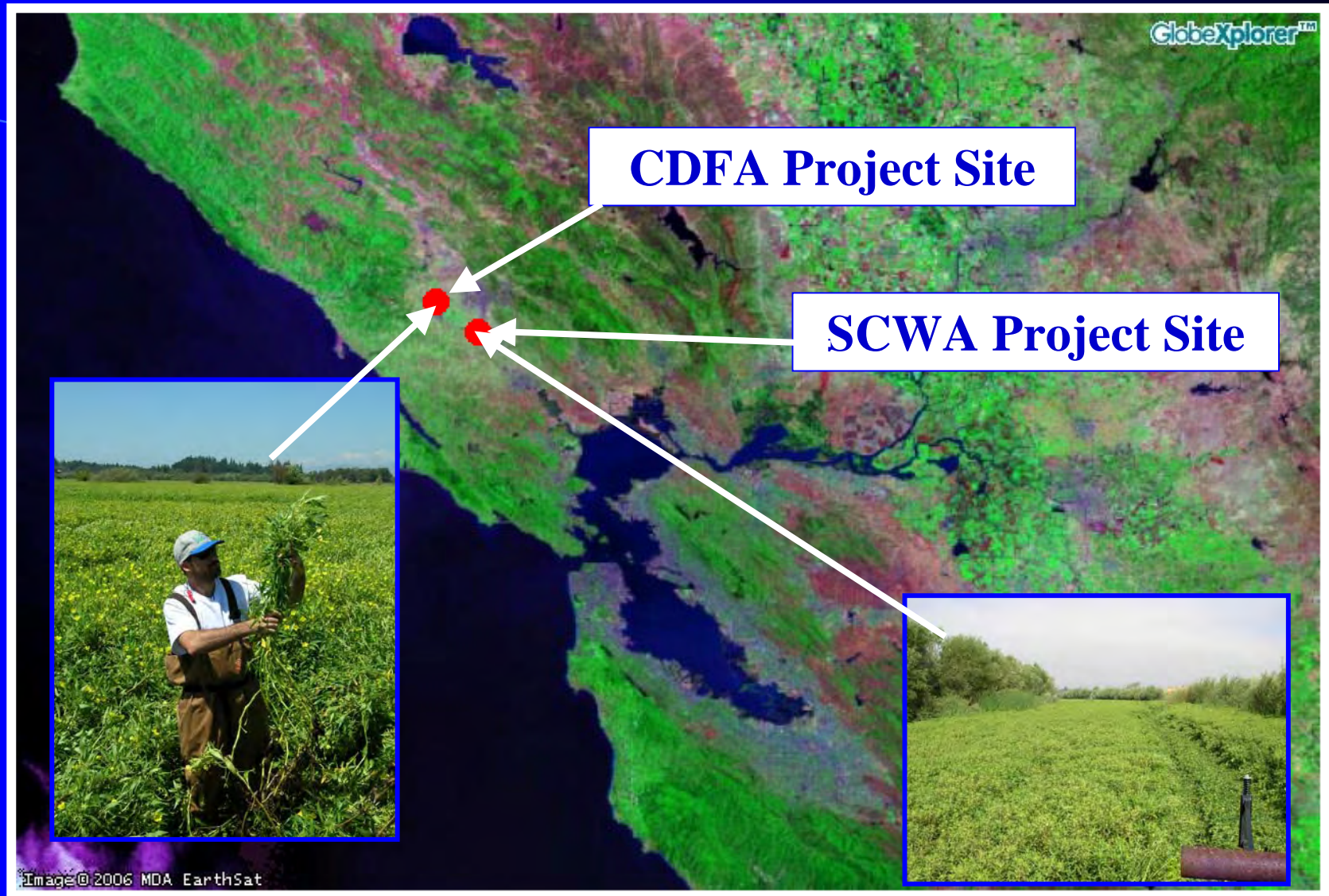


# *Ludwigia* Control in the Laguna de Santa Rosa, California

California Invasive Plant Council  
15<sup>th</sup> Annual Symposium

Thomas J. McNabb, Clean Lakes, Inc.  
Julian Meisler, Laguna de Santa Rosa Foundation

# Ludwigia Control in the Laguna de Santa Rosa, California



# Ludwigia Control in the Laguna de Santa Rosa, California



## ***Ludwigia* Control in the Laguna de Santa Rosa, California**

**The Laguna de Santa Rosa Foundation (Laguna Foundation) contracted with Clean Lakes, Inc. to carry out Year One of a three-year control effort aimed at reducing the area and density of the non-native invasive weed *Ludwigia hexapetala* within selected areas of the Laguna de Santa Rosa**

**The infestation harbors mosquito vectors of West Nile Virus (WNV) that poses a health threat to humans and wildlife; out-competes native wetland species, severely degrading habitat; and is believed to impair both the water quality and the flood-control functions of the Laguna.**

**On April 28, 2005 the California Department of Fish and Game, Central Coast Region, and the Sonoma County Water Agency, each filed a Notice of Intent (NOI) and an Aquatic Pesticide Application Plan (APAP) to comply with the terms of the General National Pollution Discharge Elimination System Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control (General Permit)**

**On July 1, 2005, the California Department of Fish and Game filed form FG 880, Application No. 05-361, Pesticide Use Recommendation for the work to be performed on the Department of Fish and Game property (Site II).**

## ***Ludwigia* Control in the Laguna de Santa Rosa, California**

**On July 14, 2005, the California Regional Water Quality Control Board, North Coast Region, issued project approvals via a letter of “Applicability of General NPDES Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States and a Notice of Coverage, Waiver of Waste Discharge Requirements for the Laguna de Santa Rosa, Sonoma County” to the Sonoma County Water Agency, *Ludwigia* Control Project (WDID No. 1B05047RSON) and to the California Department of Fish and Game’s *Ludwigia* Control Project (WDID No. 1B05082NSON).**

