent that they alone provide adequate control of the targeted pest, thus eliminating the need for pesticide completely. Conversely, in the instance of quarantine pests or invasive species, pest identification alone may suffice to fulfill surveillance requirements and indicate need for control measures. Regardless, surveillance should take in to account local environmental conditions and projected environmental conditions which would support development and/or spread of the pest population and which would limit the choice or effectiveness of control activities.

It is also important to continue surveillance following control activities to assess treatment efficacy and to monitor for new pests. Surveillance can determine if the current techniques are effective and whether additional control measures are required, particularly pesticide application. Based on follow-up surveillance activity, owner/operators can make informed decisions which serve to increase the effectiveness of their control programs and minimize the potential for pesticide discharge to state surface waters Surveillance is necessary not only to establish the species presence and their abundance but also as an evaluation tool of the effectiveness of chemical control activities. Furthermore, surveillance should be used as an indicator of the need for additional chemical control activities based on pre-established criteria related to population densities in local areas.

Assess environmental conditions (e.g. temperature, precipitation, and wind speed) in the treatment area to identify conditions that support target pest development and are conducive for treatment activities. Operator may use insecticides as dictated by the pest. Although pesticide formulations and applications vary according to pest and habitat, the focus here is on aerial applications of chemical/biological sprays. Aerial application is considered the preferred application method for large areas and areas that are inaccessible for ground application. In order to prevent poor site coverage, a guidance system (GPS), where economically feasible, or site flagging are necessary

to increase accuracy of the treatment coverage while minimizing the amount of pesticides being applied.

Before using a pesticide, the forest canopy pest control owner/operator should consider the following points:

1) do not apply a pesticide in unfavorable environmental conditions (e.g., windy, rainy, etc.) with increased potential for drift and wash off/runoff,

2) choose an application method and a pesticide formulation that will minimize the potential for movement of the material to off-site locations,

3) restrict or minimize the use of volatile pesticides on areas in or around sensitive on-target plants or animals, especially during hot weather,

4) generally, liquid pesticides applied by broadcast methods are more subject to drift than are granular formulations and their application methods,

5) during liquid application, spray droplet size should be maintained within the recommended range for the proposed target and the application method to be used, and

6) use additives to minimize drift and enhance efficacy as appropriate.

Reduce the impact on the environment and non-target organisms by evaluating the restrictions, application timing, and application methods in addition to applying the pesticide only when the action thresholds have been met. Forest canopy pest species and site restrictions (water use, water movement, etc.) must be identified when choosing an appropriate pesticide. For instance with gypsy moth control a biological insecticide, *Bacillus thuringiensis kurstaki*, is usually selected. However, if endangered or threatened butterfly or moth species are in the area, a viral insecticide that specifically targets gypsy moth larvae will be selected. Environmental factors such as temperature, as well as biological factors such as migration timing should be considered when deciding on application timing. Partial site treatments over time may be considered to minimize risk to non-target organisms. Pesticide application must be limited to the appropriate amount required to control the target pests. Methods used in applying pesticides must minimize the impact to non-target species.

Evaluate using pesticides against the most susceptible developmental stage. For forest canopy pests, pesticides should be selected that target the most susceptible life stage. For instance, with gypsy moths, the larvae are present in the canopy, are soft-bodied, and therefore are the target of chemical controls.

Recommended Forest Canopy Pest Control Reference

EPA recommends the following source for additional information on IPM's and BMP's for forest canopy pest control:

> Emily Grafton and Ralph Webb. Homeowner's guide to gypsy moth management. West Virginia University Extension Service. http://www.nj.gov/agriculture/divisions/pi/pdf/GMguide.pdf

APPENDIX E

Pattern Use Specific IPM –Mosquito and Other Flying Insect Pests Control

I. *Mosquitoes*

Background

There are over 2500 different species of mosquitoes throughout the world with approximately 200 species occurring in the U.S. The total budgets for mosquito control in the U.S. exceed $200,000,000 annually (AMCA 2009).

Mosquitoes can be a source of annoyance (e.g., work and leisure activities), a limiting factor in economic development (e.g., residential development and property value), a causal factor in decreased agricultural productivity (e.g., animal weight loss/death and decreased milk production) from irritation and blood loss, and a source of disease transmission (e.g., malaria, encephalitis, yellow fever, dengue, and West Nile Virus). Most of these diseases have been prominent as endemic or epidemic diseases in the U.S. in the past, although today, only the insect-borne (arboviral) encephalitides and West Nile virus fever occur annually and dengue occurs periodically in this country. Thus, control of mosquitoes is an important public health issue. Numerous strategies are used to reduce the impact of mosquitoes but a comprehensive approach using a variety of complementary control methods is necessary for any mosquito control program.

Of major concern is the transmission of microorganisms that cause diseases such as western equine encephalitis and St. Louis encephalitis. Both of these diseases can cause serious, sometimes fatal neurological ailments in people. (Western equine encephalitis virus also causes disease in horses.) Western equine encephalitis infections tend to be more serious in infants while St. Louis encephalitis can be a problem for older people. These viruses normally infect birds or small mammals. During such infections, the level of the virus may increase in these infected animals facilitating transmission to humans by mosquitoes. The West Nile virus, which can also cause encephalitis, was found in the northeastern U.S. for the first time in 1999, and is a good example of this mode of transmission. Over 20,000 human cases of West Nile virus have been reported in the U.S. Symptoms of human illness can range from mild flu-like symptoms to severe encephalitis, meningitis, or acute flaccid paralysis. Over 800 people have died from West Nile virus since its emergence in North America in 1999 (CDC).

Other pathogens transmitted by mosquitoes include a protozoan parasite which causes malaria, and *Dirofilaria immitis*, a parasitic roundworm and the causative agent of dog heartworm. Disease carrying mosquito species are found throughout the U.S., especially in urban areas and coastal or inland areas where flooding of low lands frequently occurs. Even when no infectious diseases are transmitted by mosquitoes, they can be a health problem to people and livestock. Mosquito bites can result in secondary infections, allergic reactions, pain, irritation, redness, and itching.

Mosquito Control IPM Practices

Identify the Problem

Prior to the first pesticide application covered under this permit that will result in a discharge to state surface waters, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, the owner/operator must do the following for each pest management area.

- Identify the pest problem in the pest management area.

- Establish densities for larval and adult mosquito or flying insect pest populations to serve as action threshold(s) for implementing pest management strategies. Operators must develop action thresholds for larval and adult mosquito prior to the first pesticide application covered under this permit. The action thresholds must be re-evaluated at least once each calendar year.

