SWAMP
Surface Water Ambient Monitoring Program

Data Report	2015

Smith River Plain 2015 Groundwater Interim Monitoring Report

North Coast Region

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NORTH COAST REGIONAL WATER QUALITY CONTROL BOARD

Smith River Plain
2015 Groundwater Monitoring Report

November 30, 2015

Surface Water Ambient Monitoring Program (SWAMP)
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Background

The North Coast Regional Water Quality Control Board (Regional Water Board) addresses water quality impacts associated with agriculture in the Agricultural Lands Discharge Program. Agricultural lands have the potential to contribute to water quality problems through the over-application of fertilizers and pesticides, human-caused erosion of sediment, pollutants in tailwater return flows, and the removal or suppression of riparian vegetation. There are approximately 350,000 acres of agricultural lands in the North Coast Region which are primarily used for vineyards, orchards, dairies, and various crops including flowers, grain, alfalfa, and hay pasture.

On the Smith River Plain in Del Norte County, approximately 1,900 acres are used to grow Easter lily bulbs. The Regional Water Board is developing a permit for waste discharges from the cultivation of lily bulbs in order to address water quality issues and meet the requirements of the California Water Code and the Nonpoint Source Policy.

In order to help inform permit conditions and to better understand water and sediment quality conditions, the Regional Water Board initiated a monitoring study in 2013. The surface water and sediment quality portions of the study are funded by the Water Board's Surface Water Ambient Monitoring Program (SWAMP) as a special study of the North Coast Region. The groundwater portion of the study is funded by the Regional Water Board discretionary laboratory funds.

This report provides a summary of the results from groundwater samples collected as part of the Smith River Plain Water and Sediment Quality Study. A final report will be included as part of the final Smith River Water and Sediment Quality Study Report, expected June 2016. An interim report on 2013 surface water and sediment quality data is currently available.

Goals and Objectives

The goals of this study are to gather and assess data from which the Regional Water Board can evaluate current groundwater quality conditions, develop appropriate permit requirements, and use as a point of reference when assessing future monitoring data to determine the effectiveness of the permit and agricultural management practices. Specifically, this study is designed to answer the following questions:

- Are contaminants detected in shallow groundwaters in agriculturally-dominated areas of the Smith River Plain?
- Is there a relationship between contaminant concentrations and the level of agricultural intensity?
- What is the direction and magnitude of change in contaminant concentrations and/or toxicity over multi-year time periods?
- Is there a risk to drinking water uses?