## **Ludwigia Control in the Laguna de Santa Rosa, California**

**The 2005 control efforts began on July 18th following receipt of the above referenced approval documents, and continued through October 21, and the 2006 control efforts began on June 22 and continued through September 29<sup>th</sup>.**

**Control occurred at two sites within the Laguna, and included three principle elements:**

- herbicide treatment**
- harvesting of dead biomass**
- and hauling of biomass to agricultural hayfields**

**The 2005 effort was the first step in the larger process of restoring the Laguna. The Foundation does not expect that control efforts will remove 100% of *Ludwigia* from the Laguna. Rather, it is expected that the control effort will reduce the population of *Ludwigia* to a point where restoration of natural ecosystem processes and vegetation can maintain it as a minor rather than dominant component of the natural community.**



## ***Ludwigia* Control in the Laguna de Santa Rosa, California**

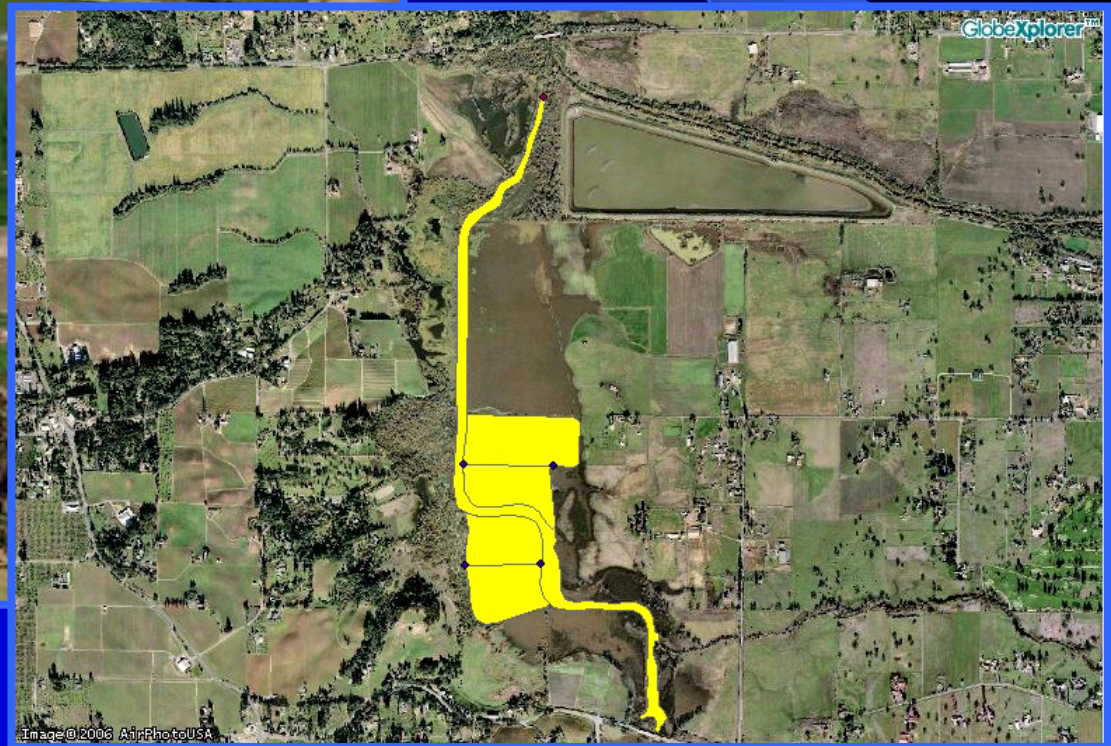
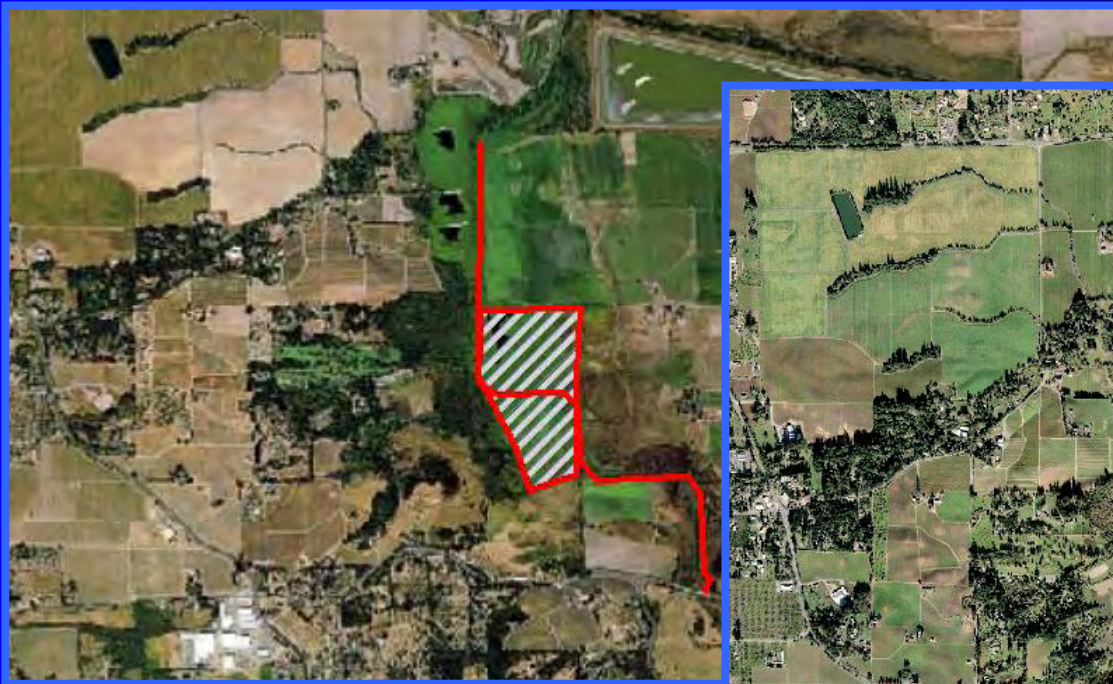
- The 2005 & 2006 *Ludwigia* control area included approximately 115.00 acres divided between two sites.
- Site I is owned by the Sonoma County Water Agency (SCWA) and is located just west of the City of Rohnert Park at and around the intersection of Stony Point Road and Rohnert Park Expressway (31.94 Acres)





