ARIZONA POLLUTANT DISCHARGE ELIMINATION SYSTEM (AZPDES)

FACT SHEET

Pesticide General Permit
for Discharges from the Application of
Aquatic Pesticides to or Over, Including Near,
Waters of the United States

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I. Background

This draft permit is being proposed to authorize point source discharges to waters of the United States (U.S.) from the application of pesticides for specific pesticide use patterns as defined in section 1.2.1 of the permit. ADEQ is soliciting comment on this permit. Please refer to the Arizona Administrative Register (AAR) Notice announcing the availability of this permit for review.

1. Clean Water Act

Section 301(a) of the Clean Water Act (CWA) provides that "the discharge of any pollutant by any person shall be unlawful" unless the discharge is in compliance with certain other sections of the Act. 33 U.S.C. 1311(a). The CWA defines "discharge of a pollutant" as "(A) any addition of any pollutant to navigable waters from any point source, (B) any addition of any pollutant to the waters of the contiguous zone or the ocean from any point source other than a vessel or other floating craft." 33 U.S.C. 1362(12). The term "navigable water" means a water of the U.S. as defined in 40 CFR 122.2. A "point source" is any "discernible, confined and discrete conveyance" but does not include "agricultural stormwater discharges and return flows from irrigated agriculture." 33 U.S.C. 1362(14). The term "pollutant" includes, among other things, "garbage… chemical wastes, biological materials …and industrial, municipal, and agricultural waste discharged into water."

One way a person may discharge a pollutant without violating the section 301 prohibition is by obtaining authorization to discharge (referred to herein as "coverage") under a section 402 National Pollutant Discharge Elimination System (NPDES) permit (33 U.S.C. 1342). Under section 402(a), states (such as Arizona) that have delegated authority to administer a state program may "issue a permit for the discharge of any pollutant, or combination of pollutants, notwithstanding section 1311(a)" upon certain conditions required by the Act. In Arizona, these permits are Arizona Pollutant Discharge Elimination System (AZPDES) permits issued by the Arizona Department of Environmental Quality (ADEQ or department).

2. AZPDES Permits

An AZPDES permit authorizes the discharge of a pollutant or pollutants into a receiving water under certain conditions. The AZPDES program relies on two (2) types of permits: individual and general. An individual permit is a permit specifically tailored for an individual discharger. Upon receiving the appropriate permit application(s), the permitting authority, i.e., ADEQ, develops a draft permit for public comment for that particular discharger based on the information contained in the permit application (e.g., type of activity, nature of discharge, receiving water quality). Following consideration of public comments, a final permit is then issued to the discharger for a specific time period (not to exceed five (5) years) with a provision for reapplying for further permit coverage prior to the expiration date.

In contrast, a general permit covers multiple facilities/sites/activities within a specific category for a specific period of time (not to exceed 5 years). For general permits, ADEQ develops and issues the permit in advance (subject to public notice), with dischargers then obtaining coverage under the permit by submitting of a Notice of Intent (NOI).

Under 40 CFR 122.28, general permits may be written to cover categories of point sources having common elements, such as facilities or discharge activities that involve the same or substantially similar types of operations, that discharge the same types of pollutants, or that are more appropriately regulated by a general permit. Given the potential number of pesticide applicators requiring AZPDES permit coverage and the discharges common to these applicators, the department believes that it makes administrative sense to issue the general permit, rather than issuing individual permits to each applicator. Courts have approved of the use of general permits. See e.g., *Natural Res. Def. Council v. Costle*, 568 F.2d 1369 (D.C. Cir. 1977); *EDC v. US EPA*, 344 F.3d 832, 853 (9th Cir. 2003). The general permit approach allows ADEQ to allocate resources in a more efficient manner and to provide more timely coverage and may significantly simplify the permitting process for the majority of pesticide dischargers. As with any permit, the CWA requires the general permit to contain technology-based effluent limitations, as well as any more stringent limits when necessary to meet applicable state water quality standards. State

water quality standards apply in the territorial seas, defined in section 502(8) of the CWA as extending three (3) miles from the baseline. *Pacific Legal Foundation v. Costle*, 586 F.2d 650, 655-656 (9th Cir. 1978); *Natural Resources Defense Council, Inc. v. U.S. EPA*, 863 F.2d 1420, 1435 (9th Cir. 1988).

3. History of Pesticide Application Regulation

This is the first AZPDES permit to be issued for the application of a pesticide to target a pest that is present in or over, including near, the water where such application results in a discharge to waters of the U.S. Historically, these types of applications have been regulated through the Federal Insecticide, Fungicide, and Rodenticide Act ("FIFRA") and other state programs, but these programs did not specifically authorize the discharge of pollutants (such as pesticide residues) to waters of the U.S.

EPA regulates the sale, distribution and use of pesticides in the U.S. under the statutory framework of FIFRA to ensure that when used in conformance with FIFRA labeling directions, pesticides will not pose unreasonable risks to human health and the environment. All new pesticides must undergo a registration procedure under FIFRA during which EPA assesses a variety of potential human health and environmental effects associated with use of the product. Under FIFRA, EPA is required to consider the effects of pesticides on the environment by determining, among other things, whether a pesticide ''will perform its intended function without unreasonable adverse effects on the environment,'' and whether ''when used in accordance with widespread and commonly recognized practice [the pesticide] will not generally cause unreasonable adverse effects on the environment.'' 7 U.S.C. 136a(c)(5). In performing this analysis, EPA examines the ingredients of a pesticide, the intended type of application site and directions for use, and supporting scientific studies for human health and environmental effects and exposures. The applicant for registration of the pesticide must provide specific data from tests done according to EPA guidelines.

When EPA approves a pesticide for a particular use it imposes restrictions through labeling requirements governing such use. The restrictions are intended to ensure that the pesticide serves an intended purpose and avoids unreasonable adverse effects. It is illegal under section 12(a)(2)(G) of FIFRA to use a registered pesticide in a manner inconsistent with its labeling. States have primary authority under FIFRA to enforce "use" violations, but both the states and EPA have ample authority to prosecute pesticide misuse when it occurs.

4. Court Decisions Leading to the CWA Regulations Concerning Pesticide Applications

Over the past ten (10) years, several courts addressed the question of whether the CWA requires CWA permits for pesticide applications. These cases resulted in some confusion among the regulated community and other affected citizens about the applicability of the CWA to pesticides applied to waters of the U.S. In 2001, the U.S. Court of Appeals for the Ninth Circuit held in Headwaters, Inc. v. Talent Irrigation District (Talent) that an applicator of herbicides was required to obtain an NPDES permit under the circumstances before the court. 243 F.3rd 526 (9th Cir. 2001). The Talent decision caused considerable confusion among public health authorities, natural resource managers, and others who rely on pesticides regarding their potential obligation to obtain an NPDES permit when applying a pesticide consistent with FIFRA.

In 2002, the Ninth Circuit in League of Wilderness Defenders et al. v. Forsgren (Forsgren) held that the application of pesticides to control Douglas Fir Tussock Moths in National Forest lands required an NPDES permit. 309 F.3d 1181 (9th Cir. 2002). The court in Forsgren did not analyze the question of whether the pesticides applied were pollutants, because it assumed that the parties agreed that they were. In fact, the U.S. expressly reserved its arguments on that issue in its brief to the District Court. Id. at 1184, n.2. The court instead analyzed the question of whether the aerial application of the pesticide constituted a point source discharge, and concluded that it did. Id. at 1185.

Additionally, the Second Circuit Court of Appeals addressed the applicability of the CWA's NPDES permit requirements to pesticide applications. In Altman v. Town of Amherst (Altman), the court vacated and remanded for further development of the record a District Court decision holding that the Town of Amherst was not required to obtain an NPDES permit to spray mosquitocides over waters of the U.S. 47 Fed. Appx. 62, 67 (2nd Cir. 2002). In its opinion, the Second Circuit stated that "[u]ntil the EPA articulates a clear interpretation of current law – among other things, whether properly used pesticides released into or over water of the U.S. can trigger the requirement for NPDES permits * * * – the question of whether properly used pesticides can become pollutants that violate the CWA will remain open." Id. at 67.

In Fairhurst v. Hagener, the Ninth Circuit again addressed the CWA's applicability to pesticide applications. The court held that pesticides applied directly to a lake in order to eliminate non-native fish species, where there are no residues or unintended effects, are not "pollutants" under the CWA because they are not chemical wastes. 422 F.3d 1146 (9th Cir. 2005).

5. 2006 Agency Rulemaking Excluding Pesticides from the NPDES Pesticides Permitting Program

On November 27, 2006, EPA issued a final rule (hereinafter called the "2006 NPDES Pesticides Rule") clarifying two (2) specific circumstances in which a 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 provided that the application is consistent with relevant Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) requirements. The rule became effective on January 26, 2007.

6. Legal Challenges to the 2006 NPDES Pesticides Rule and Court Decision

On January 19, 2007, EPA received petitions for review of the 2006 NPDES Pesticides Rule from environmental and industry groups. Petitions were filed in eleven circuit courts with the case, National Cotton Council, et al, v. EPA, assigned to the Sixth Circuit Court of Appeals.

On January 7, 2009, the Sixth Circuit vacated EPA's 2006 NPDES Pesticides Rule under a plain language reading of the CWA. 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." Specifically, an application of chemical pesticides that leaves no excess portion is not a discharge of a pollutant, and the applicator need not obtain an NPDES permit. However, chemical pesticide residuals are pollutants as applied if they are discharged from a point source for which NPDES permits are required. Biological pesticides on the other hand are always considered a pollutant under the CWA regardless of whether the application results in residuals or not and require an NPDES permit for all discharges from a point source.

In response to this decision, on April 9, 2009, EPA requested a two-year stay of the mandate to provide the Agency time to develop general permits, to assist NPDES-authorized states to develop their NPDES permits, and to provide outreach and education to the regulated community. On June 8, 2009, the Sixth Circuit granted EPA the two-year stay of the mandate.

On November 2, 2009, industry petitioners of the Sixth Circuit Case petitioned the Supreme Court to review the Sixth Circuit's decision. On February 22, 2010, the Supreme Court denied the request to hear industry's petition. EPA subsequently requested a second extension which was granted by the 6th Circuit Court, resulting in a stay of the mandate from April 9, 2011 until October 31, 2011. Therefore, as of October 31, 2011, NPDES permits (AZPDES permit coverage in Arizona) is required for discharges to Waters of the United States of biological pesticides, and of chemical pesticides that leave a residue.

7. How the Court's Decision Impacts the NPDES/AZPDES Program

EPA estimates that nationwide (this includes the EPA-issued permit, delegated states issuing their own NPDES permits, including the Arizona's AZPDES permit), approximately 365,000 pesticide applicators conduct 5.6 million applications a year for following use patterns: 1) Mosquito and Other Flying Insect or Pest Control, 2) Weed, Algae, and Vegetation (herbaceous and woody) Control, 3) Nuisance Animal Control, and 4) Forest Canopy Pest Control. It should be noted that the four (4) use patterns do not include the control of agricultural, ornamental or silvicultural terrestrial pests that are routinely controlled as part of production of agricultural or ornamental plant commodities and in forestry operations as these don't require permit coverage. The fact sheet does not address every activity which may involve a point source discharge of pollutants to waters of the U.S. that would require a permit. However, any pesticide application activities that do not fall within the four (4) use patterns, or otherwise determined to be eligible as a specific approval, will require coverage under some other AZPDES permit if those activities result in point source discharges to waters of the U.S.

An AZPDES permit is required for any addition of any pollutant to waters of the U.S. from any point source (See ARS 49-255 definition of "discharge"). This Pesticide General Permit (PGP) or any other AZPDES permit does not cover discharges that, by law, are not required to obtain the NPDES permit coverage.

Of note, the Clean Water Act specifically excludes from the definition of point source, "agricultural stormwater discharges and return flow from irrigated agriculture." Nothing in this PGP or any other AZPDES permit changes the effect of those statutory exemptions. Therefore, no AZPDES permit is required when a person applies pesticides to control agricultural terrestrial pests or ornamental terrestrial pests that are routinely controlled as part of the production of agricultural or ornamental plant commodities.

Thus, for example, the application of a pesticide to an agricultural crop for the control of terrestrial pests does not require permit coverage and any runoff from the field, either as irrigation return flow or stormwater runoff, is exempt from permit coverage even if that discharge to a water of the U.S. is known to contain biological or chemical pesticides, pesticide residues, or metabolites.

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. require AZPDES permit coverage, either under this PGP, an individual permit, or an alternative general permit.

More detailed discussion of the types of activities included under each of the pesticide use patterns and the permit requirements are provided in section 1.2.1 of this fact sheet.

8. Scope of Permit

The Sixth Circuit decision found that if a chemical pesticide leaves any excess or residue after performing its intended purpose, such excess or residue would be considered a pollutant under the CWA. The Court also found that, unlike chemical pesticides, not only would the residue and excess quantities of a biological pesticide be considered a pollutant, but so too would the biological pesticide itself.

Although the court did not define what a residual is, for purposes of this permit, EPA assumes that all chemical pesticides will leave a residual once the product has performed its intended purpose.

The department offers the following guidance with respect to the use patterns of chemical pesticides covered by this general permit.

1. If the application of a chemical pesticide is made over Waters of the United States to control pests over the water, any amount of the pesticide that falls into Waters of the United States is "excess" pesticide and would require coverage by an AZPDES permit. It is expected that some portion of every application of a pesticide made over Waters of the United States will fall directly into such waters and thus assumes that applications will trigger the requirement for an AZPDES permit. A permit is not necessary if no portion of a chemical pesticide applied over Waters of the United States will fall into those waters.

2. If the application of a chemical pesticide is made into Waters of the United States to control a pest in such waters, once the pesticide no longer provides any pesticidal benefit, any amount of the pesticide that remains in those waters is a "residual" and would require coverage by an AZPDES permit. Additionally, as the Sixth Circuit reasoned, the residual is discharged at the time of a pesticides initial application. ADEQ expects that an entity applying pesticides with a discharge to Waters of the United States who wishes to dispute this assumption would be expected to provide scientific data supporting such a determination. Such data should show what level of the pesticide can be detected in water, and at what level in water the pesticide provides a pesticidal benefit. Such data should address the properties of the chemical pesticide under different water conditions (e.g., different pH, organic content, temperature, depth, etc.) that might affect the pesticide's properties. A permit would not be necessary if it is determined that a residual did not enter Waters of the United States.

3. This permit authorizes discharges associated with five categories of pesticide application activities: mosquito and other flying insect pest control, weed and algae pest control, animal pest control, forest canopy pest control, and specific approvals. As noted above, only point source discharges of pollutants to Waters of the United require a permit, and it is beyond the scope of this Fact Sheet to identify all specific activities that do or do not require a permit. However, to the extent that activities that fall within the five covered categories require a permit, they can be authorized by this general permit if all eligibility requirements are met. For example, discharges to control pests in or near areas that are Waters of the United States, even when these areas are dry for much of the year, may be covered by this permit, if one is required. This would include discharges on forest or range lands that include dry washes and ephemeral streams, to control pests that may be found in these occasionally wet areas, including pests that may also be found in upland areas. For two of the categories, weed and algae pest control and animal pest control, the permit specifies that covered activities include applications to control pests "in water and at water's edge." ADEQ intends for the phrase "at water's edge" to allow coverage of activities targeting pests that are not necessarily "in" the water but are near the water such that control of the pests may unavoidably involve a point-source discharge of pesticides to Waters of the United States. The category forest canopy pest control is for applications to a forest canopy. ADEQ intends that this can include both mature and immature forest canopies, including canopies that may not be continuously connected, where control of pests associated with the canopy (i.e., branches and leaves of the trees) may unavoidably involve point source discharges of pesticides to Waters of the United States.