  As noted in the general discussion above, an action threshold is a point at which pest populations or environmental conditions indicate that pest control action must be taken. Action thresholds help determine both the need for control actions and the proper timing of such actions. It is a predetermined pest level that is deemed to be unacceptable.

  For example in Maryland, "A collection of more than 10 anthropophagous (human biting) female mosquitoes per night of trap operation is considered to be the level which causes discomfort and/or complaints from the majority of people. The light trap action threshold for ground spraying of adult mosquitoes is 10-20 per trap-night. The action threshold to suppress pest populations of adult mosquitoes by aerial spraying (application of insecticide by an aircraft) is a light trap collection of 100 female mosquitoes. The action threshold for landing rate counts to justify ground spraying for the control of adult mosquitoes is 1 to 3 in 1 minute. The action threshold for aerial spraying is 12 mosquitoes per minute."

  For larvae control, action thresholds are determined by standard mosquito dipping techniques. For example, in Canyon County Mosquito Abatement District, Idaho, they established larvae density action levels for *Culex* species (primary disease vectors) as Low: 1-5 larvae per dip; Medium: 6-10 larvae per dip; High: > than 10 larvae per dip. The larvae density action threshold can be used to determine how much larval control products are to be used or even if any action is to be taken. In some situations, the action threshold for a pest may be zero (i.e., no presence of the pest is tolerated). This is especially true when the pest is capable of transmitting a human pathogen (e.g., mosquitoes and the West Nile virus).

- Identify the target mosquito or flying insect pest species to develop a species-specific pest management strategy based on developmental and behavioral

considerations for each species. Knowledge of the developmental biology of mosquitoes is essential to developing pest management strategies for mosquito control.

The mosquito undergoes complete metamorphosis and has four distinct stages in its life cycle: egg, larva, pupa, and adult. Depending on the species, eggs are deposited either in permanent water habitats or in temporary/floodwater habitats. Egg deposition in permanent water habitats occurs as individual eggs or as multiple egg rafts deposited directly to the water surface in natural or artificial water-holding containers found in the domestic environment or in naturally occurring pools. Egg rafts may contain 100-200 eggs. A batch laid of single eggs may range from 60-100 eggs. Egg deposition in temporary/ floodwater habitats occurs as individual eggs on moist soil (e.g., roadside ditches, depressions, farmland irrigation ditches, etc.) or in other objects (e.g., flower pots, cans, tires, tree holes, etc.) in which periodic flooding will occur. Eggs deposited in permanent habitats will hatch in a few days whereas eggs deposited in temporary/floodwater habitats are resistant to desiccation in the absence of flooding and can withstand drying for extended periods of time (weeks to months) before hatching.

Following egg hatching, typically 2-3 days after laying, mosquitoes go through four larval developmental stages (instars) commonly known as wrigglers. Larval development generally is completed in a week or less, depending upon the species and environmental conditions (e.g., crowding, food availability, and water temperature). The first three larval instars continually feed on detritus, algae, bacteria, and fungi. However, some mosquito species are predacious with larva feeding on other mosquitoes and/or small aquatic invertebrates. Late in the fourth larval instar the larvae ceases to feed in preparation for pupation. The pupal stage, commonly referred to as a tumbler, is a non-feeding developmental stage in which the adult form is developed. Following a few hours to several days, dependent upon species and water temperature, the adult emerges from the pupae.

The adult mosquito is the pestiferous stage. Adults emerge from the water surface and after a short period of rest seek out a food source. Both males and females feed on nectar of flowers and other sugar sources as a source of energy. Only female mosquitoes seek out a blood meal as a source of protein and lipids for egg development. However, females of some species are autogenous (i.e., able to use energy reserves carried over from the immature stage to develop the first egg batch). In addition, most mosquitoes have preferred hosts which may include warm and cold blooded animals and birds. Human blood meals are seldom first or second choices with livestock, smaller mammals and/or birds generally preferred. Host seeking and blood feeding activities by mosquitoes are initiated by a complex variety of host and environmental cues (e.g., carbon dioxide, temperature, moisture, smell, color, movement and host preference). Adult feeding activity is generally either crepuscular (early morning, dusk and into the evening) or diurnal (daytime, particularly in relation to cloudy days and

shaded areas). Although highly variable by species and environmental conditions, a complete development cycle can occur every one to three weeks.

An understanding of the developmental biology of species in a given area provides the basis for developing a pest management strategy aimed at reducing pesticide discharge into surface waters of the state.

- Ensure proper identification of mosquito species to better understand the biology of the target species and develop a detailed pest management strategy. Due to the great variability in developmental habitats and adult feeding behaviors as discussed previously, proper identification is imperative in designing an effective and efficient pest management strategy. Identification of the target species will aid in development of strategies aimed at both the immature and adult developmental stages. Identification of the target species for a specific area allows 1) identification of potential breeding sites, 2) evaluation of alternative control measures aimed at controlling the immature stages (habitat modification, source reduction, larvicides, biological larvicides, and oils), and 3) assessment of potential for disease transmission.

- Identify known breeding sites for source reduction, larval control program, and habitat management. Mapping is a valuable tool in assessing mosquito habitats and designing control programs for a specific area to minimize pesticide discharge into state surface waters. Maps may simply be township/city/county maps but may also include aerial photo assessments, topographic maps, and satellite imagery where available. Mapping is essential to identify mosquito producing areas which can and cannot be controlled using non-chemical preventative measures (e.g., source reduction). Maps should include all potential sites for mosquito development including agricultural areas in the specific area (e.g., hay, pasture, circle irrigation, orchards, rill irrigated field crops, and flood irrigated pastures and farmland). Mapping should also be a priority in a surveillance program utilizing mosquito traps, biting counts, complaints, and reports from the public. Planning in coordination with mapping ensures the best pest management strategy (whether source reduction, biological, or chemical) for each particular species is chosen. Owners/operators must identify known breeding sites prior to the first pesticide application covered under this permit.

  Analyze existing surveillance data to identify new or unidentified sources of mosquito or flying insect pest problems as well as sites that have recurring pest problems. As discussed above, mapping is a valuable tool in assessing mosquito habitats and designing control programs. Owners/operators must analyze existing surveillance data to identity any new source of mosquito problems.

  In the event there are no data for your pest management area in the past calendar year, provide documentation regarding why current data are not available and the data you used to meet the permit conditions. Owners/

operators may use historical data or neighboring district data to identify the species and establish action thresholds.