## **Ludwigia Control in the Laguna de Santa Rosa, California**

- **Site II is located between Occidental Road and Guerneville Road in the Laguna Wildlife Area, which is owned and managed by the California Department of Fish and Game (CDFG). This control area was approximately 86.50 acres**



# ***Ludwigia* Control in the Laguna de Santa Rosa, California**

## **Aquatic Herbicide Application Equipment:**

**Aquatic herbicide applications were performed utilizing a combination of equipment setup with aquatic herbicide application equipment that included the MarshMog (a low ground pressure track rig), an Airboat, an Argo, and a Truck.**



# ***Ludwigia* Control in the Laguna de Santa Rosa, California**

**Mechanical Removal**  
**Equipment:** Mechanical Harvesting was performed using traditional Aquatic Plant Harvesters. The Cookie Cutter was used to Pre-cut paths through the areas for access, and to pre-cut the vegetation prior to harvesting. A Long Reach Excavator was used for clearing vegetation from the Bellevue Wilfred and the eastern portion of the Main Laguna Channel in Site I (SCWA).



# **Ludwigia Control in the Laguna de Santa Rosa, California**

- **Support Equipment:** Excavators were used to support vegetation unloading at the designated shoreline unloading areas (Site I and II), a Track Cat with a 4:1 bucket, a Tractor Loader with a Trailer Conveyor, and a Skip Loader were utilized to move and stockpile vegetation for drying within the project areas. A Water Tank Trailer was used to supply clean water to the herbicide application equipment, and to wash down roads when required, and a Jon Boat was used to remove debris from the Laguna channel at Site II, and for general access use



