Sutter-Yuba
Mosquito & Vector Control District

October 20, 2011

Mr. Phil Isorena, Chief
NPDES Wastewater Unit
State Water Resources Control Board
Division of Water Quality
P.O. Box 100
Sacramento, CA 95965-9250

Dear Mr. Isorena,

Please find enclosed the Sutter-Yuba Mosquito & Vector Control District's addendum to the Pesticide Application Plan (PAP) for the NPDES Vector Control Permit Application for the District. The three enclosed maps illustrate aerial and ground applications of larvicides and adulticides to/over/near waters of the U.S. made in 2010. You can contact me directly with any questions at 530-674-5456 ex101 or by email at mcbride@sutter-yubamvcd.org.

Sincerely,

Ronald L. McBride
District Manager

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530/674-5456
Fax 530/674-5534

Specific BMPs Used By The Sutter-Yuba Mosquito & Vector Control District

SOURCE REDUCTION

Source reduction, or "environmental management", of sites producing mosquitoes was originally the primary method of control and remains an important part of vector control today. Source reduction involves physical manipulation of environmental conditions that favor production of vector species, primarily management of standing water to eliminate or reduce mosquitoes.

The classic method of reducing areas where mosquitoes breed involved draining or filling swamps and marshes once they were recognized as the sources. These activities are now limited by the State of California and Federal Clean Water Act regulations, although it is still possible in some instances to reduce mosquito populations by improving water circulation.

Urban development and associated drainage systems have added new sources of mosquito habitat that have increased over time. Poorly designed storm drain systems, vegetation-clogged ditches, above ground and underground detention basins, swimming pools, landscape pools, cemetery flower vases and abandoned tires and containers can all produce large numbers of mosquitoes. Detection of unmaintained swimming pools and the elimination of mosquito breeding in these and similar sources are a focus of the District's program. Draining water from these man made sources is often the best option. If this is not possible, the application of mosquitofish is evaluated. In many cases bacterial larvicides, surface agents and insect growth regulators are also evaluated as control agents.

The change from flood to drip and sprinkler irrigation for orchard crops in Sutter and Yuba counties has reduced mosquito generation related to crop production. The large acreages of rice (166,525 acres) and irrigated pasture (16,039 acres) in the two counties continue to be major sources of mosquitoes. Rice fields are flooded approximately three months during the summer. There are few applicable BMPs to limit mosquito production. There are many BMPs for irrigated pastures that can be implemented to minimize mosquito production. The cost to landowners for major improvements to fields and water structures is often an obstacle. The croplands and canal systems connected to them require large amounts of surveillance and time and materials for adequate control.

The District does not do any physical management of vegetation or beds of natural waterways or wetlands. Instead, the District has adopted a Best Management Practices (BMP) Manual for the owners and residents of lands with potential mosquito breeding sources to provide guidance in preventing, limiting or eliminating production of mosquitoes.

A number of duck club owners in Sutter and Yuba Counties have signed Memoranda of Understanding with the District, using these BMPs to manage standing surface water on their properties. Additionally, the District has adopted specific dates for the flooding of duck clubs and the re-flooding of rice fields for waterfowl after harvest. The District's website contains additional guidance for private homeowners to limit or prevent mosquito breeding on their parcels.

BIOLOGICAL CONTROL

The use of biological control agents for the control of mosquitoes is an integral part of the District's Integrated Mosquito Management (IMM) plan. Biological control is the first strategy considered in our treatment matrix.

Bacterial Larvicides

The District's current program utilizes several bacterial larvicide products including Bti, Bs, and Spinosad. Bti applications were made to 130,470 acres of rice fields in 2011. Treatments were targeted around large urban centers over a five week period to control the WNV vector Culex tarsalis.