Pest Management

Prior to the first pesticide application covered under this permit that will result in a discharge to surface waters of the state., and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, you must select and implement, for each pest management area, efficient and effective means of pest management that minimize discharges resulting from application of pesticides to control mosquitoes or other flying insect pests. In developing these pest management strategies, you must evaluate the following management options, considering impact to water quality, impact to non-target organisms, pest resistance, feasibility, and cost effectiveness: No action; Prevention; Mechanical/physical methods; Cultural methods; Biological control agents; and Pesticides.

Pest management strategies will vary by locality, mosquito species, and financial concerns. As noted above, combinations of various management methods are frequently the most effective pest management strategies over the long term. The goal should be to emphasize long-term control rather than a temporary fix. Owners/operators must reevaluate every year prior to the first pesticide application for that calendar year. The following describes the management options that must be evaluated.

No Action

No action is to be taken, although a mosquito problem has been identified. This may be appropriate in cases where, for example, available control methods may cause secondary or non-target impacts that are not justified or no control methods exist.

Prevention

Prevention strategies are program activities which eliminate developing mosquito populations through environmental modification and/or habitat management. For mosquito control, these activities are physical methods such as habitat modification, cultural methods that reduce sources of mosquitoes, and biological control.

Mechanical/Physical Methods.

Habitat modification, also known as physical or permanent control, is in many cases the most effective mosquito control technique available and is accomplished by eliminating mosquito breeding sites. Habitat modification activities have the potential to be both effective and economical in some areas and can virtually eliminate the need for pesticide use in and adjacent to the affected habitat. However, the ability to use prevention strategies is dependent upon local authority and restrictions.

Cultural Methods.

Cultural methods can reduce sources of mosquitoes and can be as simple as properly discarding old containers that hold water capable of producing *Aedes aegypti, Ae. albopictus or Culex spp.* or as complex as implementing Rotational Impoundment Management (RIM) or Open Marsh Water Management (OMWM) techniques. RIM is a source reduction strategy that controls salt marsh mosquitoes (e.g., *Ae. taeniorhynchus* and *Ae. sollicitans*) at the same time as significant habitat restoration is occurring. Source reduction may include; water management, vegetation management, biological control, and pesticide use in non-state surface waters

Containers provide excellent habitats for development of numerous mosquito species. These may include but are not limited to flowerpots, cans, and tires. Container-inhabiting mosquitoes of particular concern include, *Ae. aeypti, Ae. albopictus, Cx. p. pipiens,* and *Cx. salinarious*. A container-breeding mosquito problem can be solved by properly disposing of such materials, covering them, tipping them over to ensure that they do not collect water, and/or periodic draining. Urban container-breeding mosquito control is best implemented through education and surveillance programs.

Source reduction in freshwater lakes, ponds, and retention areas is more applicable to artificially created areas than natural areas. Artificial ponds can be eliminated as a breeding site simply by filling in the areas, (i.e. habitat modification). However, large permanent waterbodies and areas for stormwater or wastewater retention require other methods. Options for these areas include minimizing and/or eliminating emergent and standing vegetation, maintenance of steep banks, and inclusion of deep water areas as sanctuary for larvivorous fish.

Mosquito production from stormwater/wastewater habitats can result in considerable mosquito problems as a result of engineering, poor construction or improper maintenance. However, mosquito populations can typically be managed by keeping such areas free of weeds through an aquatic plant management program and maintaining water quality that can support larvivorous fish. *Culex, Coquillettidia, Mansonia*, and *Anopheles* mosquitoes are often produced in these habitats.

Pastures and agricultural lands are enormous mosquito producers, frequently generating huge broods of *Aedes, Psorophora*, and *Culex* mosquitoes. Improved drainage is one effective tool for source reduction in such habitats. The second is the use of efficient, precision irrigation practices that will result in less standing water for those agricultural areas that require artificial watering.

Biological Control.

The use of biological organisms or their byproducts to combat pest insects, such as mosquitoes, is termed biological control, or biocontrol. Biocontrol is utilization of parasites, predators, and pathogens to regulate pest populations.

Generally, this definition includes natural and genetically modified organisms and means that the agent must be alive and able to attack the mosquito. The overall premise is simple: Biocontrol agents that attack mosquitoes naturally are grown in the lab and then released into the environment, usually in far greater numbers than they normally occur, and often in habitats that previously were devoid of them, so as to control targeted mosquito species.

One advantage of biocontrol agents is host-specificity which affords minimal disturbance to non-target species and to the environment. However, it is this specificity and the cost of commercializing biocontrol agents that deter development of biocontrol agents. In addition, utilization of biocontrol requires increased capital outlay and start up costs as well as increased training requirements for personnel.

Biocontrol should be considered a set of tools that a mosquito control program can use when it is economically feasible. When combined with conventional chemicals and physical control procedures, biocontrol agents can provide short and, occasionally, long-term control. Biocontrol, as a conventional control method, should aim at the weakest link of the life cycle of the mosquito. In most cases, this is the larval life stage.

Mosquitofish (*Gambusia affinis*) are currently the most extensively used biocontrol agent. These fish, which feed on mosquito larvae, can be placed in a variety of permanent and semi-permanent water habitats. Differences of opinion exist on the utility and actual control benefits derived from *Gambusia* implementation in an IPM program with results reported from excellent control to no control at all. Recently, concerns over placing *Gambusia* in habitats where other fish species assemblages are threatened have arisen. Care must be taken in placement of this cosmopolitan species in areas where endemic fish species are sensitive to further environmental perturbation.

In some aquatic habitats, fish function as an excellent mosquito biocontrol mechanism. These typically are permanent habitats where *Culex* and *Anopheles* are the primary mosquito residents and where the mosquito densities are not excessive.

Species of predacious mosquitoes in the genus *Toxorhynchites* have been studied in a variety of urban areas for control of container-inhabiting mosquitoes, such as the Asian tiger mosquito (*Ae. albopictus*). *Toxorhynchites* mosquitoes also affect mosquito populations that develop in the treehole environment; however, their introduction into urban container habitats has proven unsuccessful.

In specific containers, *Toxorhynchites* may consume a large number of prey mosquito larvae, such as *Aedes aegypti* and *Ae. albopictus*. However, this predator does not disperse well enough to impact the vast number of natural and artificial containers used by these mosquitoes. Additionally their life-cycle is 2-3

times that of their prey making it impossible for them to keep up with the other more rapidly developing mosquitoes.

Another group of biocontrol agents with promise for mosquito control is the predacious copepods (very small crustaceans). Copepods can be readily mass reared, are easily to delivered to the target sites, and perform well when used with insecticides.