# Ludwigia Control in the Laguna de Santa Rosa, California

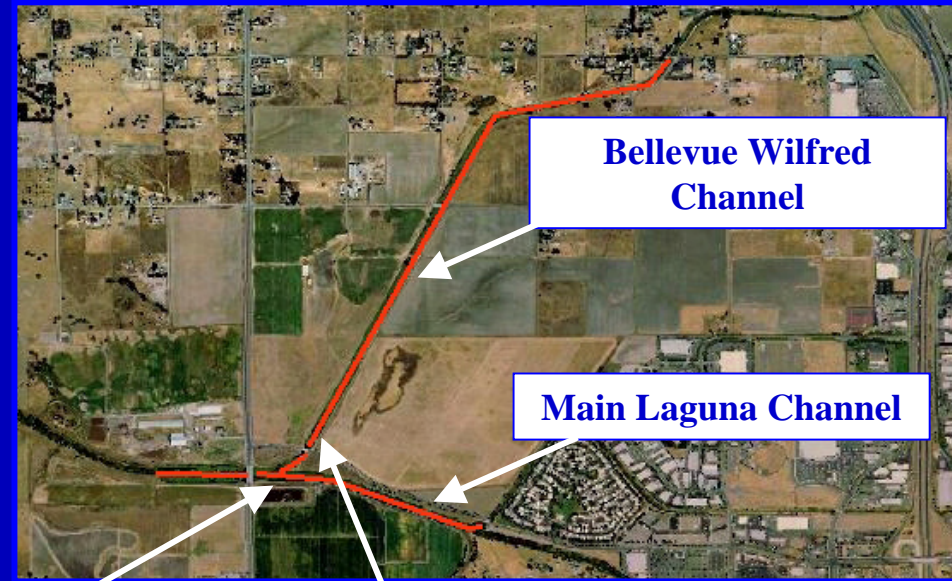


# Ludwigia Control in the Laguna de Santa Rosa, California

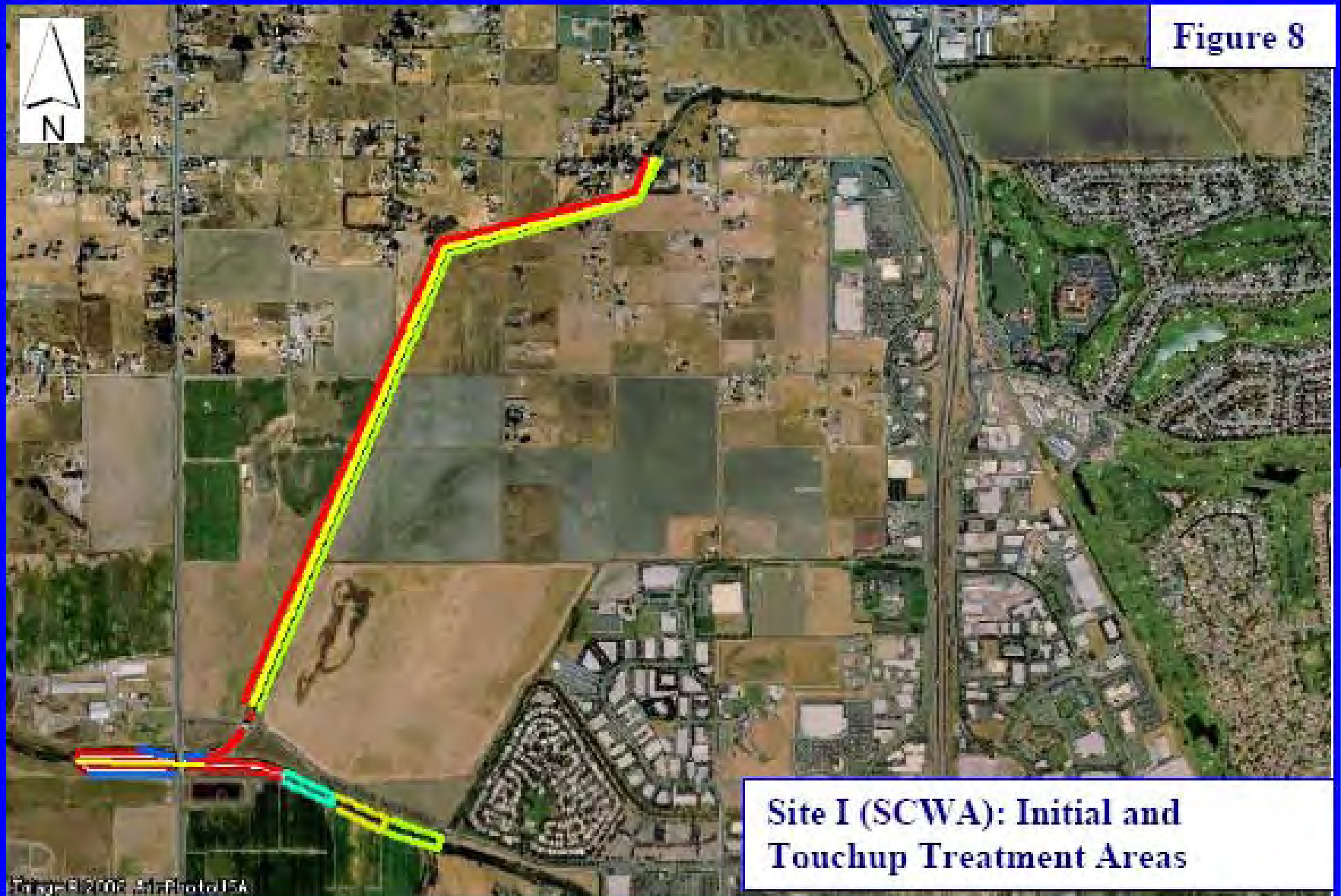
## PROJECT APPROACH Site I (SCWA)

- *Ludwigia* was treated with the glyphosate-based aquatic herbicide Glypro (Renovate in 2006) tank mixed with the aquatic adjuvant/surfactant Cygnet Plus, the drift control agent StaPut, and a marker dye per the aquatic pesticide Application Plan (APAP).

- Approximately three weeks following the initial herbicide applications, a long reach excavator (62.5 foot reach) was mobilized and used to remove the *Ludwigia* from the Bellevue Wilfred Channel, and the Cookie Cutter and Harvesters were used to remove *Ludwigia* from the main Laguna Channel.