Mosquitofish (*Gambusia affinis)*

Mosquitofish are a critical part of the District's IMM approach to mosquito control. The District has 20 acres of *Gambusia* rearing ponds in southern Sutter County as well as a limited ability to produce *Gambusia* at the District headquarters. The District places *Gambusia* in mosquito breeding sources such as urban and suburban water features (swimming pools, ornamental ponds, and containers), roadside ditches, and rice fields. In 2010, approximately 1,358 lbs of mosquitofish were planted or distributed by the District into breeding sources or provided to the public for residential use. Approximately 6,994 acres were treated in 2010.

The use of mosquitofish is preferable in areas that can be treated in early spring so that they sustain a population during mosquito season. Mosquitofish are used in addition to control with bacterial and chemical larvicides when sources are so large that use of mosquitofish alone does not adequately control production of mosquitoes. The District would like to plant additional rice field acreage but is limited in its ability to produce and over winter mosquitofish.

CHEMICAL CONTROL

The use of chemical control is considered after either source reduction or biological control have not been successful or are not a good alternative. The use of larvicides is generally preferable to adulticides as the treatment site is usually smaller, well defined and adult mosquitoes have not had an opportunity to disperse.

Larvicide Applications by the District

Application of chemical larvicides is conducted when source reduction techniques have not reduced mosquito populations to tolerable levels and levels or those at which the risk of disease transmission is considered low, based on the surveillance and response plan. The primary chemical larvicides used by the District are the surface agents, Agnique® and GB-1111, and the insect growth regulator, methoprene. We also use the bacteria, Bti and Bs, (discussed further under Biological Control) in several products for mosquito control within the District to treat rice fields, duck clubs, pastures, and wetlands. The majority of problem pastures in the District have been treated with Altosid pellets every three to four irrigations during the mosquito season. However, resistance to methoprene was detected in 2009 and the District started rotating to Natular (Spinosad) in 2011.

Adulticide Application by the District

Application of adulticides in the IMM model is generally a third-level measure to control mosquitoes when source reduction and use of larvicides have failed to adequately reduce mosquito populations. Source reduction may not be possible if the source habitat falls within a natural area subject to environmental legislation that prevents draining or other habitat alterations, or is under agricultural practices that are incongruent with physical elimination of standing water (e.g., rice production, irrigated pasture). If mosquito breeding occurs over very large areas with limited access or other conditions that prevent adequate coverage with larvicides, adequate control of mosquito populations with larvicides alone may not be feasible and use of adulticides may be necessary. Adulticides are also used to protect population centers when mosquitoes travel from production sources in search of human hosts and as barrier sprays after water is drained from rice fields in the fall months and mosquitoes migrate toward urban areas. The District attempts to rotate between classes of adulticides to ward off chemical resistance.

Limitations Of Using BMPs In The Sutter-Yuba Mosquito & Vector Control District

There are several limiting factors in implementing the District's BMPs and IMM matrix. Source reduction is often limited by CEQA, ESA, CWA and other State and Federal regulations. Additionally, the District's BMPs for private and public lands are being revised to address source reduction and vegetation management in regards to impacts to endangered and threatened species. Improvements to irrigated croplands and wildlife areas, such as land leveling, water conveyance structures and the ability to quickly deliver water, are usually limited by cost constraints.

Biological control is a major component of the District's IMM program. The use of mosquitofish is limited by the ability to propagate and over winter fish. Additionally, CDFG regulations and the ESA preclude introduction of mosquitofish into natural waterways. Predation of mosquitofish by Twin Crested Cormorants at the District's fish farm has been a major problem in recent years and has limited our ability to propagate fish. The use of Bti and Bs has been extensive with over 130,000 acres of rice fields treated in 2011. Unfortunately, the District doesn't have the resources to treat the 166,000 acres of rice fields with biological agents. We would need to treat much of this acreage on a ten day cycle over the growing season. The cost to treat rice fields is approximately $2.31/acre per application for materials and application costs alone. Chemical control is used when other control measures have not been feasible and/or ineffective and thresholds are exceeded. Additionally, there are times that adult mosquitoes from uncontrolled areas fly into the District, or undocumented mosquito sources inside the District produce adult mosquitoes. Occasionally the field crews are unable to get larval sources treated due to time constraints or human error and adult control methods are necessary.