For purposes of this permit, ADEQ is relying on existing regulatory definitions in 40 CFR 174.3 and 158.2100(a) developed under FIFRA to define the term "biological pesticides." These biological pesticides (also called "biopesticides" under FIFRA regulations) include microbial pesticides [40 CFR 158.2100(a)] and biochemical pesticides and plant-incorporated protectants. [40 CFR 174.3]

II. Structure of this Permit

This permit is written to cover the discharge of pollutants resulting from the applications of pesticides to waters of the U.S. within the state of Arizona, except for those activities conducted on Indian Country where EPA remains the permitting authority.

Throughout this fact sheet (and permit), ADEQ uses consistent terms when referring to what activity or discharge will be eligible for coverage and who will be responsible to comply with the terms of the permit. Specifically, the permit holder is referred to as the "operator." This term has a similar meaning to the term "permittee" which is also used in the fact sheet; generally, the term "permittee" is specific to the period of time that an operator or contractor is actually covered under the permit. Additionally, the terms "you" and "your" may be used interchangeably in the permit and refer to the operator and their responsibilities under the permit. The use of "you" and "your" refer to a specific activity covered under the permit but not necessarily all activities operated by a particular entity. For example, "you must submit" means the operator must submit something for the specific activities identified. Likewise, "all your discharges" would only apply to those discharges covered under the permit. More details on how an operator is to obtain permit coverage and the applicable permit requirements are provided in section 2 (Authorization to Discharge Under this Permit) of this fact sheet.

The permit is divided into eleven (11) sections: (1) coverage under this general permit, (2) authorization to discharge under this general permit (3) technology-based effluent limitations, (4) surface water quality-based effluent limitations, (5) site monitoring, (6) pesticide discharge management plan, (7) corrective action, (8) recordkeeping and annual reporting, (9) standard permit conditions, (10) penalties for violation of permit conditions, and (11) definitions and acronyms.

This general permit was developed with the understanding that there may be more than one (1) responsible person implementing it for a given discharge. As structured, the permit provides for sharing of responsibilities to meet the end goal of discharges being in compliance with permit requirements. The NPDES regulations state that "operators" are responsible for achieving permit compliance. Specifically, 40 CFR 122.21(b) clarifies that when an activity is owned by one (1) person but it is operated by another person (e.g., contractor), it is the operator's duty to meet terms of the permit. ADEQ acknowledges, however, that in many instances the owner may still perform operator duties; as such, they may still be required to obtain permit coverage, even in situations in which, for example, the owner hires a contractor to apply the pesticides to control pests. The PGP includes a definition of an "operator" that is intended to clarify this point, focusing on the fact that operator control exists both at the decision-making level about how to control pests, as well as at a level where activities are performed to ensure compliance with the specific provisions of the permit (such as calibration of pesticide application equipment).

To this end, the permit further identifies operators as being *decision makers* and *applicators*. When required to submit a NOI pursuant to section 2.4 only the *decision maker* (i.e., the person with control over the decision to conduct pesticide applications including the ability to modify those decisions) is required to submit a NOI. The *decision maker* shall identify the *applicator* on the NOI if the *applicator* is a different person than the *decision maker*. Although the applicator is not required to submit a NOI, the applicator is still an *operator* and subject to other terms and conditions of this permit. By limiting the NOI requirement to the *decision maker*, the duplication of effort is minimized. In many instances, the requirements that *decision makers* and *applicants* must meet depends on their arrangement or agreement.

ADEQ encourages operators to explore possible cost savings by sharing responsibilities for implementing aspects of this permit. For example, a mosquito control district, acting as the

decision maker, could assume the overall coordination of pesticide management practices while the applicator may be responsible for minimizing the pesticide discharge and for site monitoring and maintaining and calibrating pesticide application equipment. ADEQ is requiring, however, that in instances where multiple operators are responsible for the discharge from pesticide application activities, some form of written explanation of the division of responsibilities be documented.

Operators should carefully read each part of the permit to assess whether or what portion of the requirements in each part may apply to their activities. As discussed in more detail in this fact sheet, the permit establishes different requirements for different types of pesticide use patterns, different types of operators, and different sizes of areas treated and managed for the control of pests. The organization of the permit is intended to clarify the applicable requirements for permittees to the greatest extent possible.

III Summary of Permit Conditions

1.0 Coverage under this Permit

1.1 Permit Area

This AZPDES general permit covers discharges to waters of the U.S. within the state of Arizona, except for those discharges located on Indian Country as Arizona does not have authority to issue CWA coverage in these areas. Permit coverage for discharges located on Indian Country within the state of Arizona is issued by EPA.

ADEQ established four (4) specific use patterns and a fifth "specific approvals" category within the PGP. The department anticipates these five categories will encompass the majority of pesticide applications that would result in point source discharges to waters of the U.S. and generally represent the use patterns intended to be addressed by the 2006 rule that is now vacated. This permit does not cover terrestrial applications for the purpose of controlling pests on agricultural crops or forest floors. This fact sheet does not address whether these activities would need an NPDES permit nor does this fact sheet identify every activity which may involve a point source discharge to waters of the U.S. that would require a permit. While other use patterns are not covered by this general permit, the existence of this general permit does not, by definition, obviate the possibility that an individual permit would be necessary if other types of pesticide applications result in point source discharges to waters of the U.S.

1.2 Eligibility

Only operators whose discharges meet the eligibility requirements outlined in the permit may be covered under this permit. The discharges covered by this permit include the use patterns and types of pest control activities described in the vacated 2006 rule. Specifically, this permit covers the discharge of pesticides (biological pesticides and chemical pesticides which leave a residue) to waters of the U.S. resulting from the following use patterns: (1) Mosquito and Other Flying Insect or Pest Control; (2) Weed, Algae, and Vegetation Control; (3) Nuisance Animal Control; (4) Forest Canopy Pest Control; and (5) Specific Approvals which are determined by the department to not be categorized by use patterns 1 through 4, but are within the purpose and intent of the pesticide general permit. If an operator's discharges do not meet the eligibility provisions described in section 1.2 of the permit, point source discharges to waters of the U.S. from the application of pesticides cannot be authorized under this permit. The operator must obtain coverage under another permit in order to discharge to a water of the U.S.

As discussed above, ADEQ's decision to include specific approvals of use patterns generally stems from the EPA's 2006 rule. That rule provided that NPDES permits are not required for the application of pesticides when these pesticides are applied consistent with all relevant requirements under FIFRA (i.e., those relevant to protecting water quality), in the following two (2) circumstances:

1) The application of pesticides directly to waters of the U.S. in *order to control pests*. Examples of such applications include applications to control mosquito larvae, weeds, or other pests that are *present* in the waters of the U.S.

2) The application of pesticides to control pests that are present over waters of the U.S., including near such waters, where a portion of the pesticides will unavoidably be deposited into waters of the U.S. in order to target pests effectively; for example, when insecticides are aerially applied to a forest canopy where waters of the U.S. may be present below the canopy or when pesticides are applied over or near water for the control of adult mosquitoes or other pests.

It was reasoned that such products were not "pollutants" because they served the beneficial purpose of controlling pests. In promulgating this rule, EPA expressly noted that the rule did not cover either "spray drift" – the airborne movement of pesticide sprays away from the target application site into a water of the U.S. – or applications of pesticides to terrestrial agricultural crops. To address the vacated 2006 Rule, the PGP is designed to cover activities in which it is unavoidable that some of the pesticides will be deposited into water in order to effectively target the pests.

1.2.1 Activities Covered

All discharges authorized by this general permit involve applications made directly to waters of the U.S. 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. The general permit is structured by pesticide use patterns. These use patterns 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 general permit covers the following use patterns:

a. Mosquito and Other Flying Insect or Pest Control – to control public health/nuisance pests which develop or are present during a portion of their life cycle in or above standing or flowing water. Public health/nuisance and other insect pests in this use category include but are not limited to mosquitoes and black flies.

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

b. Weed, Algae, and Vegetation (herbaceous and woody) Control – to control invasive or other nuisance weeds, vegetation, and algae in water and at water's edge, including irrigation ditches and/or irrigation canals.

   This use pattern includes the application, by any means, of contact or systemic herbicides to control vegetation and algae (and plant pathogens such as fungi) in Waters of the United States and at water's edge, including ditches and/or canals. Applications of this nature typically are single spot pesticide applications to control infestations or staged large scale pesticide applications intended to control pests in several acres of waterway. Pesticide applications in a treatment area may be performed one or more times per year to control the pest problem.

c. Nuisance Animal Control – to control invasive or other nuisance animals in water and at water's edge. Nuisance animals in this use category include, but are not limited to fish, lampreys, and mollusks.

   This use pattern includes the application, by any means, of pesticides into Waters of the United States to control a range of animal pests for purposes such as fisheries management, invasive species eradication or equipment operation and maintenance. Applications of this nature are often made over an entire or large portion of a waterbody

as typically the target pests are mobile. Multiple pesticide applications to a waterbody for animal pest control are often made several years apart.

d. Forest Canopy Pest Control – the application of a pesticide to the forest canopy to control the population of a pest species (e.g., insect or pathogen) where to target the pests effectively a portion of the pesticide unavoidably will be applied over and deposited to water.

This use pattern includes pest control projects in, over, or to forest canopies (aerially or from the ground) to control pests in the forest canopy where Waters of the United States exist below the canopy. Applications of this nature usually occur over large tracts of land, and are typically made in response to specific pest outbreaks. ADEQ understands that for this use pattern pesticides will be unavoidably discharged into Waters of the United States in the course of controlling pests over a forest canopy as a result of pesticide application. These pests are not necessarily aquatic (e.g., airborne non-aquatic insects) but are detrimental to industry, the environment, and public health. Note: ADEQ recognizes that mosquito adulticides are applied to forest canopies, and this application is covered under the "Mosquito and Other Flying Insect Pest Control" use pattern.

e. Specific Approvals – other similar pesticide discharges determined to be in the scope of this permit and approved in writing by the department in advance of the discharge.

1.2.2 Limitations on Coverage

1.2.2.1 Discharges to Impaired Waters

Coverage under the PGP is available with this general permit for certain discharges to impaired waters. For example, discharges to waters which are impaired for pollutants other than the pesticide or its degradate(s), are eligible for coverage. Also, discharges to waters impaired for temperature or some other indicator parameter, or for physical impairments such as "habitat alteration" are also eligible for PGP coverage. If, however, permit coverage is being requested for a pesticide discharge activity that will result in a discharge of the pesticide for which the water is impaired, the operator (decision maker) must submit a copy of the pesticide discharge management plan (PDMP) with the NOI to the department for review at least 31 calendar days before the planned discharge. The department will review the PDMP and determine if controls are adequate and, if so, authorize permit coverage. If the department determines the discharge activity is not adequately controlled or otherwise causes or contributes to a violation of a water quality standard, the discharge will not be eligible for coverage under this permit.

For purposes of this permit, impaired waters are those which have been identified by Arizona or EPA pursuant to section 303(d) of the CWA as not meeting applicable water quality standards. A list of impaired waters, along with the pollutants or pollution identified as the cause of the impairment is available at:

http://www.azdeq.gov/environ/water/assessment/download/2008/2006_2008.pdf

1.2.2.2 Discharges to Outstanding Arizona Water (OAWs)

Outstanding Arizona waters (OAWs) are defined in Arizona Administrative Code (A.A.C.) R18-11-101(28). The listing of OAWs is found in A.A.C. R18-11-112(G) and is available at:

(http://www.azsos.gov/public_services/Title_18/18-11.htm).

In general, an OAW is an intermittent or perennial Arizona water that has been designated by the director as a Tier 3 water and subject to Arizona's antidegradation rules.

As such, an operator (decision maker) proposing a pesticide discharge to an OAW must submit a copy of the PDMP with the NOI to the department for review at least 31 calendar days before the planned discharge. The department will review the PDMP and determine if controls are adequate

and, if so, authorize permit coverage. If the department determines the discharge activity is not adequately controlled or otherwise causes or contributes to a violation of a water quality standard, the discharge will not be eligible for coverage under the PGP.

1.2.2.3 Discharges Currently or Previously Covered by another Permit

This section of the PGP describes situations where an operator is ineligible for coverage under this permit because of coverage under another permit. These include discharges currently covered under another AZPDES permit; discharges covered by a permit issued within the past five (5) years prior to the effective date of this permit which established site-specific numeric water quality-based limitations; and discharges from activities where the associated AZPDES permit has been or is in the process of being denied, terminated, or revoked by ADEQ (although this last provision does not apply to the routine reissuance of permits every five (5) years).

The department is including this last provision to be clear that it is not possible to obtain coverage by requesting termination of an individual permit and then submitting an NOI for coverage under the PGP. To avoid potential conflicts with the anti-backsliding provisions of the CWA, transfer from an individual permit to the PGP is only allowed under limited conditions, including that the individual permit did not contain numeric water quality-based effluent limits more stringent than those in this permit. In order for a transfer from an individual permit to this PGP to be permissible, ADEQ must determine that all conditions of the PGP are at least as stringent as the prior issued individual permit.

2.0 Authorization to Discharge Under This Permit

2.1 Effective Date of Permit Coverage

Operators (*decision makers*) that are not otherwise required to submit an NOI are automatically covered on the effective date of this permit. *Decision makers* proposing to discharge to waters designated as aquatic or wildlife (warm or cold), effluent dependent waters, impaired waters, or an Outstanding Arizona Water are automatically covered under this permit until February 6, 2012 without submitting a NOI. *Decision makers* requesting a specific approval are not automatically authorized and must submit a notice of intent and pesticide discharge management plan prior to the any discharge activity.

Decision makers proposing to discharge to waters designated as aquatic or wildlife (warm or cold), effluent dependent waters, impaired waters, or an Outstanding Arizona Water beyond February 6, 2012 must submit a NOI on or before this date for continued coverage.

The department has delayed the requirement to submit a NOI for most of the pesticide discharge categories to provide immediate permit coverage so that operators can comply with the court ruling and to allow for time to prepare a Pesticide Discharge Management Plan, if necessary.

2.2 How to Obtain Authorization

To obtain authorization under the PGP operators must meet the eligibility requirements of section 1.2 and, if required by section 2.4 of the permit, the decision maker submit a complete and accurate Notice of Intent form, including the applicable AZPDES fee.

2.3 Persons Subject to this Permit

For the purpose of this permit, persons that are involved with a pesticide discharge activity are deemed “operators.” The department understands that many pesticide discharge activities will involve more than one (1) person. As such, operators are classified as *decision makers* and *applicators*. It is noted that when required to do so, only the *decision maker* is required to submit an NOI and identify the *applicator*, if different than the *decision maker*. An example of a discharge activity that involves two (2) or more operators may be when a city (decision maker) contracts with a private company (applicator) to conduct a pesticide application that results in a discharge. In this scenario, the city would qualify as the *decision maker* because the city made

the determination (or decision) to commission the pesticide discharge. Therefore, both the city (decision maker) and the contractor (applicator) are both operators under the terms of this permit and subject to complying with permit requirements.