Birds and bats are often promoted as potential biocontrol agents of adult mosquitoes. However, while both predators eat adult mosquitoes, they do not do so in sufficient amounts to impact the mosquito populations. Mosquitoes provide such a small amount of nutrition that birds or bats expel more energy pursuing and eating mosquitoes than they derive from them. They are not a primary food source for these predators. Additionally, with mosquito flight behavior being crepuscular they are not active during the feeding periods of most birds. While bats are active during the correct time period, they simply cannot impact the massive numbers of adult mosquitoes available.

Bio-rational products exploit insecticidal toxins found in certain naturally occurring bacteria. These bacteria are cultured in mass and packaged in various formulations. The bacteria must be ingested by mosquito larvae so the toxin is released. Therefore bio-rational products are only effective against larvae since pupae do not feed. The bacteria used to control mosquito larvae have no significant effects on non-target organisms. The possibility of creating a new invasive species by the introduction of biocontrols should be considered, evaluated, and avoided.

Pesticides

There are biological and chemical pesticide products registered for use against mosquitoes.

Two biological pesticide products that are used against mosquito larvae singly or in combination are *Bacillus thuringiensis israelensis* (Bti) and *Bacillus sphaericus* (Bs). Manufactured Bti contains dead bacteria and remains effective in the water for 24 to 48 hours; some slow release formulations provide longer control. In contrast, Bs products contain live bacteria that in favorable conditions remain effective for more than 30 days. Both products are safe enough to be used in water that is consumed by humans.

In addition to the biological pesticides, there are chemical pesticides for use against mosquitoes. As described below, once the determination is made to use pesticides to control mosquitoes, additional requirements under this general permit must be met.

Pesticide Use

Conduct larval and/or adult surveillance prior to each pesticide application to assess the pest management area and to determine when action threshold(s) are met that necessitate the need for pest management. Pest surveillance is important for timing pest control properly and to evaluate the potential need for pesticide use for mosquito control. Understanding surveillance data may enable mosquito control operators to more effectively target their control efforts.

Owners/operators are required to conduct a surveillance program to minimize discharges from control activities. Surveillance is necessary not only to establish species' presence and abundance but also as an evaluation tool of the effectiveness of source reduction and chemical control activities. Furthermore, surveillance should be used as an indicator of the need for additional chemical control activities based on pre-established criteria related to population densities in local areas.

Larval surveillance involves routine sampling of aquatic habitats for developing mosquitoes. The primary tools used to determine larval densities and species composition are a calibrated dip cup and/or a bulb syringe for inaccessible areas such as treeholes. The counts may be expressed as the number of immature (larvae and pupae) mosquitoes per dip, per unit volume, or per unit surface area of the site. However, due to natural mortality from environmental factors, disease and predators, larval dip counts do not provide an accurate indication of the potential adult population. Nevertheless, larval counts do indicate when chemical larval control measures are warranted.

Adult surveillance is a key component of any mosquito control program. Adult surveillance can be conducted using CDC traps, New Jersey light traps, resting site traps, egg oviposition traps, vehicle traps, and landing count rates. Mosquito control operators should use a variety of the available traps as adults are attracted to different traps depending on their species, sex, and physiological condition. Trapped adults provide information about local species composition, distribution, and density. In addition, the need for adulticide application may also be established through the number and distribution of service requests received from the public. Collection data also provide feedback to the mapping and planning component of the IPM program as well as to its effectiveness and also serve to identify new sources of mosquitoes or identify recurring problem sites.

Disease surveillance, where practical, is also a key component of a pest management strategy. Detecting antibodies in "sentinel" chicken flocks, equine cases, and testing dead birds and adult mosquitoes for infections are all used to determine whether disease is being transmitted in an area. Mosquito and vector control agencies also may test mosquitoes for viruses in their laboratories. Although generally less sensitive than sentinel chickens, mosquito infections may be detected earlier in the season than chicken seroconversions and therefore provide an early warning of virus activity. However, disease surveillance is not applicable to all mosquito control programs. In the absence of a dedicated disease surveillance program, mosquito

control owner/operators should stay informed of arboviral occurrence or potential for occurrence in their control areas as determined by local, state, and/or national public health agencies.

Assess environmental conditions (e.g. temperature, precipitation, and wind speed) in the treatment area prior to each pesticide application to identify whether existing environmental conditions support development of pest populations and are suitable for control activities. Environmental conditions also may affect the results of adulticide application. Wind determines how the ULV droplets will be moved from the output into the treatment area. Conditions of no wind will result in the material not moving from the application point. High wind, a condition that inhibits mosquito activity, will quickly disperse the insecticide over too wide an area but at a diluted rate too low to effectively control pests. Light wind conditions (< 10 mph) are the most desirable because they move the material through the treatment area and are less inhibiting to mosquito activity. Thermal fogs perform best under very light wind conditions.

ULV application should be avoided during hot daylight hours. Thermal conditions, particularly temperature inversion, will cause the small droplets to quickly rise, moving them away from mosquito habitats. Generally, applications are made after sunset and before sunrise, depending upon mosquito species activity. Some mosquitoes (Culex and Anopheles) are most active several hours after sunset, while others (Ae. aegypti and Ae. albopictus) are more active during the daytime, and if these species are the targets, application should be made during the period of highest activity for the target species, provided that meteorological conditions are suitable for application (seldom during daylight hours).

One notable exception to treatments made when mosquitoes are up and flying is a residual barrier treatment application. Barrier treatments are based on the natural history and behavioral characteristics of the mosquito species causing the problem. Barrier applications use a residual material and are generally applied with a powered backpack sprayer to preferred resting areas and migratory stops in order to intercept adult mosquitoes hunting for blood meals. Barrier treatments are often applied during daylight hours as a large-droplet liquid application and are designed to prevent a rapid re-infestation of specific areas, such as recreational areas, parks, special-event areas, and private residences. Barrier applications can help provide control of nuisance mosquitoes for up to one week or longer.

Reduce the impact on the environment and on non-target organisms by applying the pesticide only when the action threshold has been met. Operators must apply pesticide only as indicated by action thresholds for the pest management area. As noted above, action threshold, established by the owner/operator, help determine both the need for control actions and the proper timing of such actions. Timing pesticide application can reduce the impact on the environment and on non-target organisms.