The two most important factors that impact the District's ability to implement BMPs are cost constraints and legal restrictions and /or regulations on private and public lands.

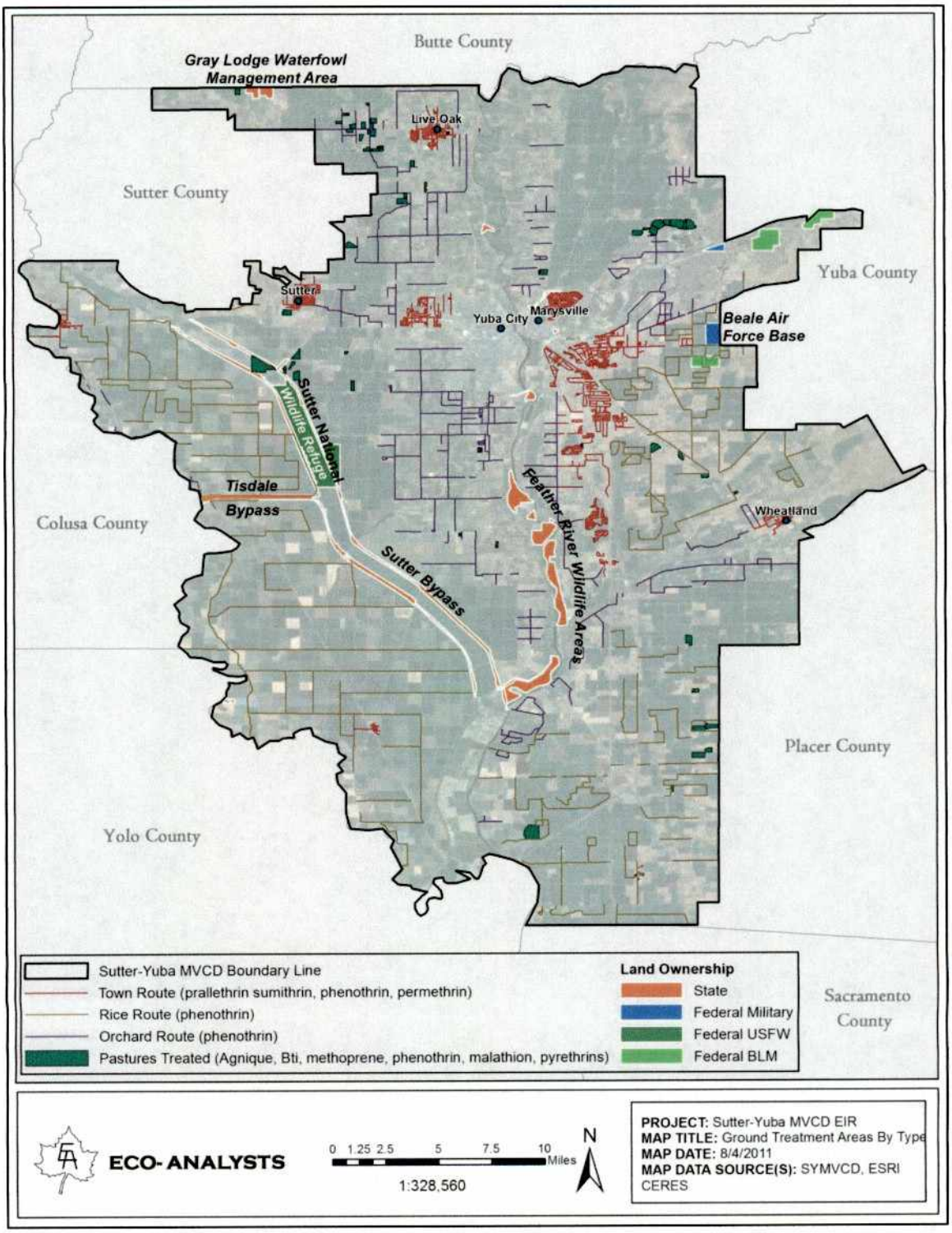

Figure 2-9. Areas treated with larvicides or adulticides by ground within SYMVCD.