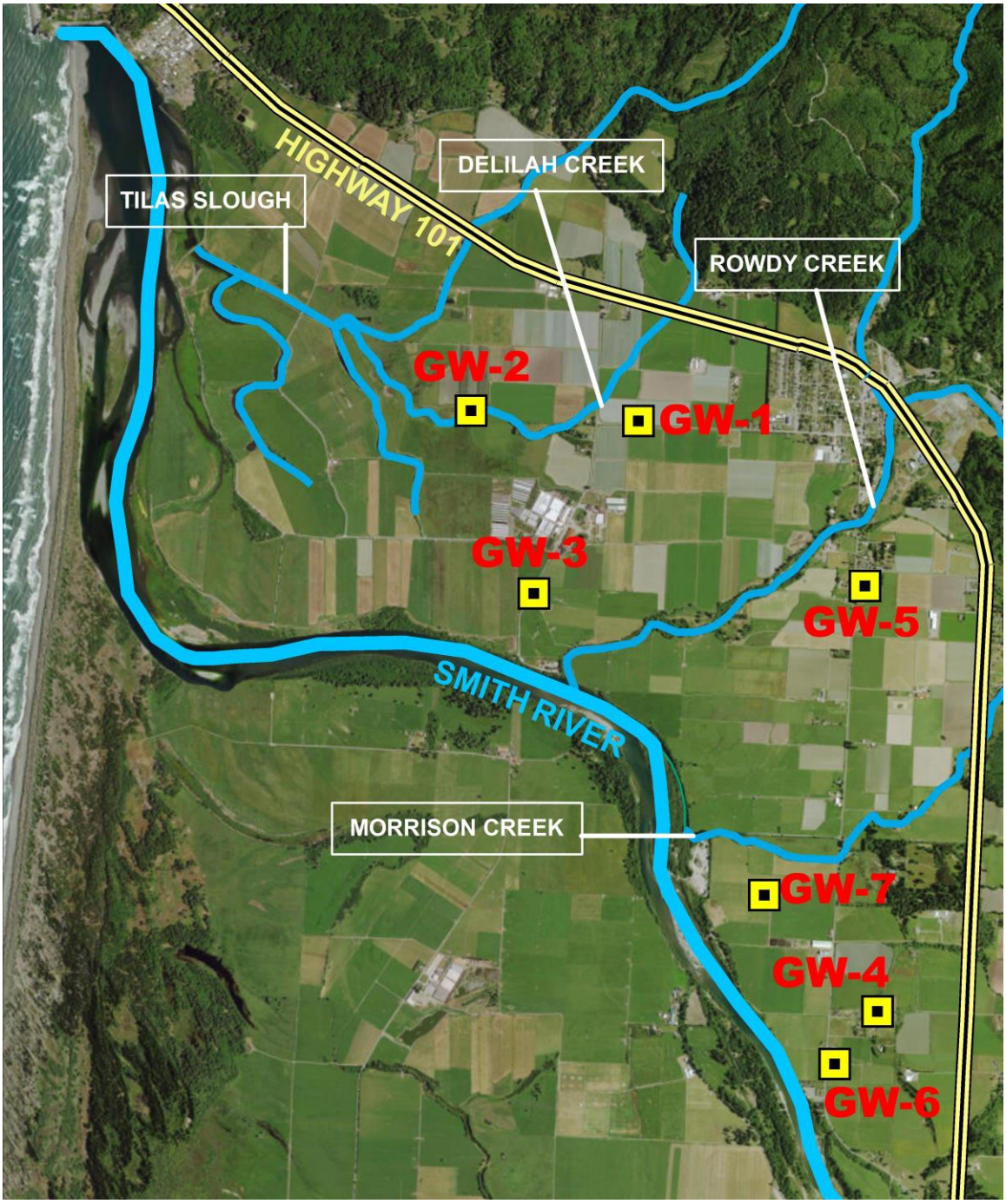

Figure 1. Sample Site Locations.

Site Selection

The groundwater portion of the Smith River Plain Water and Sediment Quality Study was designed to obtain information on the extent and concentration of contaminants, especially pesticides and pesticide residues, in the shallow groundwater that may be attributed to agricultural applications. Previous monitoring efforts conducted by the Regional Water Board and the non-profit organization Smith River Project between 1982 and 2002 documented the presence of the agricultural pesticides Aldicarb and 1,2-Dichloropropane (1,2-D) in some drinking water wells. Thus, site selection utilized a targeted approach to identify locations that were distributed throughout areas of the Smith River Plain, based on the following criteria:

- Locations accessible to staff;
- Locations spatially distributed throughout the Smith River Plain; and
- Locations of prior groundwater sampling or in close proximity thereof.

Seven groundwater wells meeting the above criteria were selected within the Smith River Plain. These included wells used for irrigation and/or drinking water supply (See Figure 1 and Table 1). Monitoring at these sites is expected to characterize the spatial extent of any contaminants that may be present within the groundwater of the Smith River Plain.

Table 1. Sampled Well Types

Drinking Water Wells		Irrigation Wells	
GW-3	GW-5	GW-1	GW-6
GW-4		GW-2	GW-7

Sample Collection and Analysis

On June 23-25, 2015, Regional Water Board staff collected one sample from each of seven groundwater wells located within the Smith River Plain. These samples were analyzed for dissolved copper, nitrate (as nitrogen), and 328 pesticides and pesticide residues (see Table 2). Among the 328 pesticides analyzed are those that were previously detected in groundwater (e.g., 1,2-Dichloropropane), those identified as pesticides of concern (e.g., MITC, which is a break down product of metam sodium), and those commonly used in high quantities in Del Norte County between 2010 and 2013 (e.g., 1,3-Dichloropropene).