# Ludwigia Control in the Laguna de Santa Rosa, California



# **Ludwigia Control in the Laguna de Santa Rosa, California**

## **PROJECT APPROACH Site I (SCWA)**





# Ludwigia Control in the Laguna de Santa Rosa, California

## PROJECT APPROACH Site I (SCWA)



# **Ludwigia Control in the Laguna de Santa Rosa, California**

**July 2005 (Pre-Treatment)**



**October 2005 (Post Mechanical Removal)**



**August 2005 (Post Treatment)**



# **Ludwigia Control in the Laguna de Santa Rosa, California**



**July 2005 (Pre-Treatment)**



**August 2005  
(Post Treatment)**



**October 2005  
(Post Mechanical Removal)**

# **Ludwigia Control in the Laguna de Santa Rosa, California**



**July 2005 (Pre-Treatment)**



**October 2005 (Post Mechanical Removal)**



**August 2005 (Post Treatment)**

## **Ludwigia Control in the Laguna de Santa Rosa, California**

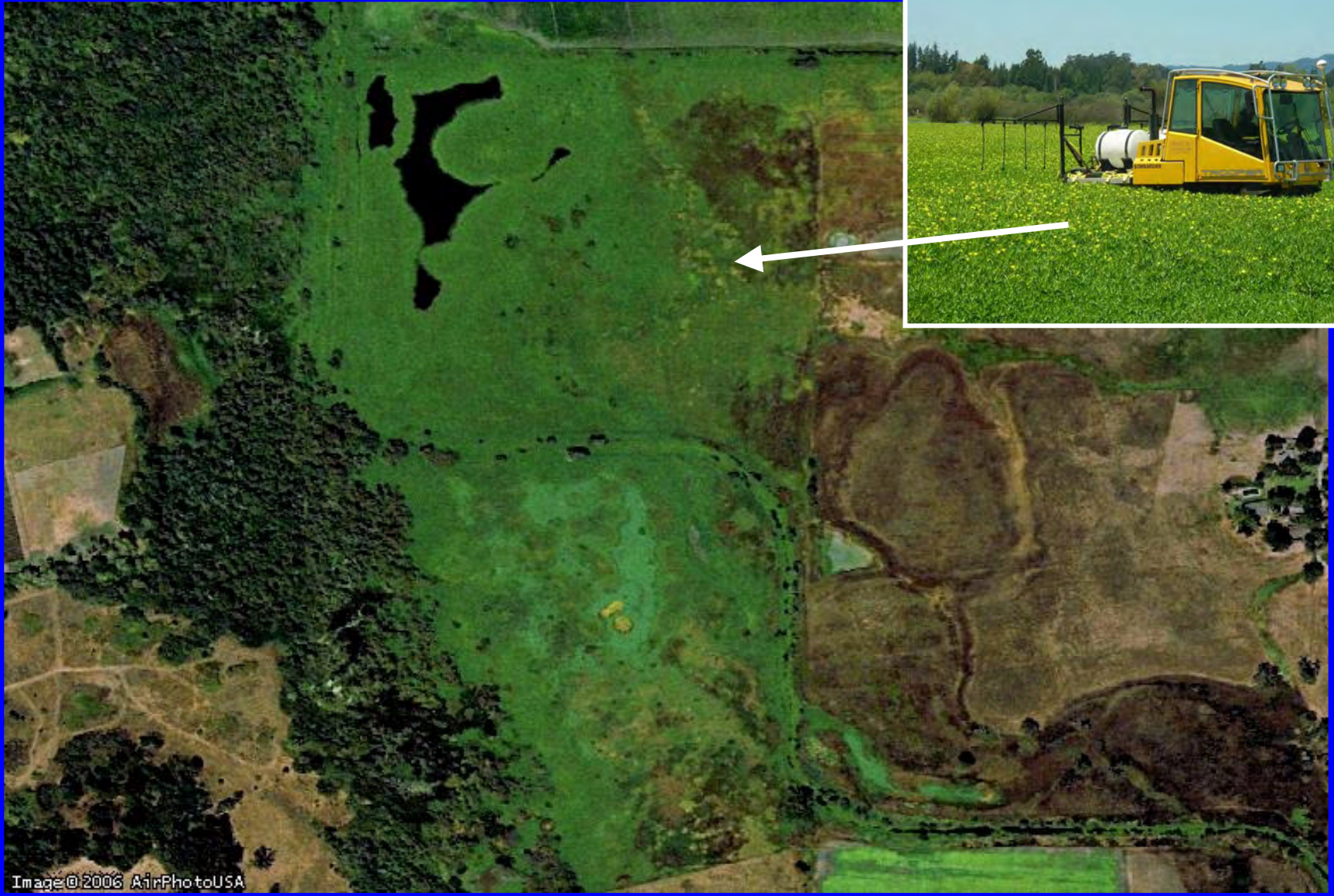
Site	Acreage Treated/ (Linear Feet)	Plant Biomass Removed Long Reach* (Cubic Yards/Tons)	Truck Loads of Vegetation Removed	Plant Biomass Removed Harvesters** (Cubic Yards/Tons)	Harvester Loads of Vegetation Removed	Total Biomass Removed Tons	Total Biomass Removed Cubic Yards
Site I (SCWA) : Bellevue Wilfred Main Channel & Y Channel to Laguna	15.7 (8,432)	9,674 Yards 2,764 Tons	691			2,764	9,674
Site I: Main Laguna Channel	12.0	3,542 Yards 1,012 Tons	253	2,686 Yards 660 Tons	330	1,672	6,228
Site I Totals	28.70	13,216 Yards 3,776 Tons	944	2,686 Yards 660 Tons	330	4,436	15,902

# Ludwigia Control in the Laguna de Santa Rosa, California

## PROJECT AREA Site II (CDFG)



# Ludwigia Control in the Laguna de Santa Rosa, California

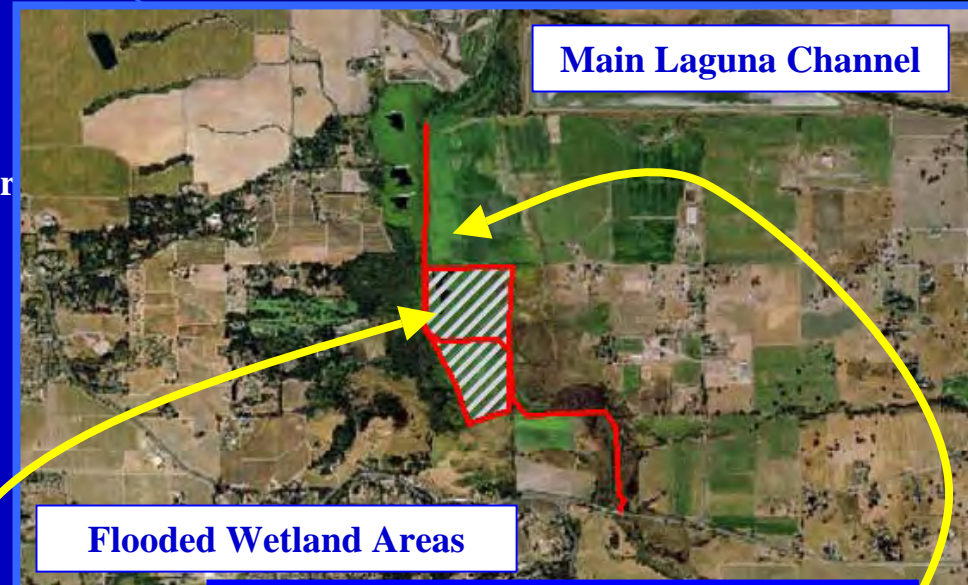


# Ludwigia Control in the Laguna de Santa Rosa, California

## PROJECT APPROACH Site II (CDFG)

- *Ludwigia* was treated with the glyphosate-based aquatic herbicide Glypro and Renovate tank mixed with the aquatic adjuvant/surfactant Cygnet Plus, the drift control agent StaPut, and a marker dye per the aquatic pesticide Application Plan (APAP).

- Approximately three weeks following the initial herbicide applications, the Cookie Cutter and Harvesters were used to remove *Ludwigia* from the main Laguna Channel and portions of the flooded wetland areas.