2.4 Pesticide Discharges Requiring a NOI

Under 40 CFR § 122.28 (b)(2)(v) and A.A.C. R18-9-C901(C)(2), some pesticide application operators may, at the discretion of the director, "be authorized to discharge under a general permit without submitting a notice of intent where the department finds that a notice of intent requirement would be inappropriate." In making such a finding, the director must consider: "the type of discharge; the expected nature of the discharge; the potential for toxic and conventional pollutants in the discharges; the expected volume of the discharges; other means of identifying discharges covered by the permit; and the estimated number of discharges to be covered by the permit."

While this permit covers eligible operators (decision makers) discharging pesticides to waters of the U.S. within Arizona, ADEQ requires Notice of Intent only for the application of pesticides to specific waters. Therefore, an operator meeting the definition of a *decision maker* is required to submit a Notice of Intent to ADEQ to obtain coverage under this general permit if the proposed discharge activity is characterized by one (1) or more of the following parameters:

a. The discharge is to a water designated as aquatic or wildlife (warm or cold);
b. The discharge is to an effluent dependant water that flows for 2.5 miles or more from the nearest point source (i.e., discharge activity);
c. The discharge is to an impaired water;
d. The discharge is to an outstanding Arizona water;
e. The discharge does not conform to a. though d. but is consistent with the intent of the permit and the operator requests a specific approval from the department; and/or
f. The director requires a NOI on a case-by-case basis in consideration of potential effects on human health and the environment.

Additionally, if the proposed pesticide discharge activity does not conform to one (1) of the four (4) pesticide use patterns (a. through d.), the operator may request specific approval (e.) for a pesticide discharge that is otherwise consistent with the purpose and intent of this permit. To request specific approval, the operator (decision maker) must submit a NOI identifying the proposed pesticide discharge activity. The department will evaluate the NOI and determine if the discharge activity is consistent with the permit and notify the operator if coverage is issued under this permit, or if coverage is necessary under an individual permit.

The department also reserves the right to require that an operator submit a NOI for discharge activities not characterized by permit section 2.4(a. through e.) on a case-by-case basis. In making this determination to require a NOI, the department will consider factors such as risk to human health and the environment. For example, the department may require a NOI for a pesticide discharge activity to an ephemeral water near a school. Regardless, the operator will be notified in writing that ADEQ is requiring a NOI for a particular discharge. If the operator was not required to submit a NOI absent being notified by the department, any discharges occurring prior to the notification are deemed covered.

Based on a review of the NOI or other information, ADEQ may in certain circumstances delay the authorization of the operator's discharge or may deny coverage under the permit and require an application for an individual AZPDES permit. ADEQ will notify the operator in writing of any such delay or the request for an individual AZPDES permit application.

Operators whose discharge are authorized by this permit but are not required to submit an NOI are automatically covered under the permit for their application and are authorized to discharge in accordance with the permit requirements as soon as the permit becomes effective. Nonetheless, ADEQ emphasizes that these operators are subject to all applicable requirements contained within the permit. If an operator that is not required to submit an NOI wants ADEQ to consider alternative permit requirements for the application, the operator must apply to ADEQ for a substitute individual permit applicable to his or her application.

2.4.1 NOI Requirements

When required to do so pursuant to permit section 2.4, operators must submit a Pesticide General Permit NOI. The NOI is available on ADEQ's website at www.azdeq.gov and at the department's office locations in Phoenix, and Tucson. In order to facilitate timely processing and permit coverage, the NOI must be complete and accurate.

2.4.2 Type of Permit Coverage and AZPDES Fees

The department anticipates many operators will engage in multiple pesticide discharge activities in different areas during the five year term of the permit. For example, a city or county may engage in pesticide discharge activities throughout its incorporated boundary. To facilitate permit coverage, this permit allows operators to submit an NOI for a single source discharge or for areawide coverage. A single source discharge is to one (1) specific water specified on the NOI, but could be recurring throughout the permit term.

Areawide coverage can be applied to two (2) or more waters within the same watershed. For example, a city could apply for areawide coverage for pesticide discharges within its municipal boundary. The permit does limit, however, that permit coverage cannot extend beyond a political boundary, watershed, district (e.g., irrigation district), or other discernable political or geographic boundary. As such, if for example a city was seeking areawide permit coverage and has two watersheds within its municipal boundary, the city would submit two (2) NOIs. Similarly, if a recognized forest has three (3) watersheds within that particular forest, three (3) separate NOIs are required for pesticide discharges within each watershed of the forest.

Arizona's AZPDES fees became effective July 1, 2011. The fee rate is established in Arizona Administrative Code, Title 18, Chapter 14, Article 1. The PGP is classified as a general permit for non-stormwater discharges and is subject to the fee structure in R18-14-109, Table 6. According to Table 6, the fees associated with submitting a NOI for the PGP are as follows:

Single Source NOI (Level 1A) - $250.00
Area Wide NOI (Level 1B) - $500.00
Pesticide Discharge Management Plan Review - $1,000.00

2.4.3 Where to Submit an NOI

Operators shall submit NOIs to ADEQ at the following address:

Arizona Department of Environmental Quality
Surface Water Section / Stormwater and General Permits Unit
1110 West Washington Street, 5415A-1
Phoenix, Arizona 85007

If available, operators may also submit their NOI electronically via the SMART NOI system.

2.4.4 Routine Permit Coverage

Operators that are not required to submit an NOI (pursuant to permit section 2.4) are automatically covered on the effective date of this permit.

Operators (*decision makers*) proposing a discharge to a water designated as aquatic or wildlife (warm or cold), to an effluent dependant water that flows more than 2.5 miles from the nearest point source (i.e., discharge location), to an impaired water, or to an Outstanding Arizona Water are automatically covered on the effective date of this permit until February 6, 2012. After February 6, 2012, operators wishing to continue to discharge to these waters must submit a NOI on or before this date. Operators requesting a specific approval must submit the NOI and Pesticide Discharge Management Plan within thirty-one (31) days before the planned discharge.

After February 6, 2012, the department will notify operators required to submit a NOI within seven (7) calendar days (for discharges to waters designated as aquatic and wildlife, and effluent dependant waters) or thirty-one (31) calendar days (for discharges to impaired waters and Outstanding Arizona Waters) that permit coverage is authorized, if additional information is required, or if coverage under an individual permit is required.

In the event the operator is not notified by the department within these time frames permit coverage is authorized by default. The seven (7) and thirty-one (31) calendar day time frames begin on the date the department receives the NOI. The operator must confirm the date the department received the NOI (by time/date stamp, certified mail return receipt, or other means) to verify coverage under the "default" provision.

2.5 Continuation of this Permit

If this permit is not reissued or replaced (or revoked or terminated) prior to its expiration date, existing dischargers are covered under an administrative continuance, in accordance with 40 CFR § 122.6. However, ADEQ does not have the authority to provide coverage to facilities not authorized to discharge under the prior issued general permit. If coverage is provided to a permittee prior to the expiration date of this permit, the permittee is authorized to discharge under this permit until the earliest of following occur:

(a) Your authorization for coverage is obtained under a reissued permit or a replacement of this permit following your timely and appropriate submittal of a complete NOI (if required) requesting authorization to discharge under the new permit and compliance with the requirements of the NOI (if you are not required to submit an NOI (see 2.4), your authorization is automatically extended until you are covered under a revised or replacement permit, or the director decides not to re-issue the permit);

(b) The operator submits a Notice of Termination (NOT) consistent with section 2.6.

(c) The issuance or denial of an individual permit for a discharge resulting from application of a pesticide that would otherwise be covered under this permit;

(d) A formal permit decision by ADEQ not to reissue this general permit, at which time ADEQ will identify a reasonable time period for covered dischargers to seek coverage under an alternative general permit or an individual permit. Coverage under this permit will cease when coverage under another permit is granted/authorized; or

(e) ADEQ has informed you that you are no longer covered under this permit, pursuant to A.A.C. R18-9-903(B).

2.6 Terminating Coverage

2.6.1 Submitting a Notice of Termination

To terminate coverage under this permit, operators that were required to submit an NOI must submit a Notice of Termination (NOT) when all active, anticipated discharge or proposed discharge activities are completed. The operator's authorization to discharge under the permit terminates at midnight of the day that a complete NOT is received by ADEQ. The requirement to submit a NOT applies only to those operators that were required to submit a NOI to obtain permit coverage. Dischargers automatically covered under this permit are likewise terminated upon permanent cessation of discharge. It is noted that if an operator that is required to submit a NOI anticipates or proposes routine or ongoing discharges for the duration of this permit, a NOT is not required.

The department requires permittees to file a NOT to notify ADEQ that its obligation to manage pesticide discharges is no longer necessary for at least one (1) of the reasons identified in the permit. If ADEQ determines the permittee has not satisfied at least one (1) of the conditions in section 2.6.2 for being able to submit a NOT (e.g., the permittee continues to have a discharge), then the NOT is invalid and the operator must continue to comply with the conditions of the permit. Likewise, if ADEQ determines that the NOT is incomplete, the permittee may be found to be in violation of reporting requirements under Section 308 of the CWA.

2.6.2 When to Submit a Notice of Termination.

Operators that were required to submit a NOI must submit a NOT, as described in section 2.6.1, when one (1) of the following conditions have been met:

(a) a new operator has taken over responsibility for the pest treatment;
(b) operations have ceased for which permit coverage had been obtained or there will no longer be discharges from such activities, or
(c) permit coverage has been obtained under an alternative general permit for all discharges requiring AZPDES permit coverage (unless you obtained coverage under an alternative permit based on an ADEQ request, in which case coverage under this permit will terminate automatically once coverage under that alternative permit is obtained).

Until such time as an operator submits a NOT, all operators (decision makers and applicators) identified on the NOI are responsible for maintaining compliance with permit requirements and will be assed the annual fee.

ADEQ is requiring a NOT from operators identified in (c) above – i.e., operators that on their own switch to a different permit – to prevent duplicate coverage under multiple AZPDES permits. Operators terminating coverage at ADEQ's request are not required to submit a Notice of Termination.

2.6.3 NOT Requirements

When required to do so pursuant to permit section 2.6.1, operators must submit a Pesticide General Permit NOT. The NOT is available on ADEQ's website at www.azdeq.gov and at the department's office locations in Phoenix, and Tucson. Permit coverage is terminated at midnight the day the department receives a complete and accurate NOT. If the NOT is not complete and accurate, the operator(s) are required to maintain compliance with all relevant conditions of the permit until such time a complete and accurate NOT is received by the department.

2.6.4 Where to Submit a NOT

Operators shall submit NOTs to ADEQ at the following address:

Arizona Department of Environmental Quality
Surface Water Section / Stormwater and General Permits Unit
1110 West Washington Street, 5415A-1
Phoenix, Arizona 85007

Alternatively, operators may submit their NOT via facsimile to ADEQ at (602) 771-4528.

If available, operators may also submit their NOT electronically via the online SMART NOI.

2.7 Alternative Permits

2.7.1 ADEQ Requiring Coverage under an Alternative Permit

The department may require an individual permit (in accordance with 40 CFR 122.28(b)(3)(ii) and A.A.C. R18-9-C902)) or coverage under an alternative AZPDES general permit instead of the PGP. The issuance of the individual permit or alternative AZPDES general permit is in accordance with 40 CFR Part 124 and provides for public comment. The circumstances in which such an action would be taken are set forth at A.A.C. R18-9-C902(A).

2.7.2 Operator Requesting Coverage under an Alternative Permit

After being covered by this permit, the operator may request to be excluded from such coverage by applying for an individual permit. In this case, the operator must submit an individual permit application in accordance with A.A.C. R18-C902(B), along with a statement of reasons supporting the request, to ADEQ. The request may be granted by issuance of an individual permit or authorization of coverage under an alternative general permit if the reasons are adequate to support the request. Under this scenario, if an individual permit is issued, or authorization to discharge under an alternative general permit is granted, coverage under this permit is automatically terminated on the effective date of the individual permit (A.A.C. R18-9-C902(A)(5)) or the date of authorization of coverage under the alternative general permit.

The department may require a operator to apply for an individual permit only if ADEQ notifies the operator in writing that a permit application is required. This notice must include a brief statement of the reasons for this decision, an application form, a statement setting a time for the operator to file the application, and a statement that on the effective date of the individual AZPDES permit the general permit as it applies to the individual permittee shall automatically terminate. ADEQ may grant additional time upon request of the applicant.

When an individual AZPDES permit is issued to an operator otherwise subject to a general AZPDES permit, coverage under the general permit is automatically terminated on the effective date of the individual permit.

2.8 Severability

Invalidation of a portion of this permit does not necessarily render the whole permit invalid. ADEQ's intent is that the permit remains in effect to the extent possible; in the event any part of this permit is invalidated, ADEQ will advise the regulated community as to the effect of such invalidation.

2.9 Other Federal and State Laws

Section 2.9 of this permit includes the following language: "Operator(s) must comply with all other applicable federal and state laws and regulations that pertain to your application of pesticides. For example, this permit does not negate the requirements under FIFRA and its implementing regulations to use registered pesticides consistent with the product's labeling. Additionally, there are other laws and regulations that may only apply to federal agencies covered under this permit

(e.g., U.S. Fish and Wildlife Service)."

This part of the permit is intended to clarify that pesticide applicators are still required to comply with other applicable laws and that merely complying with the conditions of this permit may not meet all regulations applicable to the types of activities covered under this permit.

3.0 Technology-Based Effluent Limitations

Background

The Clean Water Act (CWA) requires that all point source discharges from existing facilities, or in this case, pesticide applications (discharge activity), meet technology-based effluent limitations[1] representing the applicable levels of necessary control. Additionally, water quality-based effluent limitations (WQBELs) are required by CWA Section 301(b)(1)(C) as necessary where the technology-based effluent limitations are not sufficient to protect applicable water quality standards. See *P.U.D. No. 1 of Jefferson County et. al. v. Washington Department of Ecology*, 511 U.S. 700 (704) 1994. The technology-based effluent limitations contained in the PGP are non-numeric and constitute the levels of control that reduce the area and duration of impacts caused by the discharge of pesticides to waters of the U.S. in a treatment area. In addition, these effluent limitations provide for protection of water quality standards, including protection of beneficial uses of the receiving waters inside the treatment area following completion of pest management activities.

The technology-based effluent limitations set forth in section 3 require the operator(s) to minimize discharge of pesticides to waters of the U.S. Consistent with the control level requirements of the CWA, the term "minimize" means to reduce and/or eliminate pesticide discharges to waters of the U.S. through the use of control measures to the extent technologically available and economically achievable and practicable for the category or class of point sources covered under this permit taking into account any unique factors relating to the discharges covered under the permit.

Types of Technology-Based Effluent Limitations

Technology-based effluent limitations are in many cases established by EPA in regulations known as effluent limitations guidelines, or "ELGs." EPA establishes these regulations for specific industry categories or subcategories after conducting an in-depth analysis of that industry. The Act sets forth different standards for the ELGs based upon the type of pollutant or the type of permittee involved. Where effluent guidelines have not been established for an industry, permitting authorities establish effluent limitations for permits on a case-by-case basis based on their best professional judgment. See 33 U.S.C. § 1342(a)(1); 40 C.F.R. § 125.3(c)(2).

