

**Department of Pesticide Regulation
Environmental Monitoring Branch
1001 I Street, P.O. Box 4015
Sacramento, California 95812**

June 2015

**STUDY GW15: PROTOCOL FOR GROUNDWATER PROTECTION LIST
MONITORING FOR BENTAZON**

I. INTRODUCTION

Bentazon was first detected in California ground water in 1989 in ten rice-growing counties. Due to these detections, the California Department of Food and Agriculture's Director suspended the use of bentazon statewide (CDFA, 1989). Bentazon was then entered into the Pesticide Detection Response Process required by the Pesticide Contamination Prevention Act (FAC sections 13141-13152). Based on the findings of the subcommittee of the Pesticide Registration and Evaluation Committee, new regulations were adopted and bentazon was reinstated for limited use in 1992 (Nordmark, 2007). Regulations adopted at this time made bentazon a restricted material by adding it to Title 3 of the California Code of Regulations (3CCR) section 6800(a) and prohibiting its use on rice crops and in Del Norte and Humboldt counties. These restrictions significantly reduced the amount of bentazon used statewide.

From 1992 to 2000, six ground water monitoring studies were conducted for bentazon resulting in 61 samples being collected from 33 wells in 9 counties. In these studies, no sampling was conducted within five miles of rice fields that may have been treated in the past. Bentazon was not detected in any of the samples (Nordmark, 2007). With the lack of new detections, DPR determined that suspension of the bentazon ground water surveys was the best use of state resources. The criteria to resume sampling required significant new uses or irrigation methods, annual bentazon use exceeding 4,000 pounds statewide or 1,000 pounds in a single county, and yearly sales of bentazon-containing products exceeding 14,000 pounds of bentazon (Nordmark, 2007).

During this study DPR will conduct monitoring for bentazon in high-use areas to determine if current agricultural uses of bentazon are resulting in contamination of ground water. Approximately 74% of statewide applications of bentazon occur in Modoc, Siskiyou, Monterey, and Santa Barbara counties with the highest application being on peas, beans, and mint (CDPR, 2015; Table 2). Ground water monitoring efforts will concentrate within the sections with the highest use (Figures 3, 4, and 5). Since 2006, there has been an increase in reported use of bentazon (Figure 1 and Figure 2). This increase in usage has met the threshold to re-conduct sampling.

II. OBJECTIVE

- Monitor for bentazon in high-use areas to determine if it has migrated to ground water as a result of current legal agricultural use.
- Samples will also be analyzed for additional pesticides known to, or with the potential to, contaminate ground water (Table 1).

III. PERSONNEL

Well sampling will be conducted by the Environmental Monitoring Branch of DPR under the general supervision of Senior Environmental Scientist Joy Dias. Project personnel will include:

Project Leader:	Kevin Richardson
Field Coordinator:	Craig Nordmark
Laboratory Liaison:	Sue Peoples
Analytical Chemistry:	Center for Analytical Chemistry, California Department of Food and Agriculture (CDFA)

Please direct questions regarding this study to Kevin Richardson at (916) 324-4106 or kevin.richardson@cdpr.ca.gov.

IV. STUDY PLAN

Sample Site Selection

In Modoc, Monterey, Santa Barbara and Siskiyou counties DPR will be concentrating our sampling efforts in or around the high-use sections (Figures 3,4, and 5). Sections with the highest pesticide use and shallowest ground water depth will be prioritized for sampling. Up to three wells may be sampled in each target section depending on the availability of wells. If wells are not available in a target section, wells may be sampled in the surrounding sections. If pesticides are detected, additional samples may be taken in the vicinity of the detection(s) to determine the extent of the area impacted.

Active Ingredient Selection

Since being reinstated in 1992, bentazon use has increased statewide (Figure 1). This increase has made it necessary for DPR to resume sampling to determine if current agricultural uses of bentazon are resulting in contamination of ground water. While this study will focus on bentazon, and sample site will be selected based on bentazon use, samples collected in this study will be analyzed for a suite of pesticides and degradates.