# **Ludwigia Control in the Laguna de Santa Rosa, California**

## **PROJECT APPROACH Site II (CDFG)**

Before (July 22, 2005)

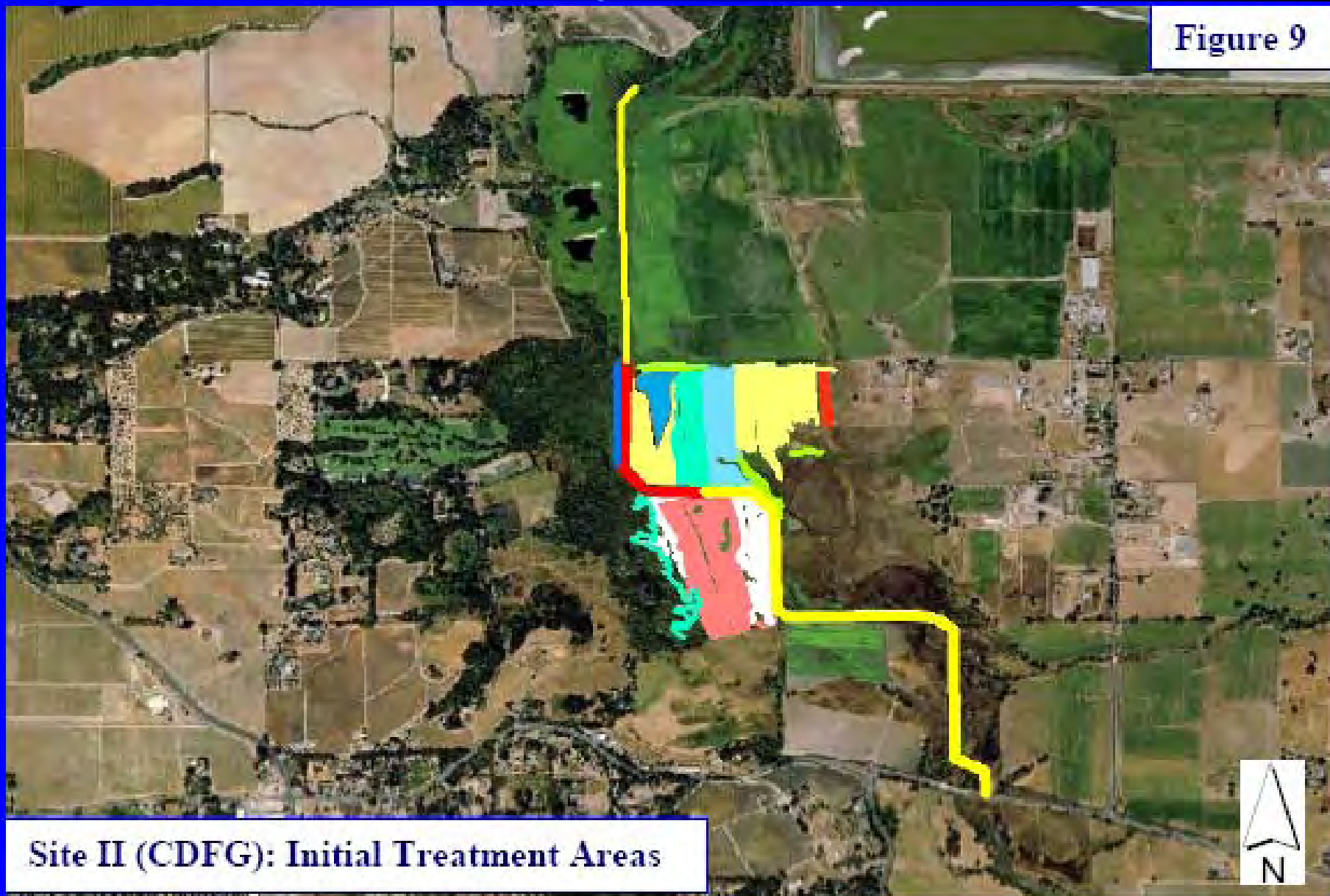


After (July 22, 2005)