ADEQ's Authority to Include Non-Numeric Technology-Based Limitations in this Permit

All NPDES and AZPDES permits are required to contain technology-based limitations. 40 CFR §§ 122.44(a)(1) and 125.3. When EPA or ADEQ have not promulgated effluent limitation guidelines for an industry, or if an operator is discharging a pollutant not covered by the effluent guideline, permit limitations may be based on the best professional judgment (BPJ, sometimes also referred to as "best engineering judgment") of the permit writer. 33 U.S.C. § 1342(a)(1); 40 CFR 125.3(c). See Student Public Interest Group v. Fritzsche, Dodge & Olcott, 759 F.2d 1131,

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Natural Res. Def. Council, Inc. v. EPA, 673 F.2d 400, 403 (D.C. Cir. 1982) (noting that "*section 502(11)* defines 'effluent limitation' as ' *any* restriction' on the amounts of pollutants discharged, not just a numerical restriction"; holding that section of CWA authorizing courts of appeals to review promulgation of "any effluent limitation or other limitation" did not confine the court's review to the EPA's establishment of numerical limitations on pollutant discharges, but instead authorized review of other limitations under the definition) (emphasis added). In *Natural Res. Def. Council, Inc. v. Costle, 568 F.2d 1369 (D.C. Cir. 1977)*, the D.C. Circuit stressed that when numerical effluent limitations are infeasible, EPA may issue permits with conditions designed to reduce the level of effluent discharges to acceptable levels.

1134 (3rd Cir. 1985); American Petroleum Inst. v. EPA, 787 F.2d 965, 971 (5th Cir. 1986). For this permit, the technology-based limitations are based on BPJ decision-making because no ELG applies.

Under federal and state regulations, non-numeric effluent limitations are authorized in lieu of numeric limitations, where "[n]umeric effluent limitations are infeasible." 40 CFR 122.44(k)(3). As far back as 1977, courts have recognized that there are circumstances when numeric effluent limitations are infeasible and have held that EPA may issue permits with conditions (e.g., best management practices) designed to reduce the level of effluent discharges to acceptable levels. Natural Res. Def. Council, Inc. v. Costle, 568 F.2d 1369 (D.C.Cir.1977).

The CWA allows best management practices (BMPs) to take the place of numeric effluent limitations under certain circumstances. Federal Regulations at 40 CFR §122.44(k), entitled "Establishing limitations, standards, and other permit conditions (applicable to State NPDES programs ...)," provides that permits may include BMPs to control or abate the discharge of pollutants when: (1) "[a]uthorized under section 402(p) of the CWA for the control of stormwater discharges"; or (2) "[n]umeric effluent limitations are infeasible." 40 CFR § 122.44(k).

Courts have held that the CWA does not require numeric limitations where such limits are infeasible. Citizens Coal Council v. United States Environmental Protection Agency, 447 F3d 879, 895-96 (6th Cir. 2006). The Sixth Circuit cited to Waterkeeper Alliance, Inc. v. EPA, 399 F.3d 486, 502 (2nd Cir. 2005), stating "site-specific BMPs are effluent limitations under the CWA." Additionally, the Sixth Circuit cited to Natural Res. Def. Council, Inc. v. EPA, 673 F.2d 400, 403 (D.C.Cir.1982) noting that "section 502(11) [of the CWA] defines 'effluent limitation' as '*any* restriction' on the amounts of pollutants discharged, not just a numerical restriction."

ADEQ's Decision to Include Non-Numeric Technology-Based Effluent Limitations in this Permit

As described above, numeric effluent limitations are not always feasible because the discharges pose challenges not presented by other types of AZPDES regulated discharges. The technology-based effluent limitations in this permit are non-numeric based on the following facts:

- The point in time for which a numeric effluent limitation would apply is not easily determinable. For discharges from the application of pesticides, the discharges can be highly intermittent and not practically separable. For example, the discharge from the application of a chemical pesticide to a water of the U.S. is represented by the residual remaining in the ambient water after the pesticide is no longer serving its intended purpose (i.e., acting as a pesticide against targeted pests in the applied medium). Chemical pesticides applied directly to water are not considered pollutants until some time after actual discharge at which point the pesticides will have performed their intended function for pest control, dissipated in the waterbody, and broken down into other compounds to some extent, etc. This discharge also will have combined with any other discharges to that waterbody (be it from other point sources, non-point source runoff, air deposition, etc). Given this situation, it is not clear what would be measured for a numeric limit or when.

- For discharges from the application of pesticides, 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 limitation at each location. This variability makes setting numeric effluent limitations for pesticide applications extremely difficult. In this situation, requiring the use of standard control practices (i.e., narrative non-numeric effluent limitations), provides a reasonable approach to control pesticides discharges.

- The precise location for which a numeric effluent limitation would apply is not clear. Discharges from the application of pesticide are different from discharges of processed wastewater from a particular industrial or commercial facility where the effluent is more predictable and easily identified as an effluent from a conveyance (e.g., pipe or ditch), can be precisely measured for compliance prior to discharge, and can be more effectively analyzed to develop numeric effluent limitations.

- Information needed to develop numeric effluent limitations is not available at this time.

Technology-based effluent limitations in this permit are presented specific to each pesticide use pattern to reflect the variations in procedures and expectations for the use and application of pesticides. These non-numeric effluent limitations are expected to minimize environmental impacts by reducing the discharge of pesticides to waters of the U.S., thereby protecting the receiving waters, including meeting of all applicable water quality standards.

The effluent limitations in this permit are expressed as specific pollution prevention requirements for minimizing the pollutant levels in the discharge. The department believes the combination of pollution prevention approaches and structural management practices required by these limits are the most environmentally sound way to control the discharge of pesticide pollutants to meet the effluent limitations. Pollution prevention continues to be the cornerstone of the AZPDES program.

Pest Management Measures Used to Meet the Technology-Based Effluent Limitations

Just as there is variability in the pesticide applications as described above, there is variability in the control measures that can be used to meet the effluent limitations. Therefore, ADEQ is not mandating the specific control measures operators must implement to meet the limitations. This is analogous to an industrial situation where discharges to waters of the U.S. are via pipes and a numeric effluent limitation may be specified as a given quantity of pollutant that may be discharged, but ADEQ would not specify what technology should be employed to meet that limitation. For pesticides, namely mosquitocides, for example, the PGP requires mosquito control operators to consider mechanical/physical methods of control to eliminate or reduce mosquito habitat. How this is achieved will vary by operator: For some, this may be achieved through regular mowing while for others mowing will not be feasible. Thus, a given control measure may be acceptable and appropriate in some circumstances but not in others. In this respect, the non-numeric effluent limitations in this permit are similar to numeric effluent limitations, which also do not require specific control technologies as long as the limitations are met.

Pest Management Measures can be actions (including processes, procedures, schedules of activities, prohibitions on practices and other management practices), or structural or installed devices to prevent or reduce water pollution. The key is determining what measure is appropriate for your situation in order to meet the effluent limitation. In this permit, operators are required to implement site-specific control measures to meet these limitations. The permit along with this fact sheet provides examples of control measures, but operators must tailor these to their situation as well as improve upon them as necessary to meet the effluent limitations.

The department notes that this permit uses both the term “control measures” and “best management practices” or “BMPs” when referring to Pest Management Measures. Use of the term control measure is intended to better describe the range of pollutant reduction practices that may be employed, whether they are structural, non-structural or procedural and includes BMPs as one (1) of the components. The greater breadth of meaning for control measures vis-à-vis BMPs is why ADEQ uses this term in many parts of the permit.

The approach to control measures in this permit is consistent with the CWA as well as its implementing regulations at 40 CFR 122.44(k)(4). Section 402(a)(2) of the CWA states: “The administrator shall prescribe conditions for such permits to assure compliance with the requirements in paragraph (1) . . . including conditions on data and information collection, reporting and such other requirements as he deems appropriate." (Section 402(a)(1) includes effluent limitation requirements.) This statutory provision is reflected in the CWA implementing

regulations, which state that control measures can be included in permits when, “[t]he practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA.” 40 CFR 122.44(k)(4).

Implementation of Control Measures

Section 3 of this permit requires operators to implement control measures to meet the technology-based effluent limitations. It also provides operators with important considerations for the implementation of their specific control measures. Some operators will have to document how such factors were taken into account in the implementation of their control measures (see section 7.1. ADEQ recognizes that not all of these considerations will be applicable to every site nor will they always affect the choice of control measures. If operators find their control measures are not minimizing discharges of pesticide adequately, the control measures must be modified as expeditiously as practicable. See section 7, Corrective Action.

Control Measures and Technology-Based Effluent Limitations – Definition of “Minimize”

The non-numeric effluent limitations require operators to “minimize” discharges of pesticide. Consistent with the control level requirements of the CWA, the term “minimize” means to reduce and/or eliminate pesticide discharges to waters of the U.S. through the use of control measures to the extent technologically available and economically achievable and practicable.

The department believes that for many pesticide applications minimization of the discharge of pesticides to waters of the U.S. can be achieved without using highly engineered, complex treatment systems. The specific limits included in section 3.0 emphasize effective “low-tech” approaches, including using the lowest effective amount of pesticide product, performing regular equipment maintenance and calibration, accurately identifying the pest problem, efficiently and effectively managing the pest problem, and properly using pesticides.

Statutes, Regulations, and Other Requirements

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. If operators are found to have applied a pesticide in a manner inconsistent with any relevant water-quality related FIFRA labeling requirements, ADEQ will presume that the effluent limitation to minimize pesticides entering the waters of the U.S. has been violated under the AZPDES permit. ADEQ 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, an operator, who is a pesticide applicator, decides to use a mosquito adulticide pesticide product with a FIFRA label that contains the following language, "Apply this product at a rate not to exceed one (1) pound per acre." The applicator applies this product at higher than the allowable rate, which results in excess product being discharged into waters of the U.S., the department would find that this application was a misuse of the pesticide under the FIFRA label and because of the misuse; ADEQ would determine that the effluent limitation that requires the operator to minimize discharges of pesticide products to waters of the U.S. was also violated. Therefore, pesticide use inconsistent with certain FIFRA labeling requirements could result in the operator being held liable for a CWA violation as well as a FIFRA violation.

Technology-Based Effluent Limitations in the PGP

The permit requires the operator to achieve all of the non-numeric effluent limitations delineated in sections 3.1 and 3.2 as described below.

All operators under section 3.1 must "minimize" pesticide applications. Under section 3.2, only those operators required to submit an NOI are required to implement pest management measures (PMM) and other permit conditions. ADEQ is not requiring these additional technology-based effluent limitation (PMM) requirements from permittees who do not have to submit an NOI.

3.1 Applicator's Responsibilities

Section 3.1 of this permit contains the general effluent limitations that apply to *all applicators*, regardless of use pattern. These effluent limitations are generally preventative in nature, and are designed to minimize pesticide discharges into waters of the U.S. All operators, regardless of whether you are required to submit an NOI, are required to minimize the discharge of pesticides to waters of the U.S. by doing the following:

3.1.1 To the extent not determined by the decision-maker, use the lowest effective amount of pesticide product per application and optimum frequency of pesticide applications necessary to control the target pest.

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, operators must use only the amount of pesticide and frequency of pesticide application necessary to control the target pest. Using only the amount of pesticide and frequency of pesticide application needed ensures maximum efficiency in pest control with the minimum quantity of pesticide. Using only the amount and frequency of applications necessary can result in cost and time savings to the user. To minimize discharges of pesticide, Operators should base the rate and frequency of application on what is known to be effective against the target pest.

3.1.2 Maintain pesticide application equipment in proper operating condition, including requirements to calibrate, clean, and repair such equipment and prevent leaks, spills, or other unintended discharges.

Common-sense and good housekeeping practices enable pesticide users to save time and money and reduce potential for unintended discharges of pesticides to waters of the U.S. 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 waters of the U.S. Some basic factors 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.

To minimize discharges of pesticides, *applicators* 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. Improperly calibrated pesticide equipment may cause either too little or too much pesticide to be applied. This lack of precision can result in excess pesticide being available or result in ineffective pest control. 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.

3.1.3. Asses weather conditions (e.g. temperature, precipitation, and wind speed) in the treatment area to ensure application is consistent with all applicable federal requirements.

Weather conditions may affect the results of pesticide application. Applicators must assess the treatment area to determine whether weather conditions support pest populations and are suitable for pesticide application.

3.2 Pest Management Measures

As noted above, NPDES/AZPDES permits must contain technology-based effluent limitations. Section 3.2 of this permit contains the effluent limitations that *decision-makers* must perform. The PGP requires *all decision-maker*, to the extent *decision-makers* determine the amount of pesticide or frequency of pesticide application, to minimize the discharge of pesticides to Waters of the United States from the application of pesticides, through the use of Pest Management Measures, as defined in section 11 of this permit, by using only the amount of pesticide and frequency of pesticide application necessary to control the target pest.

In addition, section 3.2 of this permit requires *decision-makers* that are required to submit a Notice of Intent (NOI) to identify the pest problem, implement effective and efficient pest management options, and adhere to certain pesticide use provisions. (For purposes of the discussion below on section 3.2, the term *decision-maker* means *decision-makers* required to submit an NOI.) *Decision-makers* 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. These additional technology-based effluent limitations are based on integrated pest management principles. The *decision maker* may make other arrangements to have the *applicator* comply with the requirements in section 3.2 through contractual agreement or other arrangement, but it is ultimately the *decision makers* responsibility to ensure these requirements are met.

These requirements are aimed at reducing discharge of pesticides to Waters of the United States and lessening the adverse effects of pesticides that are applied. Each pesticide use pattern has specific limitations, and these requirements are divided into three different sections: (1) identify the problem, (2) pest management options, and (3) pesticide use. For each pest management area, *decision-makers* must identify the problem prior to pesticide application, consider using a combination of chemicals and non-chemical Pest Management Measures, and perform surveillance before pesticide application to reduce environmental impacts.

As stated above, these technology-based effluent limitations are based on integrated pest management principles. Integrated pest management, 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) Integrated pest management is not a single pest control method but, rather, a series of pest management evaluations, decisions and controls. In evaluating available and relevant information, EPA found that some commercial (For-Hire Applicators) and non-commercial (e.g.,

state governments, federal governments, local governments, utilities) entities are currently implementing integrated pest management or components of integrated pest management to minimize pesticide use. For example, federal agencies are required to implement integrated pest management under 7 USC 136r-1, "Federal agencies shall use Integrated Pest Management techniques in carrying out pest management through procurement and regulatory policies, and other activities." In addition, Executive Order 13514 (October 5, 2009) requires the head of each federal agency to implement integrated pest management and other appropriate landscape management practices as a means to promote pollution prevention and eliminate waste. EPA has found that mosquito control operations are performed by local government entities and that they are generally performing integrated pest management.

Below is a general discussion describing the limitations for all pesticide use patterns. Following the general discussion are more detailed descriptions of each specific requirement under each pesticide use pattern.