In order to help assess the effectiveness of our mitigation measures and to determine if regions regulated as Ground Water Protection Areas need to be expanded, DPR routinely analyzes samples for known ground water contaminants such as atrazine, simazine and some of their degradates (3CCR section 6800[a]) using the triazine screen (Table 1). All wells sampled in this study will be screened for these know contaminants.

DPR and CDFA are in the process of developing a new multi-analyte screen which consists of 27 analytes on the GWPL (3CCR section 6800 a and b). Samples collected in this study will be analyzed using the new screen. Of these 27 active ingredients, 7 overlap with the triazine screen (Table 1). DPR will use this overlap as a quality control if there are positive detections of these pesticides.

V. SAMPLING AND ANALYTICAL METHODS

Samples will be collected in accordance with Standard Operating Procedure (SOP) FSWA001.02. Domestic wells will be prioritized for sample collection because they are usually shallower than municipal and irrigation wells. During collection of ground water samples all efforts will be taken to sample water directly from the aquifer as outlined in the SOP (Nordmark and Herrig, 2011).

Chemical analysis will be performed by the CDFA Center for Analytical Chemistry. CDFA will analyze samples for bentazon (EMON-SM-05-012). They will also analyze for the triazine group of pesticides using method EMON-SM-62.9 and the multi-analyte group using method EMON-SM-05-032 (Table 1).

SOP QAQC001.00 (Segawa, 1995) guidelines will be followed for analytical laboratory quality control and for collecting quality assurance samples in the field.

VI. DATA ANALYSIS

The analytical results obtained from CDFA will be used to determine if bentazon is migrating to ground water under current use patterns. Detections of GWPL pesticides may trigger additional focused sampling in the study regions or may lead to expansion of Ground Water Protection Areas.

VII. TIMETABLE

- July 2015 – November 2015: Conduct sampling
- August 2015 – December 2015: Obtain and review analytical results from CDFA laboratory
- June 2016 – Complete study report
- Communication
 - Provide notice to the County Agricultural Commissioner, DPR Enforcement Branch Regional Office, and the local Farm Bureau two weeks prior to initiating monitoring in a county. Additional notice will be provided if there is a six-month lapse in monitoring within a county.
 - Provide results to property owners within 30 days of receipt.
 - Provide results to state and local agencies when sampling is concluded and results have been reviewed and approved by the project team.

VIII. BUDGET

Budget Item	Units	Expense per Unit	Total Expense
Bentazon Analysis	≤ 40 Samples	\$540	≤ \$20,000
Triazine Screen	≤ 40 Samples	\$864	≤ \$31,000
Multi-Residue LC/MS	≤ 40 Samples	\$1500	≤ \$60,000
QC	≤ 12 Samples	\$3000	≤ \$36,000
Travel	≤ 90 Days	\$130	≤ \$11,700
Person Years	≤ 1	\$100,000	≤ \$100,000
Total			≤\$258,700

IX. REFERENCES

- CDFA. 1989. Notice to registrants of economic poisons containing bentazon. Available at: http://www.cdpr.ca.gov/docs/emon/grndwtr/bentazon/notice_to_registrants.pdf (verified June 26, 2015). California Department of Food and Agriculture, Sacramento, California.
- CDPR. 2013. Sampling for Pesticide Residues in California Well Water. 27th Annual Report. Available at: <http://www.cdpr.ca.gov/docs/emon/pubs/ehapreps/eh2012.pdf> (verified June 30, 2015). California Department of Pesticide Regulation, Sacramento, California.
- CDPR. 2015. Pesticide Use Reports. Available at: <http://www.cdpr.ca.gov/docs/pur/purmain.htm> (verified June 22, 2015). California Department of Pesticide Regulation, Sacramento, California.
- Nordmark, C. 2007. Memorandum to J. Sanders dated May 21, 2007. Request for approval to change the policy for conducting surveys for bentazon in California groundwater. California Department of Pesticide Regulation, Sacramento, California.
- Nordmark, C. and J. Herrig. 2011. SOP FSWA001.02. Obtaining and Preserving Well Water Samples. Available at: <http://www.cdpr.ca.gov/docs/emon/pubs/sops/fswa00102.pdf> (verified June 22, 2015). California Department of Pesticide Regulation, Sacramento, California.
- Segawa, R. 1995. SOP QAQC001.00. Chemistry Laboratory Quality Control. Available at: <http://www.cdpr.ca.gov/docs/emon/pubs/sops/qaqc001.pdf> (verified June 22, 2015). California Department of Pesticide Regulation, Sacramento, California.