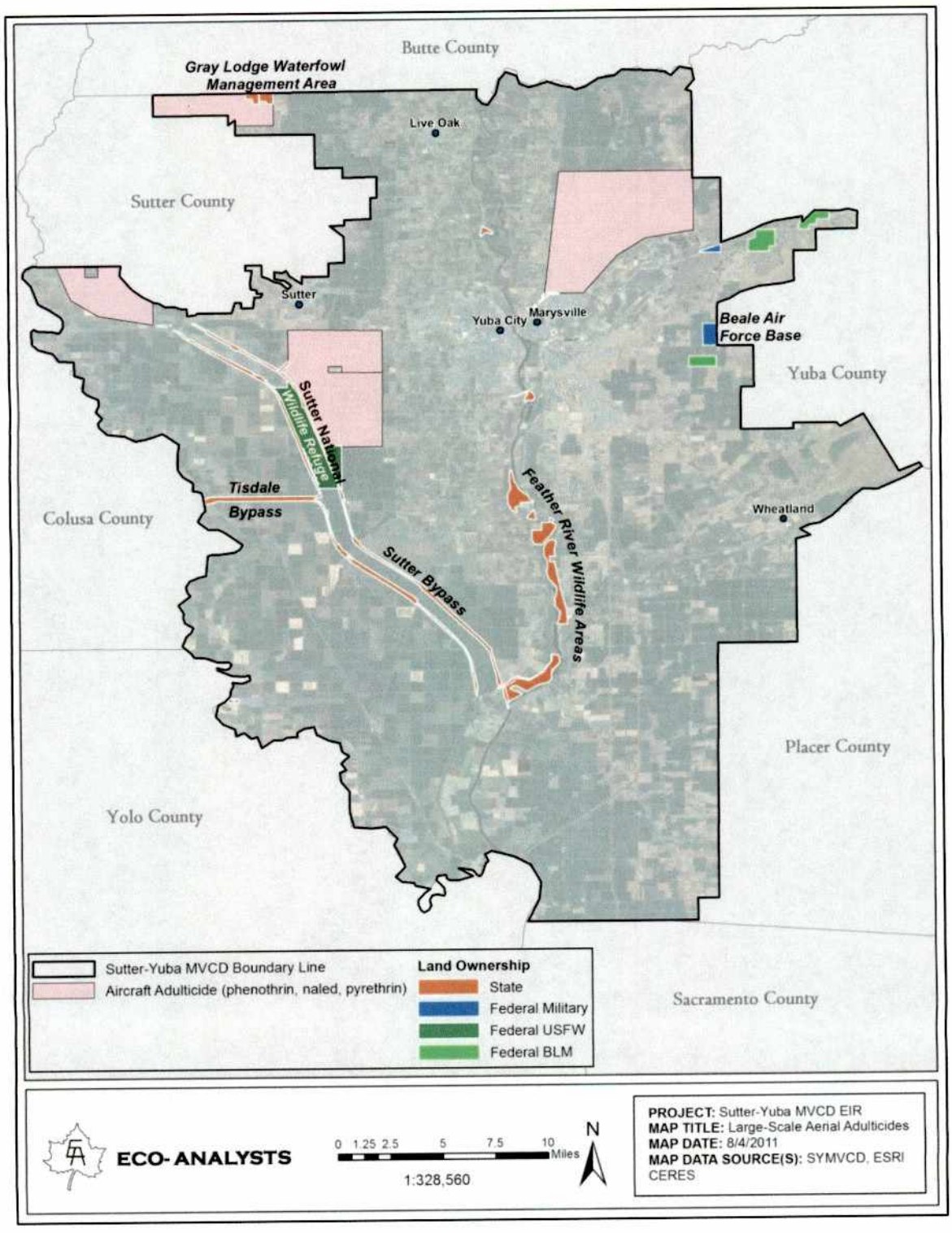

Figure 2-7. Large-scale aerial treatment with adulticides within SYMVCD.