# Ludwigia Control in the Laguna de Santa Rosa, California

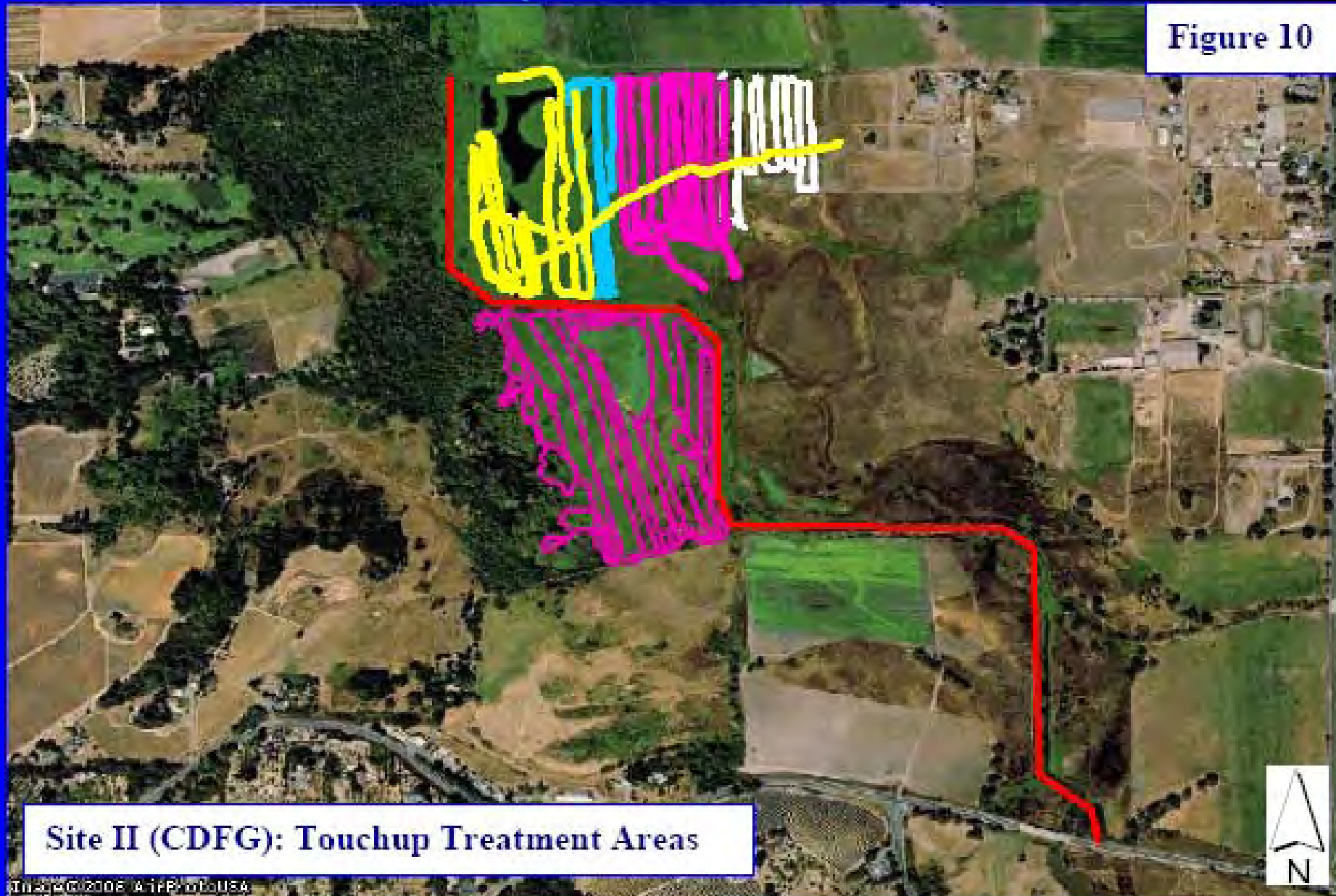
Figure 9



Site II (CDFG): Initial Treatment Areas

# Ludwigia Control in the Laguna de Santa Rosa, California

Figure 10



Site II (CDFG): Touchup Treatment Areas

# ***Ludwigia* Control in the Laguna de Santa Rosa, California**

## **PROJECT APPROACH Site II (CDFG)**



# Ludwigia Control in the Laguna de Santa Rosa, California

## PROJECT APPROACH Site II (CDFG)



# **Ludwigia Control in the Laguna de Santa Rosa, California**

## **PROJECT APPROACH Site II (CDFG)**



# **Ludwigia Control in the Laguna de Santa Rosa, California**



**July 2005 (Pre-Treatment)**



**August 2005 (Post Treatment)**



**October 2005 (Post Mechanical Removal)**

# **Ludwigia Control in the Laguna de Santa Rosa, California**

**July 2005 (Pre-Treatment)**



**October 2005 (Post Mechanical Removal)**



**August 2005 (Post Treatment)**





# **Ludwigia Control in the Laguna de Santa Rosa, California**

**July 2005 (Pre-Treatment)**



**August 2005 (Post Treatment)**



**October 2005 (Post Mechanical Removal)**

# **Ludwigia Control in the Laguna de Santa Rosa, California**



**July 2005 (Pre-Treatment)**



**October 2005 (Post Mechanical Removal)**

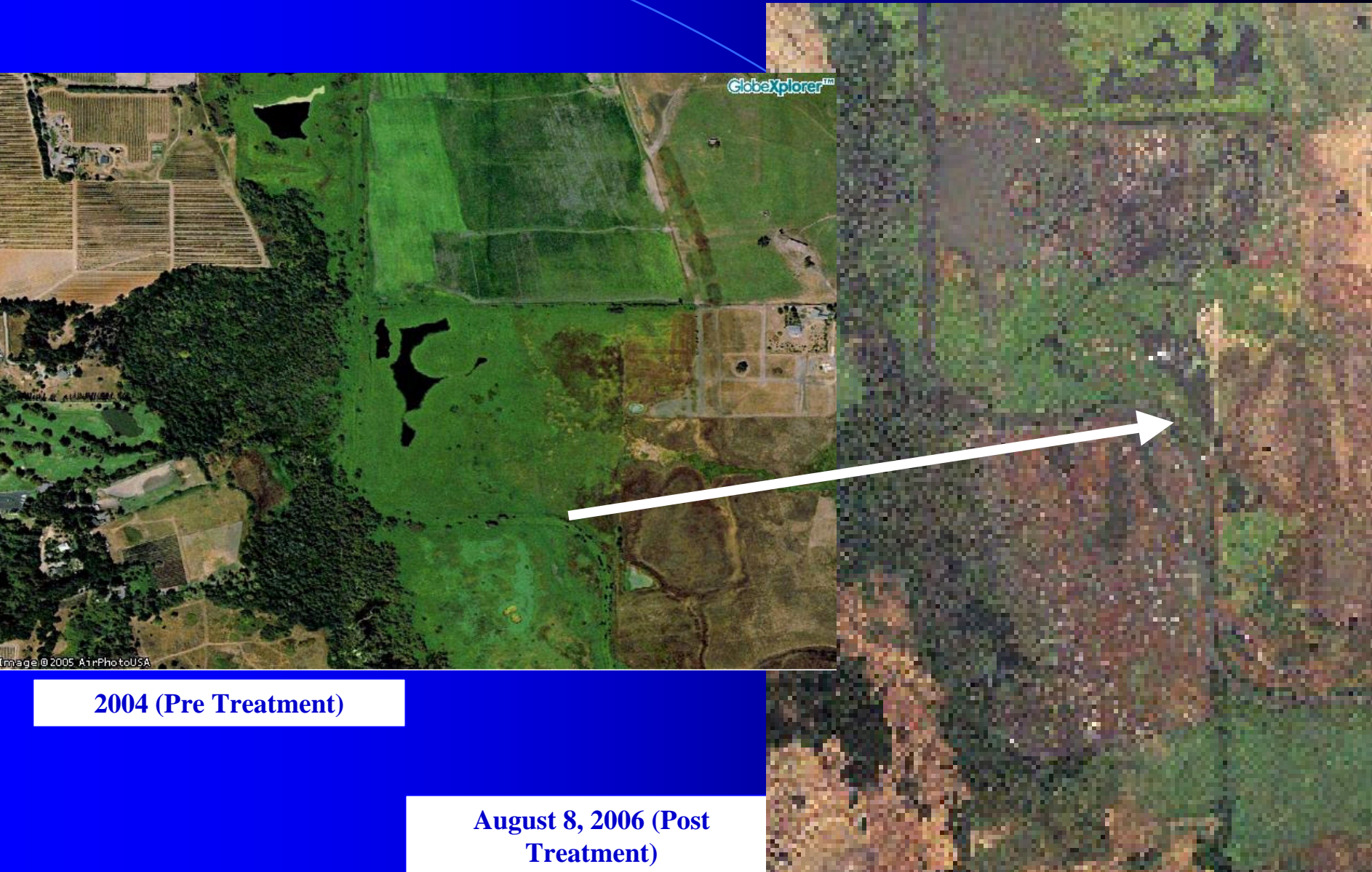


**August 2005 (Post Treatment)**

## **Ludwigia Control in the Laguna de Santa Rosa, California**

Site	Acreage Treated/ (Linear Feet)	Plant Biomass Removed Long Reach* (Cubic Yards/Tons)	Truck Loads of Vegetation Removed	Plant Biomass Removed Harvesters** (Cubic Yards/Tons)	Harvester Loads of Vegetation Removed	Total Biomass Removed Tons	Total Biomass Removed Cubic Yards
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<b>Site I Totals</b>	<b>28.70</b>	<b>13,216 Yards 3,776 Tons</b>	<b>944</b>	<b>2,686 Yards 660 Tons</b>	<b>330</b>	<b>4,436</b>	<b>15,902</b>
Site II (CDFG): Main Laguna Channel	8.5 (9,603)						
Site II: Flooded Wetland	78						
<b>Site II Totals</b>	<b>86.5</b>			<b>3,875 Yards 952 Tons</b>	<b>476</b>	<b>952</b>	<b>3,879</b>
<b>PROJECT AREA TOTALS</b>	<b>115.2</b>	<b>13,216 Yards 3,776 Tons</b>		<b>6,561 Yards 1,612 Tons</b>	<b>806</b>	<b>5,388</b>	<b>19,781</b>