Table 2. Pesticide Analytes

1,1,1,2-Tetrachloroethane	Bensulide	Diafenthiuron
1,1,1-Trichloroethane	Benzene	Diazinon
1,1,2,2-Tetrachloroethane	Benzoximate	Dibromochloromethane
1,1,2-Trichloroethane	Bifenazate	Dibromomethane
1,1-Dichloroethane	Bitertanol	Dichlorodifluoromethane
1,1-Dichloroethene	Boscalid	Dichlorvos
1,1-Dichloropropene	Bromobenzene	Diclobutrazol
1,2,3-Trichlorobenzene	Bromochloromethane	Dicrotophos
1,2,3-Trichloropropane	Bromodichloromethane	Diethofencarb
1,2,4-Trichlorobenzene	Bromoform	Difenoconazole
1,2,4-Trimethylbenzene	Bromomethane	Diflubenzuron
1,2-Dibromo-3-chloropropane	Bromuconazole (isomer)	Dimethenamide
1,2-Dibromoethane (EDB)	Bupirimate	Dimethoate
1,2-Dichlorobenzene	Buprofezin	Dimethomorph
1,2-Dichloroethane	Butafenacil	Dimoxystrobin
cis-1,2-Dichloroethene	Butocarboxim	Diniconazole
trans-1,2-Dichloroethene	Carbaryl	Dioxacarb
1,2-Dichloropropane	Carbaryl	Diuron
1,3-Dichlorobenzene	Carbendazim	DMST
1,3-Dichloropropane	Carbetamide	DNOC
cis-1,3-Dichloropropene	Carbofuran	Dodine
trans-1,3-Dichloropropene	Carbofuran	Doramectin
1,4-Dichlorobenzene	Carbon disulfide	Emamectin Ba
1-Naphthol	Carbon tetrachloride	Epoxiconazole
2,2-Dichloropropane	Carbosulfan	Eprinomectin
2-Butanone	Carboxine	Esprocarb
2-Chlorotoluene	Carfentrazone-ethyl	Ethidimuron
2-Hexanone	Chlorantraniliprole	Ethiofencarb
3-Hydroxycarbofuran	Chlordimeform	Ethiofencarb-sulfoxide
3-Hydroxycarofuran	Chlorfenvinphos	Ethion
4-Chlorotoluene	Chlorfluazuron	Ethiprole
4-Isopropyltoluene	Chlorobenzene	Ethirimol
4-Methyl-2-pentanone	Chloroethane	Ethofumesate
Acephate	Chloroform	Ethoprop
Acetamiprid	Chloromethane	Ethylbenzene
Acetochlor	Chloroxuron	Etobenzanid
Acetone	Chlorpropham (CIPC)	Etoxazole
Acibenzolar-S-methyl	Chlorpyrifos	Famoxadone
Alanycarb	Chlorpyrifos-methyl	Fenamidone
Aldicarb	Chlortoluron	Fenarimol
Aldicarb sulfone	Clethodim	Fenazaquin
Aldicarb sulfoxide	Clofentezine	Fenbuconazole
Aldicarb-sulfone	Clothianidin	Fenbutatin Oxide
Aldicarb-sulfoxide	Coumaphos	Fenhexamid
Ametryn	Cumyluron	Fenobucarb
Amicarbazone	Cyanazine	Fenpropimorph
Aminocarb	Cyazofamid	Fenpuroximate
Aspon	Cycluron	Fenuron
Atrazine	Cyflufenamid	Feoxycarb
Avermectin Ba	Cyhexatin	Flonicamid
Azinphos-methyl	Cymoxanil	Fluazifop-butyl
Azoxystrobin	Cyproconazole (isomer)	Flubendiamide
Benalaxyl	Cyprodinil	Fludioxinil
Bendiocarb	Cyromazine	Flufenacet
Benfuracarb	Daimuron	Flufenoxuron

Table 2 (cont'd). Pesticide Analytes

Fluometuron	Methylene chloride	Pyriproxyfen
Fluopicolide	Metobromuron	Quinoxyfen
Fluoxastrobin	Metolachlor	Sebuthylazine
Fluquinconazole	Metoxuron	Secbumeton
Flusilazole	Metribuzin	sec-Butylbenzene
Flutolanil	Metrofenone	Sethoxydim
Flutrialfol	Metsulfuron-methyl	Siduron
Forchlorfenuron	Mevinphos	Simazine
Formesafen	Mexacarbate	Simetryn
Formetanate	MITC	Spinetoram-J+L
Fuberidazole	Molinate	Spinosad
Furalaxyl	Monocrotophos	Spirodiclofen
Halofenozide	Monolinuron	Spiromecifen
Hexachlorobutadiene	Moxidectin	Spirotetramat
Hexaflumuron	Myclobutanil	Spiroxamine
Hexazinone	Naphthalene	Sulfentrazone
Hexythiazox	Napropamide	Tebuconazole
Hydramethylnon	n-Butylbenzene	Tebufenozide
Imazalil	Neburon	Tebuthiuron
Imazapyr	Nitenpyram	Tefufenpyrad
Imazethapyr	Novaluron	Temephos
Imibenconazole	n-Propylbenzene	Tempraloxydim
Imidacloprid	Omethoate	Terbumeton
Indoxacarb	Oxadixyl	Terbutryn
Iodomethane	Oxamyl	tert-Butylbenzene
Ipconazole	Oxamyl	Tertraconazole
Iprovalicarb	o-Xylene	Tetrachloroethene
Isocarbamid	Pencycuron	Thiabendazole
Isofenphos	Pendimethalin	Thiacloprid
Isoprocarb	Phorate	Thiamethoxam
Isoprofuron	Phosmet	Thidiazuron
Isopropylbenzene	Phoxim	Thiobencarb
Isoprothiolane	Picoxystrobin	Thiofanox
Ivermectin	Piperonyl butoxide	Thiophanate-methyl
Kresoxim-methyl	Pirimicarb	Toluene
Lactofen	Pirimiphos-methyl	Triadimefon
Linuron	Proamocarb	Triadimenol
m,p-Xylene	Prochloraz	Triazophos
Malathion	Promecarb	Trichloroethene
Mandipropamid	Prometon	Trichlorofluoromethane
Mefenacet	Prometryn	Trichlorotrifluoroethane
Mepanipyrim	Propachlor	Tricyclazole
Mepronil	Propargite	Tridemorph
Metaflumizone	Propazine	Trifloxystrobin
Metalaxyl	Propham	Triflumizole
Metconazole	Propiconazole	Triflumuron
Methamidophos	Propoxur	Triflusulfuron-methyl
Methfuroxam	Propoxur	Triphenyl Phosphate
Methidathion	Propyzamide	Triticonazole
Methiocarb	Pryaclostrobin	Uniconazole
Methiocarb	Pymetrozin	Vamidothion
Methomyl	Pyracarbolid	Xylenes, total
Methomyl	Pyridaben	Zoxamide
Methoprotryne	Pyridaphenthion	
Methoxyfenozide	Pyrimethanil	