X. FIGURES

Figure 1: Statewide Use of Bentazon per Year (CDPR, 2015)

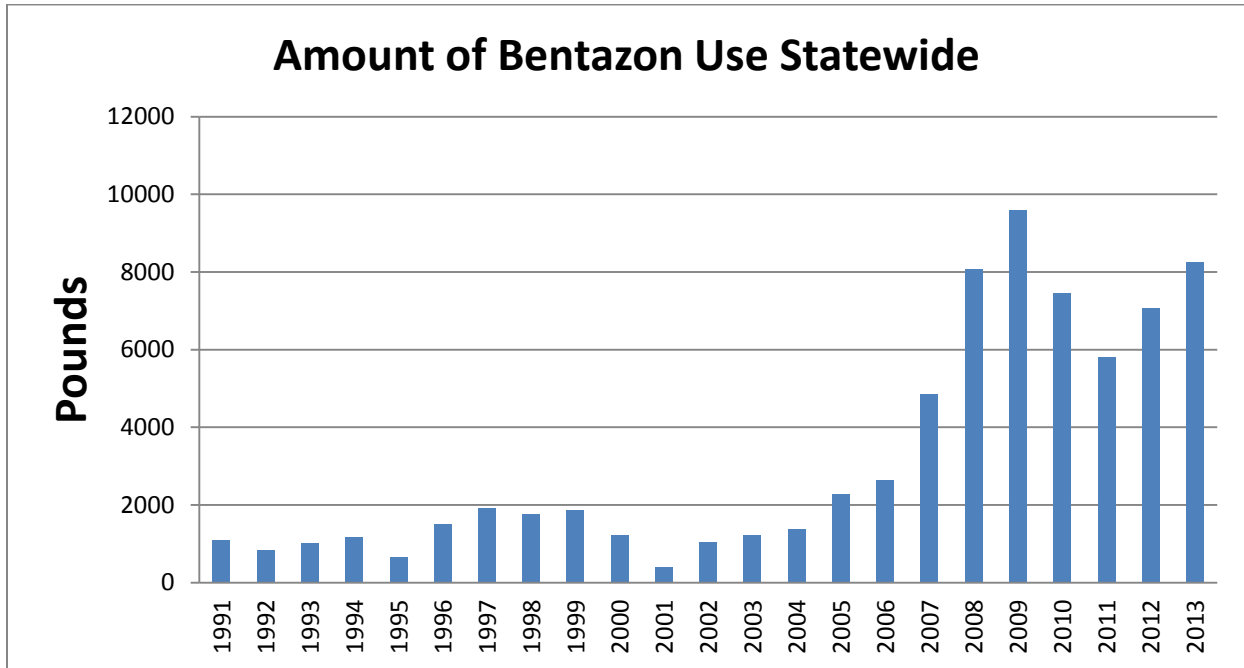


Figure 2: Amount of Bentazon Applied by County per Year (CDPR, 2015)