In situations or locations where practicable and feasible for efficacious control, use larvicides as a preferred pesticide for mosquito or flying insect pest control when

larval action thresholds have been met. Operators may use larvicides, adulticides or a combination of both. However, when practicable and feasible, larviciding should be the primary method for mosquito control. Larviciding is a general term for the process of killing mosquitoes by applying natural agents or manmade pesticide products designed to control larvae and pupae (collectively called larvicides) to aquatic habitats. Larviciding uses a variety of equipment, including aerial, from boats, and on the ground, as necessitated by the wide range of breeding habitats, target species, and budgetary constraints. Applications can be made using high pressure sprayers, ULV sprayers, handheld sprayers, and back sprayers. However, larviciding is only effective when a high percentage of the mosquito production sites are regularly treated, which may be difficult and expensive.

There are advantages and disadvantages to aerial and ground larvicide treatments. Ground larviciding allows application to the actual treatment area and consequently to only those micro-habitats where larvae are present. Therefore, ground larviciding reduces unnecessary pesticide load on the environment. However, ground applications often rely on in-the-field human estimates of the size of treatment areas and equipment output with a greater chance of overdosing or under-dosing. Ground larviciding is also impractical for large or densely wooded areas and exposes applicators to greater risk of insecticide exposure.

Aerial larviciding application methods are generally used for controlling mosquito larvae present in large areas and areas that are inaccessible for ground application. However, failure to treat an entire area with good larvicide coverage can result in the emergence of large adult populations. In order to prevent poor site coverage, a global positioning system (GPS), where economically feasible, or site flagging are necessary to increase accuracy of the treatment coverage while minimizing the amount of larvicides being applied. Aerial application does provide easier calibration of equipment due to the fact that the target area is generally mapped and the material is weighed or measured when loading. However, cost of aerial application is higher than ground application (i.e. additional personnel for flagging or expensive electronic guidance systems) and also requires special FAA licenses, training of staff, and additional liability insurance. In addition, aerial larviciding has greater potential for non-target impacts.

In situations or locations where larvicide use is not practicable or feasible for efficacious control, use adulticides for mosquito or flying insect pest control when adult action thresholds have been met. Chemical treatment for adult mosquitoes, adulticiding, is the most visible and commonly used form of mosquito control. Adulticide applications may be used for nuisance or disease vectoring mosquitoes. Adulticiding consists of dispersing an insecticide as a space spray into the air column, using ground or aerial equipment, which then remains suspended in the air column through the habitat where adult mosquitoes are flying. Any mosquito adulticiding activity that does not follow reasonable guidelines, including timing of applications, avoidance of sensitive areas, and strict adherence to the pesticide label, risks affecting non-target insect species.

Operators must ensure that the adulticide applications are made only when necessary by determining a need in accordance with specific criteria that demonstrate a potential for a mosquito-borne disease outbreak, or numbers of disease vector mosquitoes sufficient for disease transmission, or a quantifiable increase in numbers of pestiferous mosquitoes. To determine the need for adulticide application, at least one of the following criteria should be met and documented by records: 1) when a large population of adult mosquitoes is demonstrated by either a quantifiable increase in, or a sustained elevated mosquito population level as detected by standard surveillance methods, 2) where adult mosquito populations build to levels exceeding community standards (e.g., 25 mosquitoes per trap night or 5 mosquitoes per trap hour during crepuscular periods), and/or 3) when service requests for arthropod control from the public have been confirmed by one or more recognized surveillance methods.

The most common forms of adulticiding are ultra-low volume spray (ULV) and thermal fogging. Ground adulticiding is almost exclusively conducted with ULV equipment and is the most common method used to control mosquitoes. Ground adulticiding can be a very effective technique for controlling most mosquito species in residential areas with negligible non-target effects.

Aerial adulticiding is a very effective means of controlling adult mosquitoes, particularly in inaccessible areas, and may be the only means of covering a very large area quickly in case of severe mosquito outbreaks or vector borne disease epidemics. Aerial adulticide applications are made using either fixed wing aircraft or rotor craft. Application is generally as ULV spray but some thermal fogging still occurs.

Adulticide application has its own set of conditions that determine success or failure. The application must be at a dosage rate that is lethal to the target insect and applied with the correct droplet size. Whether the treatment is ground or aerially applied, it must distribute sufficient insecticide to cover the prescribed area with an effective dose. Typically with ground applications, vegetated habitats may require up to three times the dosage rates that open areas require. This is purely a function of wind movement and its ability to sufficiently carry droplets to penetrate foliage. In addition, aerial application is dependent upon favorable weather conditions.

Recommended Mosquito Control References

EPA recommends the following sources for additional information on IPM's and BMP's for mosquito control.

Anderson, RR and LC Harrington. 2010. Mosquito Biology for the Homeowner. Cornell Cooperative Extension – Medical Entomology Extension. Available at: http://www2.entomology.cornell.edu/MedEnt/MosquitoFS/MosquitoFS.html

American Mosquito Control Association. 2009. Mosquito Information. Available at: http://www.mosquito.org/mosquito-information/index.aspx

American Mosquito Control Association. 2010. Best Management Practices for Integrated Mosquito Management. Available at: http://www.mosquito.org/secure/upload/articles/BMPsforMosquitoManagement.pdf

California Department of Public Health. 2008. Best Management Practices for Mosquito Control on California State Properties. Available at: http://westnile.ca.gov/downloads.php?download_id=996&filename=CDPH_BMP_MosquitoControl6-08.pdf

Commonwealth of Massachusetts Department of Food and Agriculture State Reclamation and Mosquito Control Board. 1998. Generic Environmental Impact Report (GEIR) for the Massachusetts Mosquito Control. Available at: http://www.mass.gov/agr/mosquito/geir_docs/GEIR_FULL_TEXT.pdf

Florida Coordinating Council on Mosquito Control. 2009. Florida Mosquito Control – The State of Mission as defined by mosquito controllers, regulators, and environmental managers. Available online at: http://mosquito.ifas.ufl.edu/Documents/Florida_Mosquito_Control_White_Paper.pdf

New York City Department of Health and Human Hygiene. 2006. Comprehensive Mosquito Surveillance and Control Plan. Available at: http://www.nyc.gov/html/doh/downloads/pdf/wnv/wnvplan2006.pdf

Grodner, MG, J Criswell, C Sutherland, P Spradley, DL Renchie, ME Merchant, M Johnsen, and S Sawlis. 2007. The Best Way to Control Mosquitoes - Integrated Mosquito Management Explained. Available at: http://www-aes.tamu.edu/Public_Health_and_Vector_Control/Publications/The%20Best%20Way%20to%20Control%20Mosquitoes.pdf

Kwasny, DC, M Wolder, and CR Isola. 2004. Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands. Central Valley Joint Venture. Available at: http://www.dfg.ca.gov/lands/wetland/docs/CVJV-Mosquito-BMP.pdf