Decision-makers required to submit NOIs must do the following regardless of the pesticide use pattern:

Identify the Problem

Decision-makers 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), and in developing an action threshold. 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. 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 weeds are problematic, it may be preferable to use an aquatic herbicide as a preventive measure rather than after weeds become established. In some situations, even a slight amount of pest damage may be unacceptable for ecological or aesthetic reasons. Sometime pre-emergent pesticide application is needed, as preventive measure to keep weeds at bay. Action thresholds can vary by pest, by site, and by season. Often the action threshold is expressed as the number of pests per unit area. Action thresholds may be difficult to establish. In establishing PMMs, a practical approach is to establish an action threshold for the major pests. As operators gain insight and experience into specific pest management settings, the action levels can be revised up or down.

To identify the problem at a treatment area, *decision-makers* may use existing data to meet the conditions of the permit. For example, a mosquito district may use surveillance data from an adjacent district to identify mosquito species at their pest management area. *Decision-makers* may also use relevant historic site data.

Pest Management

Decision-makers are required to implement efficient and effective means of pest management that most successfully minimizes discharges to waters of the U.S. resulting from the application of pesticides. *Decision-makers* must evaluate both pesticide and non-pesticide methods. 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, operators 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. For additional information, see discussion under each use pattern.

Pesticide Use

Decision-makers are required to conduct pest surveillance and 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, operators are required to apply pesticide when the action threshold has been met. As noted earlier, action thresholds help determine both the need for control actions and the proper timing of such actions. There are additional requirements designed for each use pattern in sections 3.2.1 through 3.2.5 of the permit. For additional information and other limits on pesticide use, see specific discussion under each use pattern.

3.2.1 Mosquito and Other Flying Insect or Pest Control

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 Pest Management Measures

3.2.1.1 Mosquito Pest Control - Identify the Problem

Prior to the first pesticide application covered under this permit that will result in a discharge to waters of the U.S., and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, you must do the following for each pest management area. Operators must identify the pest problem in their pest management area prior to the first application covered under this permit. Knowledge of the pest problem is an important step to developing pest management strategies. Re-evaluation of the pest problem is also important to ensure pest management strategies are still applicable. Operators must identify the pest problem at least once each calendar year prior to the first application for that calendar year.

Establish densities for larval and adult mosquito or other 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 determined by the operator that is deemed to be unacceptable.

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 (4) 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 (4) 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 (3) 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 (1) to three (3) 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 waters of the U.S.

Prior to the first pesticide application covered under this permit, operators must 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. Once species have been identified, mapping is a valuable tool in assessing mosquito habitats and designing control programs for a specific area to minimize pesticide discharge into waters of the U.S. 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. 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 other 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. 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, see section 6 for documentation requirements regarding why current data are not available and the data you used to meet the permit conditions in section 3.2.1.1. Operators may use historical data or neighboring district data to identify the species and establish action thresholds.

3.2.1.2 Mosquito Pest Control - Pest Management

Prior to the first pesticide application covered under this permit that will result in a discharge to waters of the U.S., 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.

Operators are required to evaluate and implement a pest management strategy to minimize pesticide discharge into waters of the U.S. prior to the first pesticide application covered under this permit. 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. 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-waters of the U.S.

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 water bodies 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 (1) 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.

In coastal areas with extensive coastal salt marshes, there can be tremendous production of *Aedes* mosquitoes, making coastal human habitation virtually impossible. Several source reduction efforts can greatly reduce salt-marsh mosquito production through high-to mid-intensity management that relies upon artificial manipulation of the frequency and duration of inundation.

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 a PMM program with results reported from excellent control to no control at all. There are also 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. Additionally, use of endemic fish species in these areas of concern deserves greater attention. An example of this is *Rivulus* fish species. The potential of Rivulus as mosquito predators is currently being evaluated in saltwater habitats, especially in Brevard County, Florida.

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 easy to deliver 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 chemical and biological 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.

3.2.1.3 Mosquito Pest Control - Pesticide Use

Conduct larval and/or adult surveillance prior to each pesticide application to assess the pest management area. 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. 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 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 (1) 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 thresholds, established by the 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 other 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 five (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 (1) 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 (3) 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

The following sources are recommended for additional information on pest management measures 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_*MosquitoControl*6-08.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

3.2.1.4 Other Flying Insect or Pest Control (Black Flies Example) – Background

For this category, black flies are used as a demonstration of how pest management measures 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.

3.2.1.5 Other Flying Insect or Pest - Identify the Problem

Prior to the first pesticide application covered under this permit that will result in a discharge to waters of the U.S., and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, you must do the following for each pest management area. Operators must identify the pest problem in their pest management area prior to the first application covered under this permit. Knowledge of the pest problem is an important step to developing pest management strategies. Re-evaluation of the pest problem is also important to ensure pest management strategies are still applicable. Operators must identify the pest problem at least once each calendar year prior to the first application for that calendar year. Operators are required to fulfill problem identification requirements to minimize discharges to waters of the U.S. in black fly control operations. 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.

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.

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 black flies prior to 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.

Identify the target mosquito or 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 (4) 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 (3) general life history strategies. One (1) group of species produces one (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 two (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 two (2) days to eight (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 four (4) to nine (9), depending on species, with many species passing through an average of sever (7) instars. Larval development time varies from one (1) week to six (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 two (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 (1) host, too 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.

Prior to first pesticide application covered under this permit, operators must ensure proper identification of black fly species to develop a detailed pest management strategy. 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.), and 5) reduce discharge of pesticides into waters of the U.S.

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 waters of the U.S.

Analyze existing surveillance data to identify new or unidentified sources of mosquito or other 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, see section 6 for documentation requirements regarding why current data are not available and the data you used to meet the permit conditions in section 3.2.1.1. Operators may use historical data or neighboring district data to identify the species and establish action thresholds.

3.2.1.6 Other Flying Insect or Pest - Pest Management

Prior to the first pesticide application covered under this permit that will result in a discharge to waters of the U.S., 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. Operators are required to evaluate and implement a pest management strategy to minimize pesticide discharge into waters of the U.S. prior to the first pesticide application covered under this permit. 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. Operators must reevaluate every year prior to the first pesticide application for that calendar year.

Based on problem identification, two (2) preventive strategies other than pesticides should be evaluated. The first is reducing the number of black fly breeding areas. This may include removal (physical and/or chemical) of vegetation and other objects in streams to reduce the number of larval habitats. The second 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.

3.2.1.7 Other Flying Insect or Pest - 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.

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. 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 waters of the U.S., 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 operators can limit the number of applications necessary to treat any given stream and thereby reduce pesticide discharge into waters of the U.S.

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. 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.

Recommended Black Fly Control References

The following sources are recommended for additional information on pest management measures 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/

3.2.2 Weed, Algae, and Vegetation (herbaceous and woody) Control – Pest Management Measure

Background

Weeds, algae, and vegetation that negatively affect aquatic biodiversity, human health, and economic stability are considered to be pests. Weeds, algae, and vegetation can decrease populations of native aquatic species including threatened and endangered species. Weeds, algae, and vegetation 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 water bodies, 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 section 3.2.2, apply to pesticide discharges associated with management of weed, algae, and vegetation 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 (2).

Most aquatic plants and algae are largely beneficial to water quality, especially when present in the appropriate densities. However, overabundant native algae and 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 water body, and increase the risk of human diseases by providing ideal vector breeding grounds.

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.

Weeds

Weeds include floating, emergent, or submerged plants that negatively impact the quality and utility of waters of the U.S. 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 will 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. http://cenapa.ucdavis.edu/files/54815.pdf).

Vegetation

Vegetation, both herbaceous and woody, that grows at and above the water's edge includes (but are not limited to) trees, cactus, and the like. Vegetation can create a environmental or aesthetic nuisance as well as increase potential for flooding by way of reduced channel flow. Control options include mechanical, biological, and chemical methods.

The appropriate type of control for weeds, algae, and vegetation 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.

3.2.2.1 Weed, Algae and Vegetation Control Practices - Identify the Problem

Prior to the first pesticide application covered under this permit that will result in a discharge to waters of the U.S., and at least once each calendar year thereafter prior to the first pesticide application for that calendar year you must do the following for each pest management area. Operators must identify the pest problem in their pest management area prior to the first application covered under this permit. Knowledge of the pest problem is an important step to developing pest management strategies. Re-evaluation of the pest problem is also important to ensure pest management strategies are still applicable. Operators must identify the pest problem at least once each calendar year prior to the first application for that calendar year.

Identify areas with weed, algae, or vegetation 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 water bodies 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 weeds and algae from the public.

Identify target weed species. Positive identification of the weed, algae, or vegetation is required because many species within the same genera may require different levels and types of control measures species. Weed, algae, and vegetation identification is important when determining the best pest management strategy for each particular species and for determining application areas. 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, algae, or vegetation 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, algae, and vegetation 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, algae, vegetation 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, see section 6 for documentation requirements regarding why current data are not available and the data you used to meet the permit conditions in section 3.2.2.1. Operators may use historical data or neighboring district data to identify the species and establish action thresholds.

3.2.2.2 Weed, Algae and Vegetation Control Practices - Pest Management

Prior to the first pesticide application covered under this permit that will result in a discharge to waters of the U.S., 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 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. Operators must evaluate and implement a pest management strategy to minimize pesticide discharge into waters of the U.S. prior to the first pesticide application covered under this permit. 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. 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, algae, or vegetation 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 water body uses.

Prevention

Preventing introductions of possible weeds, algae, and vegetation 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, algae, and vegetation, 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 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 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 (1) or two (2) 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.[2]

[2] http://www.grounds-mag.com/mag/grounds_maintenance_weeds_overboard/

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 weeds, algae, and vegetation may be achieved through the introduction of diseases, predators, or parasites. While biological controls generally have limited application for control of weeds and algae, the 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 aquatic plants. Aquatic herbicides are spray 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.[3]

3.2.2.3 Weed, Algae and Vegetation Control Practices - 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, algae, and vegetation 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.

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 minimum effective application rate. Also, the 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. 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

[3] http://www.ecy.wa.gov/programs/wq/plants/management/aqua028.html

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, Algae and Vegetation Control References

The following sources are recommended for additional information on pest management measures and BMP's for 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)

3.2.3 Nuisance Animal Control

Background

Nuisance animals, such as fish, lampreys, and mollusks, 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 water bodies, 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 and impede the environmental stability and use goals for a body of water, control measures will become necessary.

The requirements in this section apply to pesticide discharges associated with management of nuisance animals including, but not limited to, fish, lampreys, and mollusks. Nuisance animal control includes management of nuisance species in waters of the U.S. including but not limited to lakes, ponds, rivers, estuaries, and streams. As a part of a nuisance animal control program, a pest management strategy should consider mechanical, biological, and chemical controls. Details for identifying aquatic 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 waters of the U.S. 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.

Lampreys

There are approximately 40 species of lamprey, which are aquatic vertebrates. The sea lamprey is an example of a problematic non-native parasitic species that feeds on native fish species in U.S. waters, although not currently in Arizona. Lampreys may be managed using lampricides that are applied directly to the waters of the U.S. 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.

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 nuisance animals; however, it is important to consider the impacts of mechanical, biological, and/or chemical pesticide use for control of mussels and other nuisance mollusk species.

Other Nuisance Animals

There may be nuisance animals of concern in addition to fish, lampreys, and mollusks. Control of other aquatic animals including, but not limited to, crustaceans found to be a nuisance and requiring management with mechanical, biological, and/or chemical pesticides are included in the requirements in section 3.2.3.

The appropriate type of control for 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.

3.2.3.1 Nuisance Animal Control - Pest Management Measures

Identify the Problem

Prior to the first pesticide application covered under this permit that will result in a discharge to waters of the U.S., and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, you must do the following for each pest management area. Operators must identify the pest problem in their pest management area prior to the first application covered under this permit. Knowledge of the pest problem is an important step to developing pest management strategies. Re-evaluation of the pest problem is also important to ensure pest management strategies are still applicable. Operators must identify the pest problem at least once each calendar year prior to the first application for that calendar year

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 water bodies 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 nuisance animals from the public.

Identify target nuisance animal species. Positive identification of the 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 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, see section 6 for documentation requirements regarding why current data are not available and the data you used to meet the permit conditions in section 3.2.3.1. Operators may use historical data or neighboring district data to identify the species and establish action thresholds.

3.2.3.2 Nuisance Animal Control - Pest Management

Prior to the first pesticide application covered under this permit that will result in a discharge to waters of the U.S., 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 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.

Operators are required to evaluate and implement a pest management strategy to minimize pesticide discharge into waters of the U.S. prior to the first pesticide application covered under this permit. 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. 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 a 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 (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 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 and Biological Control

Mechanical and biological 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 of nuisance animals may be achieved through the introduction of diseases, predators, or parasites. While biological control generally has limited application for control of nuisance animals, 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 nuisance animal control.

Pesticide

Chemical and biological pesticides such as lampricides, molluscides, and piscicides, are registered for use to control nuisance animals. These pesticides are specifically formulated for use in water where 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.

3.2.3.3 Nuisance Animal Control - 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 PMM plan, tailored to the regional conditions. The PMM 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 must 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 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. 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

The following sources are recommended for additional information on pest management measures 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)

3.2.4 Forest Canopy Pest Control - Pest Management Measures

Background

The forest canopy is the uppermost level of the forest. It is composed of mature treetops, or the crowns of the mature trees. It provides habitat for animals and plants, some of whom live their entire lives in the canopy. Pests that threaten the health of the forest canopy must be controlled to maintain forest health. Forest canopy pest control programs are designed to integrate environment-friendly control measures (e.g., sterile insect release, pheromone trapping, mating disruption, etc.) to reduce losses and pesticide use. But pesticide applications may aerially blanket large tracts of terrain to control an entire population of pests within a delimited geographic area or be applied via ground application techniques.

Forest canopy pest control programs included in this permit are pesticide applications that may inadvertently expose waters of the U.S. to direct, but limited, pesticide application. Forest canopy pest control can be directed at a variety of pests, but primarily insects. Forest canopy pest control programs are utilized to prevent habitat elimination/ modification, economic losses (e.g., habitat aesthetics, tree losses), quarantine pest outbreaks, and eradicate or prevent the spread of introduced invasive species. Therefore, forest canopy pest management programs provide environmental, economic, and quality of life benefits in the U.S.

The type of forest canopy pest control is dictated by the biology of the target pest and by environmental conditions and concerns for a specific area. Forest canopy pest control programs are primarily conducted at the state and federal level but may also be conducted at the local/community level.

This permit requires PMM programs to incorporate, but not be limited to, the following components: problem identification, mapping/planning, pest survey, cultural control, biological control, chemical control, and education.

3.2.4.1 Forest Canopy Pest Control - Identify the Problem

Prior to the first pesticide application covered under this permit that will result in a discharge to waters of the U.S., and at least once each calendar year thereafter prior to the first pesticide application in that calendar year, you must do the following for each pest management area. In order to reduce pesticide discharge into waters of the U.S. associated with forest canopy pest control, it is important for operators to 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.

Establish target pest densities to serve as action threshold(s) for implementing pest management strategies. Operators must develop action thresholds for the target pests prior to 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.

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 a forest canopy pest control system. 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 waters of the U.S. 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.

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.