Results

Nitrate

Nitrate is a common groundwater chemical contaminant. It can be naturally occurring, but is also commonly associated with fertilizer use or animal and human waste products. Nitrate concentrations in the groundwater ranged from 4.8 mg/L to 12.7 mg/L (see Table 3). The three wells exceeding the US Environmental Protection Agency's and California Department of Public Health's drinking water standard of 10.0 mg/L are irrigation wells and are not used as drinking water supply.

Table 3. Nitrate concentrations (mg/L).

Drinking Water Wells		Irrigation Wells	
Groundwater Well GW-3	4.80	Groundwater Well GW-1	12.70
Groundwater Well GW-4	6.64	Groundwater Well GW-2	11.40
Groundwater Well GW-5	6.72	Groundwater Well GW-6	6.66
Duplicate Sample GW-5	6.70	Groundwater Well GW-7	11.70
		US EPA and CA DPH Drinking Water Standard	10.00

Copper

Pesticide compounds that include copper are applied to the agricultural fields of the Smith River Plain at various times throughout the year. The analysis of dissolved copper in the groundwater resulted in non-detects in all but one groundwater well. The one detection of dissolved copper (5.7 ug/L) was documented in the sample collected from Groundwater Well GW-3, a domestic water supply well. The detected concentration is well below the US Environmental Protection Agency's and California Department of Public Health's drinking water standard (1,300/1,000 µg/L, respectively).

Pesticides

Analysis for the 320 pesticides and pesticide residues listed in Table 1 at the seven groundwater wells only documented two low level detections of 1,2-Dichloropropane (1,2-D) at Groundwater Well GW-1 (0.6 ug/L) and Groundwater Well GW-5 (2.3 ug/L). The 1,2-D concentrations detected are below the US Environmental Protection Agency's and California Department of Public Health's drinking water standard of 5 µg/L.

Previous testing of Groundwater Well GW-1 conducted in June 2002 detected 1,2-D at a concentration of 1.1 µg/L. Previous testing of Groundwater Well GW-5 conducted in June 2002 detected 1,2-D at concentrations of 3.9 µg/L(see Table 4). These results indicate that concentrations of 1,2-D have declined in groundwater since use of this pesticide in this area ceased in 1983. Aldicarb is another pesticide that is no longer used in the Smith River Plain, and Aldicarb was not detected in any of the groundwater well samples collected during this sampling effort (see Table 5).

Table 4. 1,2-D Concentrations (ug/L).

Site and Well Type		1983	1984	1985	1986	1987	1990	1991	2002	2015
GW-1	Irrigation	19.9	8.7	6.4	7.2	3.6	3.4	1.1	1.1	0.6
GW-2										ND
GW-6										ND
GW-7										ND
GW-3	Domestic						ND			ND
GW-4		4.1	23.3	27.4	28.9	15.0	6.3	4.0		ND
GW-5		32.0	86.7	84.4	26.2	15.1	9.7	12.0	3.9	2.3

Table 5. Aldicarb Concentrations (ug/L).

Site and Well Type		1983	1984	1985	1986	1987	1990	1991	2015
GW-1	Irrigation	12.0	8.8	1.8	5.1	ND	0.3		ND
GW-2									ND
GW-6									ND
GW-7									ND
GW-3	Domestic								ND
GW-4		6.0	23.1	12.3	7.3	4.8	0.9	ND	ND
GW-5		1.0	5.8	5.1	26.2	15.1	9.7	12.0	ND

Final Monitoring Schedule and Reporting

Regional Water Board staff have completed all of the sample collection for the Smith River Water and Sediment Quality Study. It is anticipated that all of the remaining laboratory data and quality assurance reviews will completed and reported by January 2016. Data analysis and a final peer-reviewed report will be completed in June 2016.

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