Rose, RI. 2001. Pesticides and Public Health: Integrated Methods of Mosquito Management. Emerging Infectious Diseases 7:1. Available at: http://www.cdc.gov/ncidod/eid/vol7no1/rose.htm

Sacramento-Yolo Mosquito and Vector Control District. 2008. Mosquito Reduction Best Management Practices. Available at: http://www.fightthebite.net/download/SYMVCD_BMP_Manual.pdf

State of Massachusetts. 2008. Massachusetts Best Management Practices and Guidance for Freshwater Mosquito Control. Available at:

http://www.mass.gov/agr/mosquito/docs/mepa/Document_2_Freshwater%20BMP%20to%20MEPA_%20Oct_24_2008.pdf

State of New Hampshire. 2008. Policy for Mosquito Control on State Lands. Available at: http://governor.nh.gov/news/documents/040108policy.pdf

State of New Mexico. 2008. Philosophy of Mosquito Control. http://www.health.state.nm.us/ERD/HealthData/documents/PhilosophyofMosquitoControl2008_000.pdf

Washington State Department of Ecology/Water Quality Program. 2004. Best Management Practices for Mosquito Control. Available at: http://www.ecy.wa.gov/biblio/0310023.html

II. Other Flying Insect Pest Control (Black Flies Example)

Background

Black flies are used as a demonstration of how IPM practices would be implemented for other flying insect pest control.

There are 1800 species of black flies throughout the world with approximately 254 species in North America alone. Black flies can be 1) a source of annoyance to people, animals, and wildlife, 2) a limiting factor in economic development (e.g., residential development and property value), and 3) a causal factor in decreased agricultural productivity (e.g., animal weight loss/death and milk production). Black fly control in the U.S. provides economic, health and quality of life benefits. In contrast to the integrated approach used for mosquito control, due to its unique biology, black fly control in the U.S. is primarily through the use of larvicides.

Black flies, commonly referred to as buffalo gnats, are the smallest of the blood feeding dipterans. Worldwide, blackflies are responsible for transmitting ochocerciasis (river blindness) to millions of people in tropical areas. Black flies can also vector *bovine onchocerciasis, mansonellosis*, and *leucoytozoonosis* in wild and domestic animals. While generally only considered nuisance pests in the U.S., epidemiological research has demonstrated that black flies are competent vectors of *vesicular stomitis* and suggests that these pests may be responsible for periodic outbreaks of this disease in livestock, wildlife, and humans in the western U.S. However, flies may also become so abundant as to be drawn into the air passages of livestock, occasionally resulting in death. Black fly feeding activity may also result in allergic reaction in both animals and man as a result of histaminic substances in black fly saliva.

Black Flies - IPM Practices

Identify the Problem

Prior to the first pesticide application covered under this permit that will result in a discharge to state surface waters, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, the owner/operator must do the following for each pest management area.

- Identify the pest problem in the pest management area. Identification includes: (1) black fly biology, (2) local developmental habitats, (3) avoidance methods, and (4) the benefits and risks of chemical use as a pest management strategy.

- Establish densities for larval and adult flying insect pest populations to serve as action threshold(s) for implementing pest management strategies. As noted in the general discussion above, an action threshold is a point at which pest populations or environmental conditions indicate that pest control action must be taken. Action thresholds help determine both the need for control actions and the proper timing of such actions. It is a predetermined pest level that is deemed to be unacceptable.

- Identify the target flying insect pest species to develop species-specific pest management strategies based on developmental and behavioral considerations for each species. The life cycle for black fly includes four stages: egg, larva, pupa, and adult. All are aquatic except the adults, which leave the water to search for food and mates. Black fly immatures have three general life history strategies. One group of species produces 1 generation per year (univoltine) that matures in late winter or early spring. A second group is also univoltine, but these species develop during late spring or summer. The third and final group of species produces 2 or more generations per year (bivoltine or multivoltine) that typically develop from early summer through fall.

  Adult females deposit from 150 to 500 eggs in flowing water. Flowing water habitats capable of black fly production range from a 4-inch trickle to large rivers. Egg-laying occurs near dusk for many species. The eggs are dropped singly from the air or deposited in masses on trailing vegetation, rocks, debris and other substrates. Eggs hatch in 2 days to 8 months, depending on black fly species and water temperature. Incubation time in some species is delayed by a prolonged diapause, or resting period. Eggs of many species can successfully withstand temperature extremes, fluctuating water levels, and desiccation associated with alternating flood and drought conditions during seasonal changes. Many species overwinter in the egg stage, but a few black flies spend the winter months as larvae and pupae, or rarely, as adults.

  Larvae anchor themselves to clean vegetation, rocks, or debris by spinning a small silken pad with their mouthparts and inserting a row of hooks at the end of their enlarged abdomen into the silk pad. This technique allows the larvae to

secure themselves in areas of very fast water velocity and orient their body with the abdomen pointed upstream, and head positioned downstream to feed. Larvae can easily relocate to other areas by drifting downstream on a silken thread, spinning a new silk pad, and reattaching themselves in areas with more acceptable substrates or food supplies. Feeding is accomplished by expanding a pair of fan-like structures on their hardened head capsule to efficiently filter microscopic food particles from the water column. The larvae filter or scrape very fine organic matter, filamentous algae, bacteria and tiny aquatic animals from the current or substrates. Larvae are often infected with various parasites and pathogens, including nematode worms, bacteria, fungi, protozoa and viruses.

Larval instars vary from 4 to 9, depending on species, with many species passing through an average of 7 instars. Larval development time varies from 1 week to 6 months depending on species, water temperature, stream turbidity and food availability. Larval growth is very temperature dependent, with relatively slow growth during the cold winter months and very rapid growth during warm summer water temperatures. Some summer-developing, multivoltine species are capable of completing their entire life cycle in just a few weeks. Mature larvae, with fully developed respiratory filaments visible as a dark area on each side of the thorax, stop feeding, and construct a silken pupal cocoon where metamorphosis takes place.

Pupae secure themselves inside their cocoons with rows of spine-like hooks on their abdomen. The tightly woven or loose cocoons, characteristically shaped for each species, are attached to substrates with the closed end facing upstream to protect pupae from current and sediments. Some species have a lateral aperture, or window, on each side of the cocoon to increase water circulation around the pupa. The branched respiratory organs that project from the pupal thorax are designed to function in or out of water. This adaptation allows pupae to obtain oxygen at all times, and survive normal fluctuations in water levels. The pupal stage may last from 2 days to several weeks depending on the species and water temperature.