The third component of problem identification is to 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, see section 6 for documentation requirements regarding why current data are not available and the data you used to meet the permit conditions in section 3.2.4.1. Operators may use historical data or neighboring district data to identify the species and establish action thresholds.

3.2.4.2 Forest Canopy Pest Control - Pest Management

Prior to the first pesticide application covered under this permit that will result in a discharge to waters of the U.S., 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 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. An example of mechanical control in a forest canopy would be egg mass removal (gypsy moth).

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 Pesticide Management Measures. The latter two (2) 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.

3.2.4.3 Forest Canopy Pest Control - 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. Operators must apply pesticides only as needed as determined by pre-established criteria and pest action thresholds. 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, operators can make informed decisions which serve to increase the effectiveness of their control programs and minimize the potential for pesticide discharge to waters of the U.S. 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 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, and 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

The following sources are recommended for additional information on pest management measures 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

3.2.5 Specific Approval - Pest Management Measures

Background

This permit anticipates an operator may wish to conduct a pesticide discharge activity that is not otherwise characterized by one (1) of the four (4) defined use patterns, but may be within the purpose and intent of the general permit. In such cases, the operator must submit an NOI and prepare and submit a PDMP to the department for consideration. The PDMP must address the following pest management measures.

3.2.5.1 Specific Approval - Identify the Problem -

Prior to the first pesticide application covered under this permit that will result in a discharge to waters of the U.S., and at least once each calendar year thereafter prior to the first pesticide application in that calendar year, you must do the following for each pest management area. In order to reduce pesticide discharge into waters of the U.S. it is important for operators to 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.

Establish target pest densities to serve as action threshold(s) for implementing pest management strategies. Operators must develop action thresholds for the target pests prior to 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.

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 a forest canopy pest control system. 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 waters of the U.S. 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.

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.

The third component of problem identification is to 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, see section 6 for documentation requirements regarding why current data are not available and the data you used to meet the permit conditions in section 3.2.5.1. Operators may use historical data or neighboring district data to identify the species and establish action thresholds.

3.2.5.2 Specific Approval – Pest Management

Prior to the first pesticide application covered under this permit that will result in a discharge to waters of the U.S., 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. 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 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 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 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 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.

Biological control of pests may be achieved through the introduction/enhancement of diseases, predators, or parasites. In addition, pest control programs aimed specifically at insects may also utilize sterile insect release, mating disruption, and biological pesticides.

Cultural Method

Cultural control methods are strategies that make the habitat unsuitable for a pest. The PDMP must provide a discussion of cultural methods that were considered and a rationale as to why the cultural method would or would not be appropriate.

Pesticide

The PDMP must identify the pesticide being considered for use, action threshold(s), the need and intended purpose, and how the product will be applied (aerially, truck mounted equipment, etc.).

3.2.5.3 Specific Approval – 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. Operators must apply pesticides only as needed as determined by pre-established criteria and pest action thresholds. 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. 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, operators can make informed decisions which serve to increase the effectiveness of their control programs and minimize the potential for pesticide discharge to waters of the U.S. 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 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. 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.

4.0 Water-Quality-Based Effluent Limitations

The CWA requires NPDES permits to include technology-based effluent limitations for all discharges and then if necessary for a specific discharge, water quality based effluent limitations (WQBELs). Permit writers are to assess whether the technology-based effluent limitations are protective of water quality standards and if not, permit writers must also include WQBELs as necessary to ensure that the discharge will not cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality (see 40 CFR 122.44(d)). In developing WQBELs; permit writers must consider the potential impact of every proposed surface water discharge on the quality of the receiving water. 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, in general, ADEQ includes a narrative statement that addresses WQBELs. In this permit the WQBEL is as follows:

> *All operators must control discharges as necessary to meet applicable numeric and narrative state, territory, or tribal water quality standards for any discharges authorized under this permit, with compliance required upon beginning such discharge.*
>
> *If at any time an operator becomes aware (e.g., throuugh self-monitoring or by notification), or ADEQ determines, that the pesticide discharge causes or contributes to an excursion of applicable water quality standards, you must take corrective action as required in section 7.*

The first sentence includes the general requirement to control discharges as necessary to meet water quality standards, while the second sentence implements this requirement in more specific terms by imposing on operators a responsibility to take corrective action in response to an excursion of applicable water quality standards, whether discovered by ADEQ or by the operator. Failure to take such corrective action is a violation of the permit. Additionally, ADEQ may determine that additional technology-based and/or water quality-based effluent limitations are necessary, or may deny coverage under this permit and require an application for an individual AZPDES permit, pursuant to section 2.7 of the permit.

Each operator is required to control its discharge as necessary to meet applicable water quality standards. In general, ADEQ expects that compliance with the other conditions in this permit (e.g., the technology-based limitations, corrective actions, etc.) will result in discharges that are controlled as necessary to meet applicable water quality standards based on the cumulative effect of the following factors, which are described in more detail below:

a. Under FIFRA, EPA evaluates risk associated with pesticides and mitigates unreasonable ecological risk. Compliance with FIFRA is assumed.

b. EPA evaluated national–scale ambient monitoring data, as well as the frequency of the identification of specific pesticides as the cause of water impairments, to assess whether pesticide residues are currently present in waters at levels that would exceed water quality standards. The monitoring data show that, in most samples, most pesticides were below ambient water quality criteria or benchmarks developed by EPA's Office of Pesticide Programs (OPP) as indicators of narrative water quality criteria. For the small number of pesticides found in monitoring data to be present above such benchmarks, the evaluation, as summarized in Appendices B and C of this fact sheet, also documents risk mitigation actions taken by EPA (such as cancellation of pesticide uses) that are expected to reduce the levels of those pesticides in water.

c. Technology-based effluent limitations in the PGP provide further protections beyond compliance with existing FIFRA requirements.

d. Biological pesticides discharged to waters, by regulatory definition, do not work through a toxic mode of action. For chemical pesticides, the discharges covered under this permit are the residues after the pesticide has performed its intended purpose. Thus, the residue will be no higher than, and in many instances, lower than, the concentration of the pesticide as applied.

e. The PGP puts additional requirements on pesticide discharges to impaired waters (if impaired for the pesticide being considered for use) and outstanding Arizona waters.

This permit requires permittees to control discharges as necessary to meet applicable water quality standards. When the operator or ADEQ determines a discharge will cause or contribute to an excursion above any WQS, including failure to protect and maintain existing designated uses of receiving waters, the operator must take corrective action to ensure that the situation is eliminated and will not be repeated in the future (see section 7.0). If additional control measures are required, ADEQ expects the operator to vigilantly and in good-faith follow and document, as applicable, the process for BMP selection, installation, implementation and maintenance, and cooperate to eliminate the identified problem within the time frame stipulated in section 7.0 of the PGP.

5.0 Site Monitoring

Monitoring is required in any AZPDES permit specifically for the purpose of demonstrating compliance with the permit conditions. There are a variety of monitoring methods that a "traditional" AZPDES permit may require, including end-of-pipe monitoring to show compliance with relevant effluent limitations prior to discharging to a receiving waterbody. Monitoring may also pertain to actions taken to ensure that record keeping or other permit control activities are being properly implemented. Water quality monitoring of receiving streams is not typically required in AZPDES permits unless it is required to determine among other things, compliance with mixing zone dilution standards or some other special permit condition.

Pursuant to CWA section 308 and 402(a)(2), 40 CFR 122.43(a), and other applicable implementing regulations, the following requirements have been included in the permit, as discussed below. 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. For instance, the permit requires routine visual inspections (described below) to be conducted as part of the pest treatment activity or as part of post-application pest surveillance, and calls for records of the pesticide discharge volume to be kept. The monitoring requirements of the permit are reasonable measures of good pest management practice that the conscientious operator should be currently employing to ensure environmental health and safety and optimal control of pest organisms.

Monitoring of pesticide discharges poses several challenges not generally encountered in "traditional" AZPDES permitting situations. For example, there is no "wastewater discharge" per se from pesticide applications that is analogous to end-of-pipe discharges. A manufacturing plant would, for example, typically direct its wastewater through a treatment system to remove pollutants, and then would direct the effluent through a pipe into a receiving waterbody. However, for chemical pesticide applications, at the time of application the pesticide contains both the portion serving its intended purpose as well as the potential residual for which monitoring data would be appropriate. Thus, monitoring the "outfall" in this case would merely provide data on the amount of the product as applied (information already known through the FIFRA registration process) and would not be useful for comparing with any type of effluent limitation or water quality standard.

This permit does not require ambient water quality monitoring for the following reasons:

1. Lack of applicable measurable standards: Pesticide-specific water quality standards do not exist at this time for the vast majority of constituents in the products authorized for use under this PGP.

2. Safety and Accessibility: Pesticides, particularly those used for mosquito control and forestry pest control, are often applied over waterbodies in remote areas, hazardous terrain, and swamps that are either inaccessible or pose safety risks for the collection of samples.

3. Difficulty of residue sampling for chemical pesticides: For chemical pesticides, the "pollutant" regulated by the PGP is the residue that remains after the pesticide has completed its activity, and it is this residue that would be the subject of any water quality monitoring requirement. However, the point at which only "residue" remains is not practically discernable at this time for all pesticides.

4. Usefulness of data: Some states have questioned the value of ambient water quality monitoring data obtained from state permitting programs. The data generally showed that water quality impacts were not occurring, and one (1) state even discontinued the requirement in revisions of its state permit.

Given the questionable ability of ambient water quality data to demonstrate permit compliance, the department believes there are suitable alternative monitoring activities to determine permit compliance, other than ambient water quality monitoring, for this permit.

Thus, the monitoring program required under this PGP is tailored to accommodate the unique situations related to pesticide applications. Visual monitoring is required in the PGP to determine if any pesticide use practices may need to be revised to ensure that avoidable adverse impacts to the environment do not occur. Monitoring records will establish a history that may indicate if or when practices need to be reconsidered.

5.1 Monitoring Requirements for Applicators

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 operator's use of pesticides in a given area. This requirement consists of visually monitoring the area to and around where pesticides are applied for possible and observable adverse incidents, such as unanticipated death or distress of non-target organisms and disruption of wildlife habitat, recreational or municipal water use.

Visual monitoring assessments are required during the pesticide application when feasibility and safety allow. Visual monitoring is not required during the course of pesticide application when that application 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:

1. Applications made from an aircraft
2. Applications made from a moving road vehicle when the applicator is the driver
3. Applications made from moving watercraft when the applicator is the driver
4. Applications made from a moving off-road wheeled or tracked vehicle when the applicator is the driver.

5.2 Visual Monitoring Requirements

Visual monitoring must also be conducted during any post-application surveillance, such as to determine the efficacy of the pesticide application. Visual monitoring of this type is required of all operators but only if the operator, be it the applicator or the decision-maker or both, performs post application surveillance in the course of business. ADEQ expects that post-application visual assessments are reasonably conducted on foot or from a stationary vehicle, although they might also be conducted from a moving vehicle, including a boat or plane, in certain circumstances.

6.0 Pesticide Discharge Management Plan (PDMP)

Section 6 of this permit requires decision makers who are required to submit an NOI (pursuant to section 2.4 of the permit) and engages in a pesticide discharge activity that exceeds one or more of the thresholds identified in Table 6.0 to prepare and implement a Pesticide Discharge Management Plan (PDMP).

Table 6.0
Annual Treatment Area Threshold

Pesticide Use	Treatment Threshold
Mosquitoes and Other Flying Insect Pests	
In Water	6,400 acres of treatment area
Weed, Algae and Vegetation Control	
In Water	80 acres of treatment area
At Water's Edge	20 linear miles of treatment area at water's edge
Animal Pest Control	
In Water	80 acres of treatment area
At Water's Edge	20 linear miles of treatment area at water's edge
Forest Canopy Pest Control	
In Water	6,400 acres of treatment area
Discharges to Impaired Waters or Outstanding Arizona Waters	
In Water	Any amount
At Water's Edge	Any amount
Specific Approvals	
In Water	Any amount
At Water's Edge	Any amount

* See the section 11, Annual Treatment Area Threshold for determining area and di

The PDMP must be kept up-to-date for the duration of coverage under this general permit, even if the discharge(s) subsequently falls below one (1) or more of the thresholds identified in Table 6.0.

Developing a PDMP helps operators ensure they have (1) taken steps to identify the pest problem, (2) evaluated pest management options, and (3) included appropriate control measures to control pesticide discharges as required by section 3.2.

Operators, who exceed an annual treatment area due to a declared pest emergency and thus must submit an NOI, 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. Section 6.1 of the permit contains the required elements to be documented in the PDMP.

The PDMP itself does not contain effluent limitations; rather it constitutes a tool both to assist the operator in documenting what control measures it is implementing to meet the 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 to meet effluent limitations, such as in response to a section 7.1 triggering condition, such changes must be documented in the PDMP. If operators fail 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).

Operators may choose to reference other documents, such as a pre-existing integrated pest management (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 operator must have authored the pre-existing plan in order to use it. When referencing other documents the operator is responsible for ensuring his/her PDMP and the other documents together contain all the necessary elements for a complete PDMP, as specified in section 6.1. In addition, the 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 consistent with section 6.3 of the permit.

6.1 Contents of Pesticide Discharge Management Plan

The PDMP prepared under this permit must meet specific requirements under section 6.1 of the permit. Generally, operators must document the following: (1) a pesticide discharge management team; (2) a description of 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.

6.1.1 Pesticide Discharge Management Plan Team

The permit requires that a qualified individual or team of individuals be identified (by name, position, and/or title) to manage pesticide discharge, including the pesticide applicator. If the pesticide applicator has not been identified at the time of the plan development, the 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 operator 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. ADEQ expects most operators will have more than one (1) 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.

6.1.2 Pest Problem Identification

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

1. Pest Problem Description.

The permit requires that the PDMP include a description of the pest problem at the pest management area. A detailed pest management area description assists Decision-makers in subsequent efforts to identify and set priorities for the evaluation and selection of Pest Management Measures taken to meet effluent limitations set forth in Parts 2 and 3 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 historical data or other available data (e.g., 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 permit requires that the PDMP include a description of the action threshold(s) established for the target pest, including a description of how they were determined and method(s) to determine when the action threshold(s) has been met. An action threshold is a level of pest prevalence (or other indicator) at which an Operator takes action to reduce the pest population.

3. General Location Map

The PDMP must also 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 Waters of the United States. 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 any Tier 3 (Outstanding National Resource Waters and any water(s) impaired for a specific pesticide or its degradates to which there may be a discharge. Internet links to all state, territory and tribal water quality standards are available at: http://epa.gov/waterscience/standards/wqslibrary/.

6.1.3 Description of Pest Management Measures Options Evaluation

The permit requires that the PDMP include a description of the control measures to demonstrate how the operator(s) specifically plan to meet the applicable technology-based or water quality-based effluent limitations. The description of the control measures selected to meet the effluent limitations must include a brief explanation of the control measures used at the site to reduce pesticide discharge, including evaluation and implementation of the six (6) 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 waters of the U.S.

All six (6) 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 (6) pest management tools were evaluated prior to selecting a site specific pest management strategy. For the no action option, operators should document the impact of this option without any current pest management strategy at the site. For the prevention management option, the 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, 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 waters of the U.S.

6.1.4 Response Procedures

The following procedures necessary to minimize discharges must also be documented in the PDMP.