# Ludwigia Control in the Laguna de Santa Rosa, California



**2004 (Pre Treatment)**

**August 8, 2006 (Post Treatment)**

# ***Ludwigia* Control in the Laguna de Santa Rosa, California**



# **Ludwigia Control in the Laguna de Santa Rosa, California**



# ***Ludwigia* Control in the Laguna de Santa Rosa, California**



# *Ludwigia* Control in the Laguna de Santa Rosa, California





# *Ludwigia* Control in the Laguna de Santa Rosa, California



# *Ludwigia* Control in the Laguna de Santa Rosa, California



# Ludwigia Control in the Laguna de Santa Rosa

**ASSOCIATED PROGRAM COSTS:** The associated 2005 program costs including labor and materials were as follows:

## Site I (Sonoma County Water Agency Site)

	Cut Paths & Pre Cut Vegetation	Vegetation Removal Long Reach	Vegetation Removal Aquatic Harvesters	Removed Vegetation Handling	Herbicide Applications	Mobilization Demobilization	Reporting	Totals
Unit Costs	\$17,500.00	\$94,666.25	\$30,707.50	\$90,705.00	\$30,395.93	\$12,841.83	\$6,505.45	\$283,321.96
Projected Costs	\$376,033.45							
Cost Per Acre*	\$609.75	\$3,298.48	\$1,069.95	\$3,160.45	\$1,059.09	\$447.45	\$226.67	\$9,871.85
Cost Per Cubic Yard*	\$1.10	\$5.95	\$1.93	\$5.70	\$1.91	\$0.81	\$0.41	\$17.82
Cost Per Ton*	\$3.94	\$21.34	\$6.92	\$20.45	\$6.85	\$2.89	\$1.47	\$63.87

\*Based on a total control area of 28.70 acres and volume data from Table I

## Site II (California Department of Fish and Game)

	Cut Paths & Pre Cut Vegetation	Vegetation Removal Long Reach	Vegetation Removal Aquatic Harvesters	Removed Vegetation Handling	Herbicide Applications	Mobilization Demobilization	Reporting	Totals
Unit Costs	\$67,900.00	N/A	\$83,290.10	\$82,050.45	\$56,929.75	\$16,822.58	\$6,505.45	\$313,498.33
Projected Costs	\$303,275.65							
Cost Per Acre*	\$784.97		\$962.89	\$948.56	\$658.15	\$194.48	\$75.21	\$3,624.26
Cost Per Cubic Yard*	\$17.50		\$21.47	\$21.15	\$14.68	\$4.34	\$1.68	\$80.82
Cost Per Ton*	\$71.32		\$87.49	\$86.19	\$59.80	\$17.67	\$6.83	\$329.30

\*Based on a total control area of 86.50 acres and volume data from Table I

# **Ludwigia Control in the Laguna de Santa Rosa, California**



[www.lagunafoundation.org](http://www.lagunafoundation.org)  
[www.cleanlake.com](http://www.cleanlake.com)