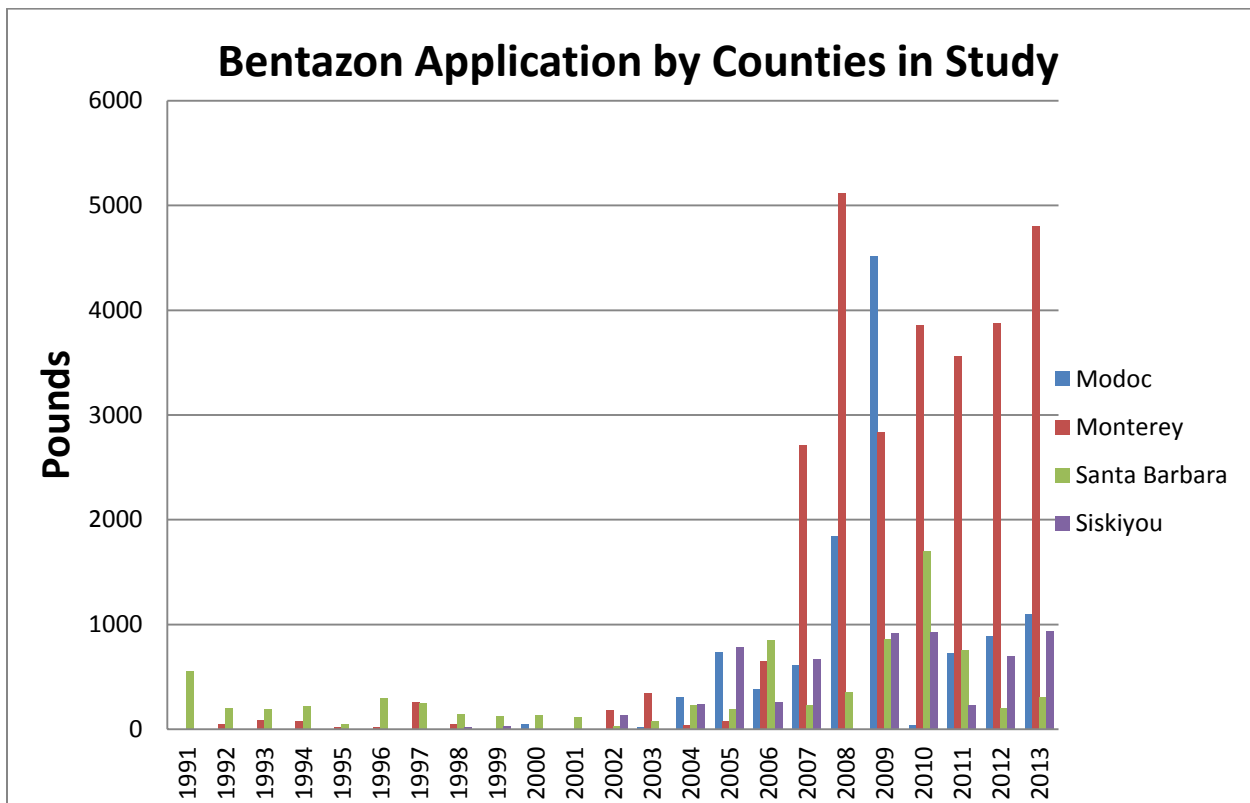


Figure 3: Bentazon Use per Section in Modoc and Siskiyou Counties (CDPR, 2015)