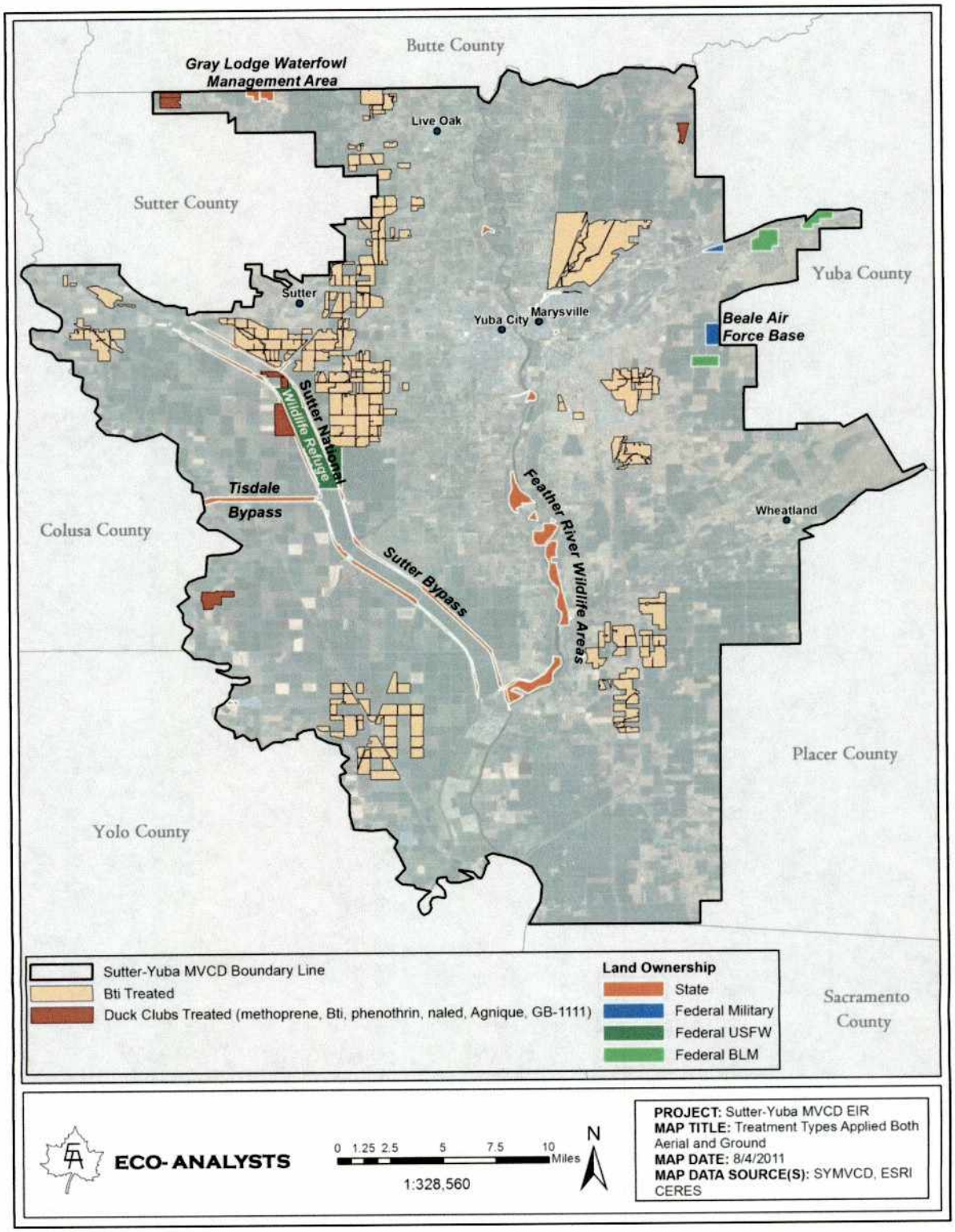

Figure 2-8. Areas treated with larvicides and adulticides by ground and air within SYMVCD.