Adults emerge from the pupal skin through an elongate slit at the top of the thorax and ride a bubble of air that propels them to the water surface. Freshly emerged adults fly to streamside vegetation where their wings and bodies quickly dry and harden. Mature adults immediately seek food sources and mates. Both sexes feed on nectar, sap, or honeydew to obtain the sugar used for flight and energy. Only females feed on blood. In most species, mating takes place in flight, with females flying into male swarms that form over landmarks such as waterfalls, vegetation or host species. Males utilize their large eyes to detect and seize females entering the swarm. Male and female pairs exit the swarm, and mating takes place in flight in just a few seconds. Females then seek a host to obtain the blood meal required to nourish their eggs. Adults are strong fliers, capable of dispersing many miles from their larval habitats.

Black fly females are attracted to their specific hosts by size, shape, color, carbon dioxide, body odor, body movement, skin texture, temperature and humidity. Females use their mouthparts to cut, or lacerate the host skin, and then drink from the resulting pool of blood. Anticoagulants in the saliva are injected into the bite to facilitate bleeding. Many domestic and wild animals have been killed by outbreaks of adult black flies. Deaths have been attributed to acute toxemia from large numbers of bites, anaphylactic shock, and weakness due to blood loss. In humans, lesions can develop at the bite, accompanied by reddening, itching, and swelling. In severe cases, allergic reactions may occur, resulting in nausea, dizziness, and fever.

Host specificity in black flies varies from highly specific species that will feed on blood from only one host, to much more generalized species that will draw blood from a number of different hosts. Although host preferences for many North American black flies are poorly understood, it is estimated that 67% feed on mammals and 33% feed on birds. Approximately 10% of North American species will feed on the blood of humans.

Due to preferred hosts and developmental habitats, proper identification of the pest species is instrumental in determining the biology (univoltine or multivoltine), and developmental habitat preference (e.g., flow rate, stream size, stream substrate composition), and flight range of the target species. By knowing these factors, a control program can 1) determine if the black fly species warrants control activities (i.e. host preference and historical problems), 2) identify habitats and delineate the potential area for ongoing monitoring and control activities, 3) determine frequency of site monitoring, 4) estimate timing for pesticide application (i.e. historical seasonal occurrence, age distribution of susceptible immature population, environmental conditions suitable for control activity, etc.), 5) reduce discharge of pesticides into state surface waters.

- Identify known breeding sites for source reduction, larval control program, and habitat management. In conjunction with species identification, mapping should be considered part of control programs aimed at black fly management. Maps may simply be township/city/county maps but may also include aerial photo assessments, topographic maps, and satellite imagery where available and/or practicable. Mapping is essential to identify areas of flowing water which are suitable for production of the target species. As black flies are strong fliers and will travel great distance to obtain a blood meal, mapping should be for an extended area from the site to be protected by control activities. Species identification and mapping should also be a priority in a surveillance program (both current and historical) to determine the need for initiating control activity. Identification and mapping are both essential to planning a control program which reduces pesticide discharge into state surface waters

- Analyze existing surveillance data to identify new or unidentified sources of mosquito or flying insect pest problems as well as sites that have recurring pest problems. As discussed above, mapping is a valuable tool in assessing pest

habitats and designing control programs. Operators must analyze existing surveillance data to identity new sources of black fly problems.

In the event there are no data for your pest management area in the past calendar year, provide documentation regarding why current data are not available and the data you used to meet the permit conditions. Owners/operators may use historical data or neighboring district data to identify the species and establish action thresholds.

Pest Management

Prior to the first pesticide application covered under this permit that will result in a discharge to state surface waters, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, you must select and implement, for each pest management area, efficient and effective means of pest management that minimize discharges resulting from application of pesticides to control flying insect pests.

Pest management strategies will vary by locality (i.e. stream size, stream substrate, and stream vegetation), black fly species (i.e. multi/univoltine development and host specificity), and financial concerns (i.e. accessibility to streams and size/rate of flow for the streams). As noted above, combinations of various management methods are frequently the most effective pest management strategies over the long term. The goal should be to emphasize long-term control rather than a temporary fix.

In developing these pest management strategies, you must evaluate the following management options, considering impact to water quality, impact to non-target organisms, pest resistance, feasibility, and cost effectiveness: No action; Prevention; Mechanical/physical methods; Cultural methods; Biological control agents; and Pesticides.

No Action

No action is to be taken, although a problem has been identified. This may be appropriate in cases where, for example, available control methods may cause secondary or non-target impacts that are not justified or no control methods exist.

Prevention

Prevention strategies are program activities which eliminate developing flying insect populations through environmental modification and/or habitat management. These activities are physical methods such as habitat modification, cultural methods that reduce sources of flying insects, and biological control.

Mechanical/Physical Methods

Reducing the number of black fly breeding areas may include removal (physical and/or chemical) of vegetation and other objects in streams to reduce number of larval habitats. Another method is temporary damming of flowing stream larval development sites to create pool habitats. As larvae require flowing water for

development, pooling can kill developing black fly larvae. However, the impact of these habitat management options must be considered in relation to other environmental impacts on other aquatic species. Furthermore, due to the wide variability in stream size/flow rate and the accessibility of streams for habitat modification, these options are seldom acceptable control solutions for most black fly developmental habitats.

Cultural Methods.

Cultural methods can reduce sources of flying insects and can be as simple as properly discarding old containers that hold water or draining fields to eliminate standing water.

Pesticide

There are biological and chemical pesticide products registered for use against black flies.

Bacillus thuringiensis var israelensis (Bti) is the primary larvicide used for black fly control in the U.S. Bti is a gram positive, aerobic, spore-forming bacterium that produces protoxins in the form of parasporal protein crystals. In the alkaline digestive tract of black flies and mosquitoes, the protoxins become activated into highly toxic delta-endotoxins. The endotoxins cause a rapid breakdown in the lining of the mid-gut and necrosis of skeletal muscles, resulting in paralysis and mortality of target insect pests. Bti is nontoxic to most non-target organisms due to their acidic digestive systems and lack of suitable tissue receptor sites.

To minimize pesticide discharge into state surface waters, owner/operators must apply larvicides as needed for source reduction as indicated by the action threshold in situations or locations where it is practicable and feasible to do so. The action threshold may be based on occurrence of adults (current or historical) and/or larval sampling of stream substrates for immature black flies. Surveillance is also a valuable tool for assessing the effectiveness of larval control activities.