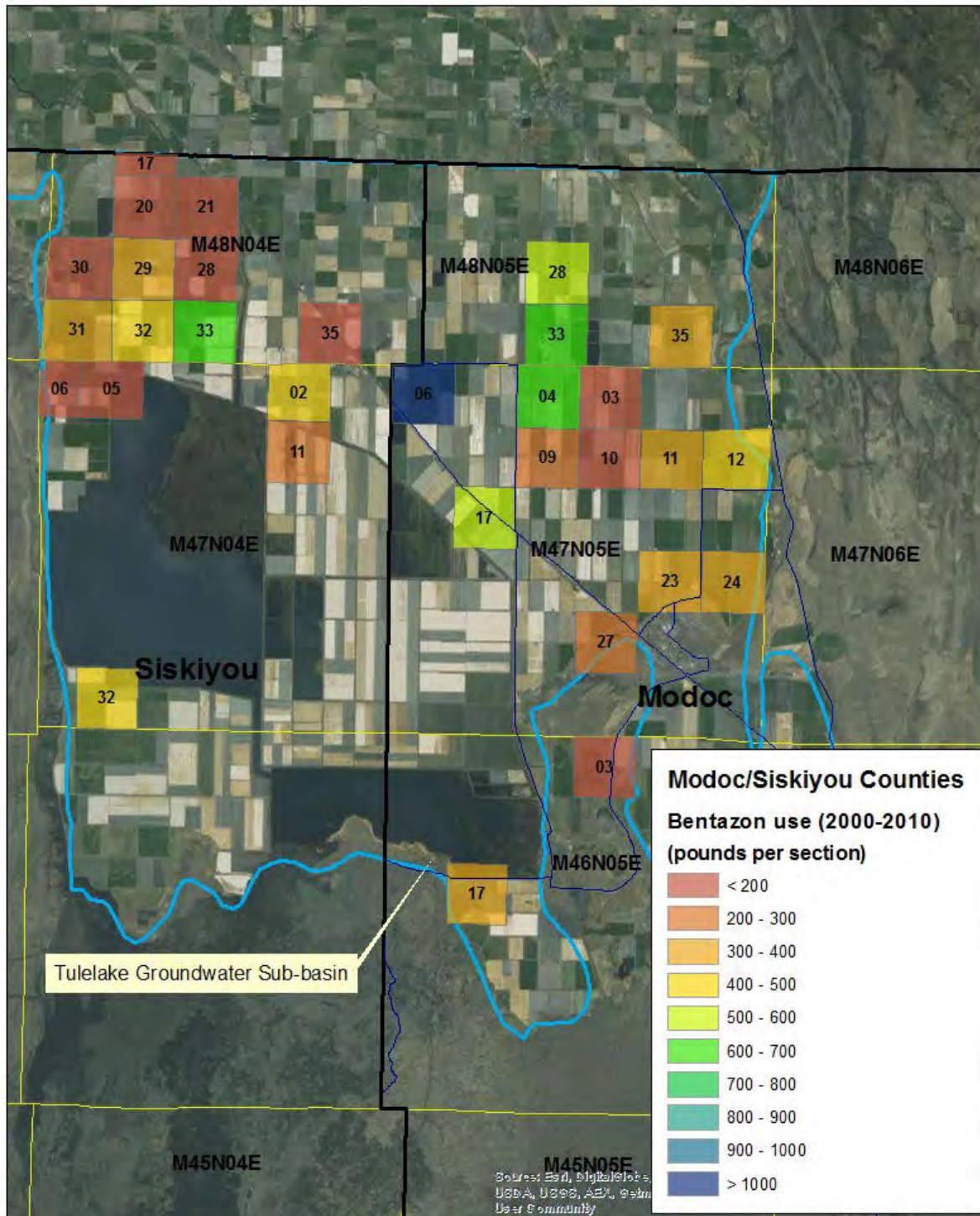


Figure 4: Bentazon Use per Section in Monterey County (CDPR, 2015)