1. 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.

2. Adverse Incident Response Procedures

In the PDMP, operators must 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; and (including police and fire department).

6.1.5 Signature Requirements

The PDMP must be signed and certified in accordance with the signatory requirements in the Standard Permit Conditions section of the permit. This requirement is consistent with standard permit conditions described in 40 CFR 122.22 and is intended to ensure that the operator understands his/her 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.

6.2 Pesticide Discharge Management Plan Modifications

This permit requires that the PDMP be updated whenever any of the triggering conditions for corrective action in section 7.1 of the permit occur, or when a review following the triggering conditions in section 7.1 requires the operator to revise his/her control measures as necessary to meet the effluent limitations in this permit (section 3). Keeping the PDMP up-to-date will help the operator ensure that the condition that triggered the corrective action does not reoccur. 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 in accordance with section 6.2 is a recordkeeping violation, not a violation of an effluent limit. For example, if the operator changes its maintenance procedures, but fails to update its PDMP to reflect these changes, a recordkeeping violation will result. The operator must revise its PDMP to reflect the new maintenance procedures and include documentation of the corrective action to return to full compliance.

6.3 Pesticide Discharge Management Plan Availability

This permit requires that a copy of the current PDMP, along with all supporting maps and documents, be kept at the address provided on the NOI. The PDMP and all supporting documents must be immediately available to representatives of ADEQ, EPA, or local agency governing pesticide applications, as well as representatives of the U.S. Fish and Wildlife Service (USFWS) and the Arizona Game and Fish Department at the time of an on-site inspection or

upon request. This requirement is consistent with standard permit conditions described in 40 CFR 122.41. Section 6.3 of this permit indicates that ADEQ 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 ADEQ.

7.0 Corrective Action

The purpose of including corrective action requirements in this permit is to assist this new universe of AZPDES permittees with effectively meeting technology-based and water-quality-based effluent limitations and implementing integrated pest management practices in this permit. Corrective actions in this permit are follow-up actions a permittee must take to assess and correct problems. They require review and revision of control measures and pesticide application activities, as necessary, to ensure that these problems are eliminated and will not be repeated in the future. The permit makes clear that the permittee is expected to assess why a specific problem has occurred and document what steps were taken to eliminate the problem. ADEQ believes this approach will help permittees in complying with the requirements of the permit quickly. 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.

7.1 Situations Requiring Revision of Pest Management Measures

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

- An unauthorized release or discharge occurs;
- An operator becomes aware, or ADEQ determines, that control measures are not effective enough for the discharge to meet applicable water quality standards;
- Any monitoring activities indicate failure to meet applicable technology-based effluent limitations in Part 2
- An inspection or evaluation of your facility by ADEQ, EPA, or local entity, determines that modifications are necessary to meet the non-numeric effluent limits detailed in section 3 of the PGP; or
- An operator 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.

ADEQ considers the above situations to be of significant concern. Thus, the department is requiring operators to assess the cause of these situations which may be affiliated with the discharge from the application of pesticides and take any necessary steps to eliminate the situation and ensure that the situation will not be repeated in the future.

The purpose of section 7.1 is to ensure compliance with corrective action requirements through increased accountability and oversight. ADEQ considers ongoing assessment of control measure effectiveness and corrective actions integral to an effective pesticide management program. This corrective action assessment must be kept with the other recordkeeping documentation required by this permit.

7.2 Corrective Action Deadlines

The permit requires that corrective action be completed "before or, if not practicable, as soon as possible after the next pesticide application that results in a discharge." ADEQ emphasizes that this timeframe is not a grace period within which an operator is relieved of any liability for a permit violation. ADEQ is adopting this flexible deadline to account for the variation in types of responses (e.g., evaluate situation and select, design, install, and implement new or modified Pest Management Measures) that may be necessary to address any identified situations of concern. ADEQ recognizes that in rare cases a corrective action review may identify the need for substantial improvements to the operator's Pest Management Measures, and does not want to limit the selection and implementation of such controls with an inflexible deadline. Another possibility is that ADEQ or the operator may determine that further monitoring is needed under section 7.3 of the permit to pinpoint the source of the problem, and this monitoring may need to be conducted during future pesticide application activities. However, ADEQ believes that in the vast majority of cases, corrective action reviews will identify responses that can be taken quickly, either before the next pesticide application that results in a discharge or shortly thereafter.

7.3 Effect of Corrective Action

The occurrence of a situation described in section 7.1 may, but does not implicitly, constitute a violation of the permit. The occurrence of a situation identified in section 7.1 does require the operator to immediately review and as necessary, revise the selection and implementation of their control measures to eliminate the situation. Section 7.3 explains that taking corrective action does not absolve the operator of any liability for a permit violation requiring that action, however, failure to take required corrective action will constitute an original or an additional permit violation. ADEQ 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 section 7.1 if such requirements conflict.

7.4 Adverse Incident Documentation and Reporting

Section 7.4 of the PGP requires operators to take specific actions in response to identified adverse incidents which may have resulted from a discharge from the operator's pesticide application. Operators are required to provide verbal notice to ADEQ within 24 hours and then follow-up with a written report within thirty (30) days of becoming aware of the adverse incident. A "adverse incident" (as defined in the permit) generally is defined as any effect of a pesticide's use that is unexpected or unintended.

Section 7.4.1 requires operators to call ADEQ within 24 hours of any identified adverse incident and provide basic information about it. The purpose of this requirement is twofold: (1) to provide an opportunity for ADEQ to respond to these incidents as soon as reasonably can be expected, and (2) to provide a basis for potential corrective actions. 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 operators to document the information identified in 7.4.1, including the date and time you notified ADEQ and a description of any deviations from 7.4.1 notification requirements based on nuances of the adverse incident. For example, a permittee may decide to notify multiple ADEQ 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.

Section 7.4.2 requires permittees to provide a written report of the adverse incident to ADEQ within thirty (30) days of discovering the adverse incident. The adverse incident report must include the following information:

- Information required to be provided in section 7.4.1

- Date and time you contacted ADEQ notifying the department of the adverse incident;
- Location of incident, including the names of any waters affected and appearance of those waters (sheen, color, clarity, etc.)
- 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)
- Pesticide application rate, intended use site (e.g., banks, above, or directly to water), and method of application;
- 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.

ADEQ believes adverse incident information associated with discharges from the application of pesticides is useful to the Agency because the information:

- Provides the department with an indication of the effectiveness of the permit in controlling discharges to protect water quality, including data upon which ADEQ may base future permit decisions (e.g., modifications to or reissuance of this permit).
- May be considered when reviewing applications for registration of new pesticides that are chemically similar to existing pesticides;
- May be considered in ecological risk assessment and during deliberations on risk management decisions;
- May be reviewed to determine trends that may indicate potential ecological impacts with an existing pesticide and/or to track improvements when mitigation measures are applied;
- Provides information on the nature, extent, and severity of incidents to decision-makers, stakeholders, and the public; and
- Provides the agency with information on which to assess compliance with regulatory requirements, including documentation and reporting.

Currently, there is no database that includes adverse reporting from anyone other than the registrant under 6(a)(2) of FIFRA. ADEQ does not consider inclusion of adverse incident reporting in the AZPDES permit to be a duplicative requirement to the FIFRA section 6(a)(2) requirements for registrant reporting of adverse incidents. This is because pesticide registrants are not likely to be directly covered under the PGP. Requiring the reporting of adverse incidents and follow-up corrective actions may address the lack of a universal, mandatory legal duty for pesticide users to report adverse incidents, at least for the pesticide use patterns covered by this permit.

The department acknowledges that assessing and correcting adverse incidents may be complicated in certain instances. For example, symptoms associated with adverse incidents are often vague or mimic other causes which may lead to incorrect diagnoses. Thus, it may be difficult to identify and track chronic effects resulting from pesticides discharges. It may also be difficult to observe adverse effects because of limited visibility or access such as dead fish poisoned in a wetland under dense vegetation or in sparsely populated areas or because scavengers scatter or devour carcasses before discovery. However, ADEQ believes that it is important to identify to the extent feasible situations where adverse effects occur where discharges from the application of pesticides also occur.

Immediately observable signs of distress or damage to non-target plants, animals and other macro-organisms within the treatment area may warrant concern for a possible adverse incident related to a discharge of pesticides during application. ADEQ acknowledges that some degree of detrimental impact to non-target species is to be expected and is acceptable during the course of normal pesticide treatment. ADEQ expects 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.

During a visual inspection, operators should watch for distressed or dead juvenile and small fishes, washed up or floating fish, fish swimming abnormally or erratically, fish lying lethargically at the water surface or in shallow water, fish that are listless or nonresponsive to disturbance, the stunting, wilting, or desiccation of non-target submerged or emergent aquatic plants, and other dead or visibly distressed non-target organisms including amphibians, turtles, and macro-invertebrates. These 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). It should be noted that observation of these 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 Pest Management Measures.

Complete information concerning adverse impacts will aid ADEQ in any review of current or future pesticide use, adherence to control measures, and BMP effectiveness. Reporting of adverse incidents is not required under this permit in the following situations:

- You are aware of facts that clearly establish that the adverse incident was not related to toxic effects or exposure from the pesticide application;
- You have been notified in writing by EPA that the reporting requirement has been waived for this incident or category of incidents;
- You receive information notifying you of an adverse incident but that information is clearly erroneous; and
- An adverse incident occurs to pests that are similar in kind to pests identified as potential targets on the FIFRA label.

However, records of all visual inspections, even for these situations, must be kept by the operator.

7.5 Reportable Spills and Leaks

Section 7.5.1 requires operators to call the National Response Center (NRC) to report any spill or leak of a hazardous substance or oil into waters of the U.S with 24 hours of becoming aware of the spill or leak.[4] Section 7.5.2 requires operators to document this notification within thirty (30) days of becoming aware of such spill or leak. This documentation provides a written record of what was reported verbally. It should also include a description of the reporting system that will be used to alert responsible managers and legal authorities in the event of a future spill or leak and a description of preventive measures to prevent, contain, or treat spills and leaks of these materials. Section 7.4.3 requires operators to notify the U.S. Fish and Wildlife Service and Arizona Game and Fish Department if the operator becomes aware of an incident that may have resulted from a discharge from your pesticide application that adversely affects a federally-listed threatened or endangered species. This information will be used to ascertain compliance with permit conditions.

7.6 Documentation for Other Corrective Action

For any event described in section 7.1 of the permit, other than for adverse incidents or reportable spills or leaks, immediate reporting to ADEQ is not required, but operators must document basic information describing the event and the operator's response to that event within thirty (30) days. For triggering events in section 7.1, where the operator determines that any revision to control measures is not necessary, the operator must still document the review and the basis for this determination. ADEQ is not requiring operators to submit this documentation to the department. Rather, ADEQ expects operators to retain this information and upon request, to make any such records available to ADEQ, EPA, or any other state, federal, or local regulatory

[4] Reportable Spills and Leaks are defined as those that trigger the requirement to notify the National Response Center (40 CFR Parts 110, 117, 302) based on the type of pollutant and quantity released.

agency governing pesticide applications. A summary of this information must also be included in the annual report for operators subject to the annual reporting requirement.

8.0 Recordkeeping and Annual Reporting

This permit requires operators to maintain certain records to help them assess performance of control measures and to document compliance with permit conditions. These requirements are consistent with federal regulations at 40 CFR 122.41(j), but have been tailored to more closely reflect requirements of the PGP. Section 8 of this permit describes recordkeeping requirements for all operators and the requirements for certain operators (i.e., those large applicators that are required to submit an NOI). Operators can rely on records and documents developed for other programs, such as requirements under FIFRA, provided all requirements of the permit are satisfied.

8.1 Record to be kept by all Operators (all Decision-makers and all Applicators)

These records must be kept by all operators, including those not submitting an NOI. Although this section is a universal requirement, these particular records are necessary only in theevent of an adverse incident, the case that corrective action was required, or in the event of a discharge resulting from a spill or leak.

- A copy of any Adverse Incident Reports;
- Rationale for any determination that reporting of an identified adverse incident is not required; consistent with allowances identified in section 7.4.1;
- A copy of any spill and leak or other unpermitted discharge documentation; and
- A copy of any corrective action documentation (see section 7.6)

8.2 Record to be kept by all For-hire Applicators

All operators who are For-Hire Applicators as defined in Section 11 must keep the records listed above, as well as records that specifically document pesticide application equipment maintenance and details of the pesticide application event. Since decision-makers who are not themselves performing pesticide applications are generally not able to record such information, ADEQ requires different recordkeeping requirements depending on the type of Operator.

a. Documentation of equipment calibration; and
b. Information on each treatment area to which pesticides are discharged, including:
    1. Description of each treatment area, including location and size (acres or linear feet) of treatment area and identification of any waters, either by name or by location, to which pesticide(s) are discharged;
    2. Pesticide use pattern(s) (i.e., mosquito and other flying insects, weed and algae, animal pest, or forest canopy);
    3. Target pest(s);
    4. Documentation of any assessment of weather conditions in the treatment area prior to and during application to ensure application is consistent with all applicable federal requirements;
    5. Name of each pesticide product used including the EPA registration number;
    6. Quantity of each pesticide product applied to each treatment area;
    7. Pesticide application date(s); and
    8. Whether or not visual monitoring was conducted during pesticide application and/or post-application and if not, why not and whether any unusual or unexpected effects identified to non-target organisms.

8.3 Records to be kept by all Decision-Makers Required to Submit a NOI and Prepare a Pesticide Discharge Management Plan

Any decision-maker that is required to submit an NOI and prepare a Pesticide Discharge Management Plan is required to keep the records listed in section 8.3 of the permit. The information will allow ADEQ to better characterize the discharges resulting from pesticide applications in a variety of different circumstances.

Decision-makers who are required to submit an NOI and required to prepare a Pesticide Discharge Management Plan must keep the following records:

a. Copy of the NOI submitted to ADEQ, any correspondence exchanged between the decision-maker and ADEQ specific to coverage under this permit, and a copy of the ADEQ acknowledgment letter with the assigned permit tracking number;
b. A copy of the PDMP, including any modifications made to the PDMP during the term of this permit;
c. Copy of any annual reports;
a. Documentation of equipment calibration (only if decision-maker is also the applicator);
e. Information on each treatment area to which pesticides are discharged, including:
    1. Description of each treatment area, including location and size (acres or linear feet) of treatment area and identification of any Waters of the United States, either by name or by location, to which pesticide(s) are discharged;
    2. Pesticide use pattern(s) (i.e., mosquito and other flying insects, weed and algae, animal pest, or forest canopy);
    3. Target pest(s) and explanation of need for pest control;
    4. Action Thresholds;
    5. Method and/or data used to determine that action threshold(s) has been met;
    6. Description of pest management measure(s) implemented prior to the first pesticide application;
    7. Company name and contact information for pesticide applicator;
    8. Name of each pesticide product used including the EPA registration number;
    9. Quantity of each pesticide product applied to each treatment area;
    10. Pesticide application date(s); and
    11. Whether or not visual monitoring was conducted during pesticide application and/or post-application and if not, why not and whether any unusual or unexpected effects identified to non-target organisms.

8.4 Records Schedule

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 3 years from the date their coverage under this permit expires or is terminated.