Larvicides may be applied to streams using either ground or aerial equipment. Choice of equipment is largely dictated by stream size and accessibility. Application equipment may include backpack sprayers, boats equipped with sprayers or metered release systems, helicopters or fixed wing aircraft. The amount of insecticide required to treat a stream should be based on the desired dosage and the stream discharge. Stream discharge is calculated by determining the average width and depth of the stream and the stream velocity (discharge = width (m) x depth (m) x velocity (m/s)). Proper calibration of insecticide delivery based on discharge is necessary to ensure complete coverage throughout the water column in order to expose all larval habitats to an effective insecticide dose.

Larvicide is applied across the stream width for the time specified by the application rate. The point of application should be far enough upstream from the larval habitat to ensure proper insecticide dispersal in the water passing over the

treatment area. Operators should determine the effective downstream carry (maximum distance at which at least 80% larval control is achieved) of the insecticide suspension. By determining downstream carry, black fly control owner/operators can limit the number of applications necessary to treat any given stream and thereby reduce pesticide discharge into state surface waters.

In situations or locations where larvicide use is not practicable or feasible for efficacious control, owners/operators may use chemical adulticides for flying insect pest control when adult action thresholds have been met. Pesticide control of black flies in the U.S. historically relied upon both larvicides and adulticides. However, adulticide use against black fly populations is no longer a common practice. As adult black flies are seeking blood meals during the daytime, adulticide application coincides with human activity, so daytime application is no longer a standard control procedure. One reason for this change is due to environmental factors associated with daytime adulticide application, particularly thermal inversions, which cause adulticide application for black fly control to be ineffective. Furthermore, as only adults directly contacted by the adulticide application are killed, with no residual activity against other adults immigrating to the treatment area, adulticide applications are both ineffective and expensive. For these reasons, larvicides which target the immature stages before development of the pestiferous adult are now the primary means of black fly control in the U.S.

Pesticide Use

Conduct larval and/or adult surveillance prior to each pesticide application to assess the pest management area and to determine when action threshold(s) are met that necessitate the need for pest management. Larval surveillance involves routine sampling of aquatic habitats for developing black flies. Larval surveillance is primarily accomplished by collecting stream substrates (rocks, vegetation, etc.) and examining for larval and pupal occurrence. Due to the varied developmental sites for black larvae and their ability to move in streams relative to changes in flow patterns, quantitative sampling will vary from site to site and in many instances, particularly with continuously changing water levels, is not practical. Qualitative sampling is often used in lieu of quantitative sampling, as an indicator of egg hatch and to indicate the age distribution of developing larvae. Qualitative sampling alone when used in conjunction with historical occurrence data can provide a reliable indicator of the need to initiate control activities.

Adult surveillance for black flies may include sweep sampling, vacuum aspiration of adults, and the use of silhouette traps. Traps may be simple visual attractants or may be baited with artificial attractants (e.g., ocentol and CO_2). However, as different black fly species will respond differently in relation to different attractants, based on host preference, care must be used in selecting attractants that will provide a representative sample of the complete black fly spectrum present in any given location. Choice of adult sampling will in many cases be dictated by historical occurrence of black flies in a given area. Regardless, surveillance data is a useful tool

in providing feedback to the mapping and planning component of any pest management strategy.

Assess environmental conditions (e.g. temperature, precipitation, and wind speed) in the treatment area prior to each pesticide application to identify whether existing environmental conditions support development of pest populations and are suitable for control activities. Environmental conditions may affect the results of pesticide application. Operators must assess the treatment area to determine whether site conditions support pest populations and are suitable for pesticide application.

Reduce the impact on the environment and on non-target organisms by applying the pesticide only when the action threshold has been met. Operators must apply pesticide only as indicated by action thresholds for the pest management area. As noted above, action threshold help determine both the need for control actions and the proper timing of such actions. Timing pesticide application can reduce the impact on the environment and on non-target organisms.

Recommended Black Fly Control References

EPA recommends the following sources for additional information on IPMs and BMPs for black fly control:

Commonwealth of Pennsylvania. 2009. Black Fly Suppression Program. Available at: http://www.depweb.state.pa.us/blackfly/cwp/view.asp?a=3&Q=505536&blackflyNav=|

Government of Alberta – Agriculture and Rural Development. 1993. Black Fly Control. Available at: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex3321

Greater Los Angeles Vector Control District. 2008. Black Flies – Vector Services and Information. Available at: http://www.glacvcd.org/Contents/Vector-Services-Info/Black-Flies.aspx

Metropolitan Mosquito Control District. 2009. Biting Gnat Control. Available at: http://www.mmcd.org/gnat.html

North Carolina Cooperative Extension. 2005. Insect Notes – Black Flies and Their Control. Available at: http://www.ces.ncsu.edu/depts/ent/notes/Urban/blackfly.htm

North Elba – Black Fly Control Dept. 2009. About the black fly control program. Available at: http://www.northelba.org/html/black_fly_control.html

Ohio State University Extension. 1997. Factsheet – Black Flies. HYG-2167-97. Available at: http://imayhavetermites.com/Black%20Flies,%20HYG-2167-97.htm

The Merck Veterinary Manual. 2009. Black Flies. Available at: http://www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/71702.htm

Undeen, AH and DP Malloy. 1996. Use of stream width for determining the dosage rates of Bacillus Thuringiensis Var. israensis for larval black fly (Diptera: Simuliidae) control. Journal of the American Mosquito Control Association. 12(2):312-315. Available at: http://www.nysm.nysed.gov/bio_molloy/patent_pubs/pdfs/undeen_&_molloy_1996_use_of_stream_width.pdf

University of Florida. 2007. Featured Creatures – Black Flies. EENY-30. Available at http://entomology.ifas.ufl.edu/creatures/livestock/bfly.htm

University of New Hampshire Cooperative Extension. 2001. Black Flies. Available at: http://www.ultimate.com/washington/wla/blackfly/

APPENDIX F
Pattern Use Specific IPM –Research & Development Applications

The Department is aware that there could be circumstances where a pesticide application is required but the type or amount of pesticide used is not pre-determined. The most likely scenario is an invasive species that could cause economic or environmental damage if it remained unchecked, and there is no established treatment methodology for it.

If an owner/operator (typically a university or state- or federal-governmental agencies) needs to develop new, effective methods of treatment, the Department recognizes this under the Research & Development pesticide use pattern. In that case, the owner/operator will be required to obtain authorization under the PGP prior to applying the pesticide. However, the authorization will be more generalized than the other pesticide use patterns, and the requirement to develop a PDMP is broadened to require the owner/operator to implement the PDMP only to the extent that its requirements do not compromise the research design.