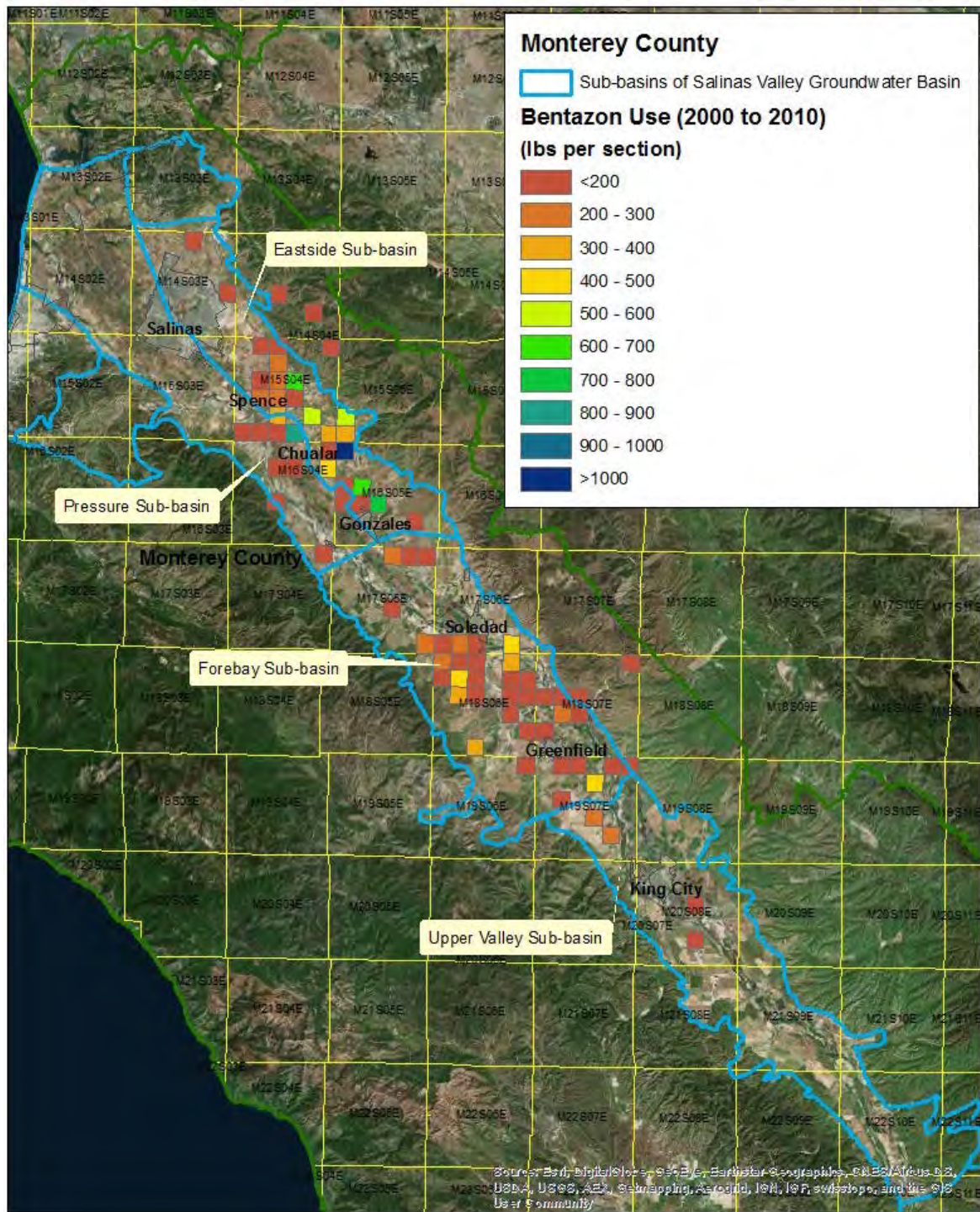
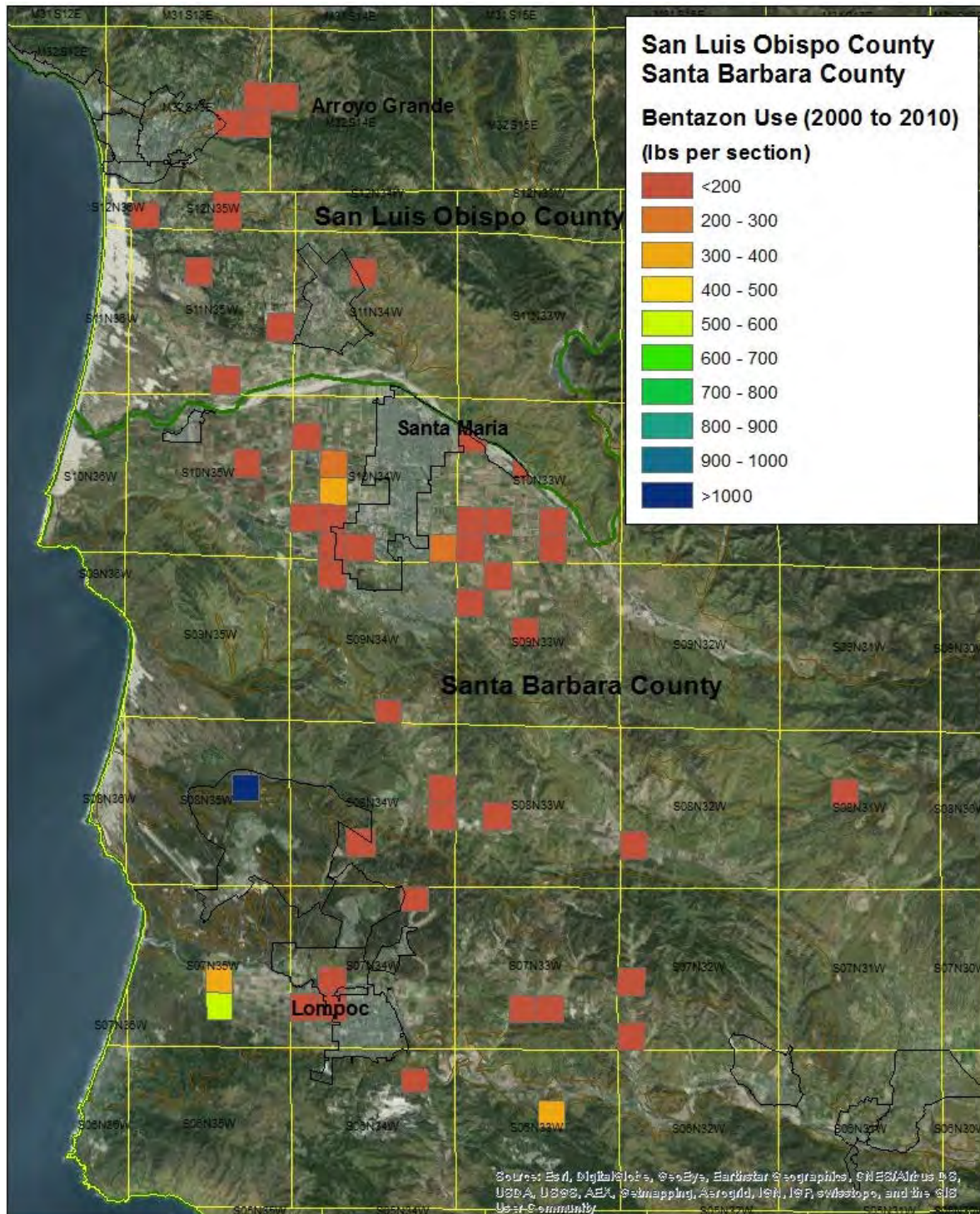