ADEQ recommends that all decision-makers keep records of acres or linear miles treated each calendar year for all applicable use patterns covered under this general permit. This record will help decision-makers estimate when they will exceed the annual treatment area threshold.

8.5 Annual Reporting

In addition to recordkeeping, all operators who are required to submit an NOI and who exceeds one (1) or more of the thresholds identified in Table 3.2 must prepare an annual report on a form provided by the department. The annual report must be retained with the SWPPP and available upon request to the department, EPA, or other state, federal, or local department or agency with regulatory authority over the discharge activity.

Additionally, operators who are decision makers engaged in a discharge activity to an impaired water, an outstanding Arizona water, or whose discharge is subject to a specific approval must submit the annual report to the department.

The annual reporting period for all discharges is from January 1 through December 31 of each year. Annual reports for each year shall be included with the SWPPP no later than February 1 for previous reporting year. Annual reports for operators who are required to submit an annual report to the department shall be received by ADEQ no later than February 21 for the preceding reporting period.

The annual report must include information for the reporting period, 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, an annual report for that first partial year is not required, but you must submit annual reports thereafter with the first annual report submitted to also include information from the first partial year. When an operator terminates permit coverage, as specified in section 2.6, the operator must prepare (and submit to ADEQ if required, see above) an annual report for the portion of the year up through the date of terminating permit coverage. The final annual report must be submitted with your Notice of Termination. Information in the annual report will be used by ADEQ to assess permit compliance and to determine whether additional controls on pesticide discharges are necessary to protect water quality. For example, these 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, at a minimum, the following information specific to each pest treatment area covered under the permit:

a. Identification of any waters or other treatment area, including size, either by name or by location, to which you discharged any pesticide(s);
b. Pesticide use pattern(s) (i.e., mosquito and other flying insects and pests, weeds and algae, nuisance animals, forest canopy, or specific approval) and target pest(s);
c. Company name(s) and contact information for pesticide applicator(s), if different from the decision maker;
d. Total amount of each pesticide product applied for the reporting year by the EPA registration number(s) and by application method (e.g., aerially by fixed-wing or rotary aircraft, broadcast spray, etc.);
e. Whether this pest control activity was addressed in your PDMP prior to pesticide application;
f. If applicable, an annual report of any adverse incidents as a result of these treatment(s), for incidents, as described in section 7.4.1; and
g. A description of any corrective action(s), including spill responses, resulting from pesticide application activities and the rationale for such action(s).

9.0 Standard Permit Conditions

Federal regulations require that all permits contain the standard permit conditions specified in 40 CFR 122.41. Those standard conditions with some minor revisions to more clearly address pesticide application activities are included in section 9 of the permit.

10.0 Penalties for Violations of Permit Conditions

Section 10 of the permit informs operators about potential penalties, including fines and possible imprisonment, for violations of permit conditions. It is noted that for pesticide discharge activities involving more than one operators (e.g., decision maker and applicator are different persons), any and all operators covered under this permit, regardless of whether or not they submitted a NOI, are still responsible, jointly and severally, for any violation that may occur, though ADEQ may consider this written division of responsibilities when determining the appropriate enforcement response to a violation

11.0 Definitions and Acronyms

Appendix A of the permit provides permit-specific definitions of statutory, regulatory, and other terms important for understanding this draft permit and its requirements. Any terms that are not listed in this definitions part have the meaning given to the terms by 40 CFR Part 122.2 (the definitions section of the NPDES regulations).

APPENDIX A. Chemicals with exceedances in USGS study and subsequent mitigation measures that reduce pesticide residues in water

Chemical	Action	Date
Alachlor	Reduced maximum application rates and frequency of application; Restricted Use Pesticide; 50 foot setback from waters for mixing and loading; state management plan; spray drift advisory; monitoring program.	1998 Reregistration Eligibility Decision (RED)
Atrazine	Intensive monitoring program	2003 Interim Reregistration Eligibility Decision (IRED)
Diuron Used monitoring data from USGS, Florida & California	Powder formulations cancelled; reduction in application rates and number of applications; no aerial applications for most crops; no treatment of home lawns	2003 RED
Thiobencarb	Application restrictions for LA, TX; label restrictions for catfish/crayfish farming; 14-day holding periods for rice farming; mixing and loading restrictions within 100 ft of water; no applications within 24 hr of rainfall	1997 RED
Azinphos-methyl	All uses to be phased out by 2012; until such time, the following measures imposed: buffer zones; limit maximum usage and frequency; spray drift requirements; prohibit aerial application on most crops; limit maximum usage and frequency	2001 IRED
Carbaryl	Lawn broadcast uses of liquid formulations cancelled; certain other uses and application methods cancelled; reduced application rates for some uses; prohibit most aerial applications	2003 IRED
Carbofuran	Most uses cancelled; for remaining six (6) uses, the agency plans to issue a Notice of Intent to Cancel.	2006 IRED
Chlorpyrifos	Residential uses cancelled; agricultural use restrictions including reduced application rates and fewer applications per season, increase in retreatment intervals and addition of buffer zones around water bodies	2001 IRED
Diazinon	Residential uses and granular uses cancelled; aerial application cancelled; seed treatment uses cancelled	2002 IRED
Disulfoton	Cancelled some uses; reduced application rates and frequency of application for certain crops; buffers zones near water; aerial application prohibited; Notice of Receipt of Voluntary Cancellation of all Product Registrations published 7/22/09. Product Cancellation Order published September 23, 2009.	2002 IRED
Malathion	Some uses cancelled; reduced application rates and frequency of application for many crops; 25 and 50 foot buffer zones for non-ULV and ULV aerial applications near water; droplet size and application altitude specifications for mosquito adulticide use; spray drift minimization label statements for agricultural and public health products; environmental hazard precautionary label statements required for agricultural, public health, and residential products	2006 RED; 2009 RED Revision
Methomyl	Reduced maximum application rates; buffer zones; use rate restrictions; ground water and surface water advisories	1998 RED
Methyl Parathion	Cancelled several fruit and vegetable uses; mixing and loading away from water; reduced application rates and number of applications	2003 IRED
Phorate	Reduced application rates and number of applications; prohibit aerial applications; buffer zones; setbacks from wells	2001 IRED
Propargite	Reduced maximum rates and number of applications; 50 ft	2001 RED

Chemical	Action	Date
	buffer; spray drift label requirement	
Terbufos	Buffer zones and setbacks; reduction in sales; limited mixing and loading near water	2001 IRED
Lindane	All uses cancelled except seed treatment (2002 RED); all remaining uses cancelled effective 7/07	2002 RED; 2006 RED Addendum
Heptachlor/Heptachlor Epoxide	All uses cancelled	1978 Cancellation
Chlordane	All uses cancelled	1978 Cancellation
Molinate	All uses cancelled over five (5) year period - 2008 effective date	2003 Voluntary Cancellation
Ethyl Parathion	All uses cancelled; all products phased out by 2003	2000 Cancellation
Dinoseb	All uses cancelled	1986 Cancellation
Cyanazine	All uses cancelled	1996 Cancellation
DDT/DDE	All uses cancelled	1972 Cancellation
Dieldrin	All uses cancelled	1974 Cancellation
Toxaphene	All uses cancelled	1982 Cancellation
Methoxychlor	All uses cancelled	2004 Cancellation
Endrin	All uses cancelled	1995 Cancellation

APPENDIX B

Summary of Pesticide-Specific Exceedance Data and Risk Mitigation Actions

- Of the 75 pesticides and eight (8) degradates analyzed, 19 pesticides in use at the time of the study were measured at concentrations that exceeded EPA benchmarks: five (5) herbicides (alachlor, atrazine, diuron, molinate, and thiobencarb) and 13 insecticides (azinphos-methyl, carbaryl, carbofuran, chlorpyrifos, diazinon, disulfoton, malathion, methomyl, parathion, methyl parathion, phorate, propargite, and terbufos).
- In addition, DDE, a degradate of DDT, was detected at levels in approximately 20 streams that exceeded EPA benchmarks.
- The uses for five (5) pesticides (diuron, diazinon, chlorpyrifos, parathion, and DDT (degradate DDE)) detected by USGS have been cancelled or significantly limited.
- Five (5) pesticides accounted for the majority of the exceedances: alachlor, azinphos-methyl, atrazine, chlorpyrifos, diazinon, and malathion. These pesticides are discussed in more detail below:

Alachlor

Summary of USGS Findings:

- For alachlor, there were 14 instances where alachlor measured concentrations exceeded a benchmark. Usage of alachlor declined along with number of exceedances throughout the study and following the issuance of EPA's RED in 1998, there were no exceedances observed in the last three (3) years of the study (1999 – 2001).

Azinphos Methyl

Summary of USGS Findings:

- For azinphos-methyl, there were 15 instances where azinphos-methyl measured concentrations exceeded a benchmark. All uses of azinphos methyl will be phased out by 2012.

Atrazine

History:

- Registered in 1958 as a triazine herbicide
- Initiated special review based on carcinogenic potential in 1988
- Risk reduction measures voluntarily initiated by registrant in the 1990s
- Special review for triazines initiated in 1994
- January 2003 IRED specified mitigation measures to reduce risk, including intensive drinking water monitoring of 125 vulnerable CWS
- October 2003 Addendum to IRED concluded not likely to be a human carcinogen; specified ecological monitoring and mitigation program for vulnerable watersheds; and, consistent with FIFRA-SAP review, concluded that available data does not establish atrazine caused developmental effects on amphibians
- Cumulative triazine assessment to be issued later this year and may identify further risk mitigation options

Review Process:

- Extensive public participation review process during reregistration
- Extensive consultation with federal, state, and local regulatory partners, registrants, pesticides users, public interest groups, and other stakeholders
- SAP review of Agency's cancer assessment and ecological risk assessment for amphibians

Mitigation Measures:

- Product use changes required in January, 2003 IRED to reduce exposure to workers and exposure from residential uses
- Intensive and targeted monitoring program of drinking water (raw water at 125 CWS in areas of

atrazine use); if atrazine exceeds EPA's safety standards, use will be prohibited in affected watershed area; complemented by routine SDWA monitoring of finished drinking water and rural well monitoring study
- Ecological monitoring and risk mitigation within 40 representative vulnerable watersheds associated with corn and sorghum production. If watershed exceeds level of concern, remediation measures will be required, and need for further expansion of monitoring will be considered.
- Implementation of testing program to evaluate potential risk to amphibians
- Continue to review ongoing epidemiology and cancer studies and amphibian studies

Summary of USGS Findings:
- Only four (4) exceedances in agricultural streams for the aquatic community benchmark were observed.

Atrazine Ecological Monitoring Program:

- As a condition of reregistration, the registrant must conduct a monitoring program. The purpose of program is to determine the extent to which water bodies in the most vulnerable watersheds may exceed an effects-based benchmark. If a water body exceeds a benchmark, it will be subject to mitigation measures through registrant actions, regulatory options, and/or TMDL-like watershed management programs.
- Endpoint of concern or benchmark is change in aquatic community structure, based in part, on a large number of microcosm and mesocosm studies for atrazine. This is the most sensitive endpoint and considers direct effects on fish and invertebrates and indirect effects on habitat and food sources.
- The FIFRA risk assessment and draft atrazine aquatic life criteria are based on the same endpoint and were jointly prepared.
- Forty representative vulnerable watersheds in corn/sorghum areas (Midwest) are being monitored. Monitoring in the Midwest sites will occur over three (3) years (2004-2006) and each watershed will have a minimum of two (2) years worth of data. Each watershed is sampled every four (4) days; some watersheds are sampled daily.
- Four (4) vulnerable watersheds in sugarcane growing areas (LA, FL) will be monitored; sugarcane monitoring sites will have two (2) years of data from 2005-2006.
- EPA scientists are reviewing the first five (5) years of Midwest data and two (2) years of the sugarcane data for Louisiana. Preliminary analysis suggests that measured concentrations of atrazine in Missouri and Nebraska exceeded the agency's LOC. The agency is evaluating the sugarcane data and has not yet made a determination on those results.

Atrazine Drinking Water Monitoring Program:

- As a condition of reregistration, the registrant must monitor over 130 Community Water Systems (CWSs) in areas of atrazine use in 10 states (Illinois, Indiana, Iowa, Kansas, Kentucky, Missouri, North Carolina, Ohio, Texas, and Louisiana.) If atrazine is detected above agency standards for raw water, the use will be prohibited in that specific watershed area.
- Weekly monitoring through the growing season (generally April through July) with biweekly monitoring for the rest of the year.
- Both raw and finished water are being monitored; some CWSs have more than one (1) raw water source measured.
- There were no exceedances of the human health benchmark, which is 37.5 ppb atrazine and its degradates based on a 90-day average in raw water.

Chlorpyrifos

History and Mitigation Measures:

- Registered in 1965 as an Organophosphate ("OP") insecticide
- MOA signed with registrant in January 1997 to reduce indoor exposures

- MOA signed with registrant in June 2000 to eliminate and phase out most uses that result in residential exposure (home lawns, indoor crack and crevice treatments, and whole house post-construction termiticide treatments). These actions also mitigated risks to workers who apply chlorpyrifos and reduced risks to the environment.
- IRED issued in February 2002 included additional provisions to further reduce worker and ecological risks through label changes that included worker protection measures, buffer zones around water bodies, and rate reductions for agricultural uses.

Summary of USGS Findings:

- Chlorpyrifos exceedances were observed in approximately 20 of the agricultural streams, 10 of the mixed land-use streams, and 14 of the urban streams predominantly in the period of 1993-1994.
- For chlorpyrifos, there were 46 instances where chlorpyrifos measured concentrations exceeded a benchmark which were predominantly observed in the period of 1993-1994. Urban uses for chlorpyrifos have been banned in 2000, and in 2002 agricultural uses were changed to mitigate potential aquatic effects.
- Chlorpyrifos levels have decreased significantly since the June 2000 MOA was signed and residential uses were eliminated

Diazinon

History and Mitigation Measures:

- MOA with registrant signed in December 2000; phased out and cancelled all indoor and outdoor residential uses.
- IRED issued in May 2004 included additional measures for the remaining agricultural use products to further reduce risks to workers, birds and the environment. These measures included cancellation of certain crop uses, terminating most uses of the granular formulation, deleting most aerial applications, reducing the amount and frequency of use, adopting engineering controls, and other protective measures.
- EPA's regulatory activities have eliminated about 75% of diazinon's former uses, particularly its residential uses.
- Final water quality criteria was issued by Office of Water in 2006

USGS Results:

- Diazinon exceedances were observed in approximately 10 agricultural streams, 10 mixed land-use streams, and 20 urban streams.
- The vast majority of exceedances were associated with potential aquatic invertebrate effects.
- For diazinon, there were 44 sites where diazinon measured concentrations exceeded a benchmark.
- Since urban uses of diazinon were cancelled in 2000, concentrations have decreased significantly in urban and mixed land-use streams. A recent regional USGS study of diazinon shows declining concentrations in several urban streams in the Northeast during 1998-2004.

Malathion

Summary of USGS Findings:

- For malathion, there were 27 instances where malathion measured concentrations exceeded a benchmark.
- The revision of the malathion RED was completed in 2009. Mitigation required by the RED will reduce maximum application rates and the number of applications allowed annually when labels are revised during product reregistration, which is currently underway.