Figure 5: Bentazon Use per Section in San Luis Obispo and Santa Barbara Counties (CDPR, 2015)



XI. TABLES

**Table 1: Pesticide Active Ingredient Screen CDFA Lab Method
(Shading indicates overlapping analytes)**

MULTI-RESIDUE EMON-SM-05-032	TRIAZINE SCREEN EMON-SM-62.9
Atrazine	ACET
Azinphos-Methyl	Atrazine
Azoxystrobin	Bromacil
Bensulide	DACT
Bromacil	DEA
Carbaryl	Diuron
Carbofuran	DSMN
Diazinon	Hexazinone
Dimethenamide	Norflurazon
Dimethoate	Prometon
Diuron	Simazine
Ethofumesate	Tebuthiuron
Fenamiphos	Propazine
Fludioxonil	
Imidacloprid	
Linuron	
Mefenoxam/Metalaxyl	
Methiocarb	
Metolachlor	
Metribuzin	
Napropamide	
Norflurazon	
Oryzalin	
Prometon	
Simazine	
Tebuthiuron	
Thiamethoxam	
Thiobencarb	
Uniconazole	

Table 2: Highest Use of Bentazon by Crop 1990-2014 (CDPR, 2015)

SITE	BENTAZON APPLIED (LBS)
Peas	33,180
Beans	24,064
Mint	19,856