


California Association of Pest Control Advisors (CAPCA)
San Ramon, CA March 12, 2015

CAPCA
Seminar
San Ramon
March 12, 2015

**Golf Course
Maintenance
and Stream
Water Quality:
Double Bogey
or Eagle?**

 **Blankinship Associates**
Agricultural & Environmental
Scientists & Engineers

Contra Costa Clean Water Program Golf Course Study

Today's Talk



- Why We Did It
- How We Did It
- What We Found
- What YOU Should Do
- "The Risk Myth"



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Rationale

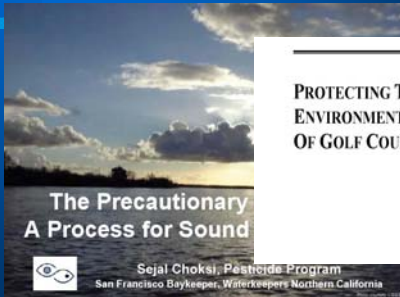


- The Sponsors
 - City of Pittsburg
 - Contra Costa Co Cleanwater Program
- NPDES Permit
- Water Quality Protection
- Address Golf Course Perceptions

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Contra Costa Clean Water Program Golf Course Study

Perception Is Reality



PROTECTING THE AQUATIC ENVIRONMENT FROM THE EFFECTS OF GOLF COURSES

By Richard D. Klein
Community & Environmental Defense Services
811 Central Palace Court
Owings Mills, Maryland 21117
(410) 454-9121
FAX (410) 454-9123
www.ced-s.org

November 1999

Sejal Choksi, Pesticide Program
San Francisco Baykeeper, Waterkeepers Northern California

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Perception Is Reality

Updated: 7:37 a.m. Thursday, July 21, 2011 / Posted: 11:50 p.m. Wednesday, July 20, 2011

Homeowners Sue Golf Course Over Polluted Water

Deland, Fla. — A group of 42 Volusia County homeowners filed a class action lawsuit against the Deland Golf Course over ground water pollution. They say the well water at the homes is contaminated with the cancer-causing chemical, dibutyltin.

Homeowners in the Country Club Estates neighborhood sued the golf course and Shell Chemical for \$10 million in damages. The lawsuit claims the golf course used the now-banned pesticide in the 1970s.

"What's going to want to buy a property with contaminated water," asked Gretelka Herrera, a concerned homeowner.

Nearly 13 homes in the neighborhood tested positive for the chemical. All of the homes with wells that tested positive are located on the east side of the country club off Woodland Boulevard.

The homeowners are concerned the positive tests will significantly lower their property values and make it harder to sell their homes.

"It's between my house and someone else's they might look past mine because of the situation in my neighborhood. That's not right," said Jerry Ziegler, a concerned homeowner.

The Florida Department of Environmental Protection is investigating the Country Club. The agency also tested 69 more nearby wells for dibutyltin.


Article 135
Technical Note 427 from Waterbed Protection Techniques, 1/27, 56-60

Groundwater Impacts of Golf Course Development in Cape Cod

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Perception Is Reality



GOLF DIGEST May 2008

"The most important article we've ever published"

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Perception Is Reality



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Perception Is Reality



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Perception Is Reality



- **Golf Digest:** Would you say that golf-course pesticide use in the United States today is not safe?
- **Jay Feldman*:** I would say that, yes.


* Co-founder: Beyond Pesticides

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Objectives

- **Organic v. traditional fertilizer:**
Which is better for protecting surface water quality adjacent to golf courses ?
- **Are pesticides leaving golf courses ?**



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Overview

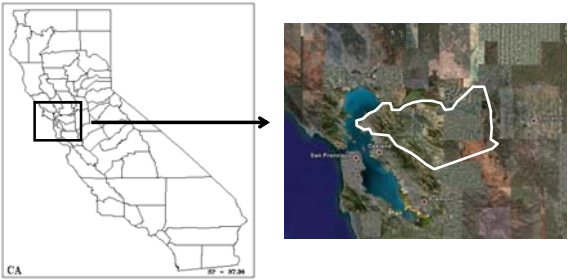


Golf in Contra Costa Co.

- 30 Courses
- 31 Watersheds
- Wide Geographic, Weather and Area-Specific Variability

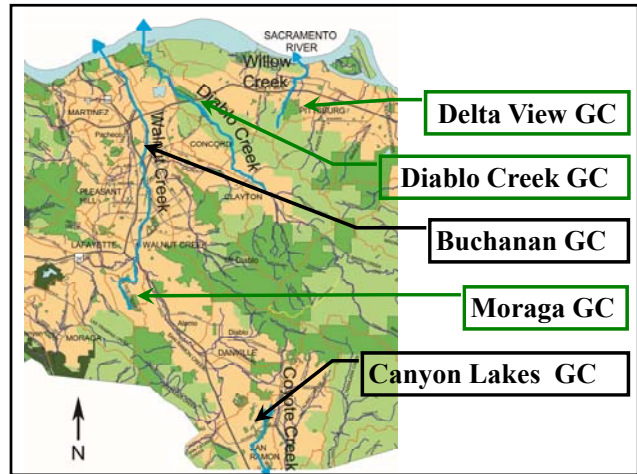
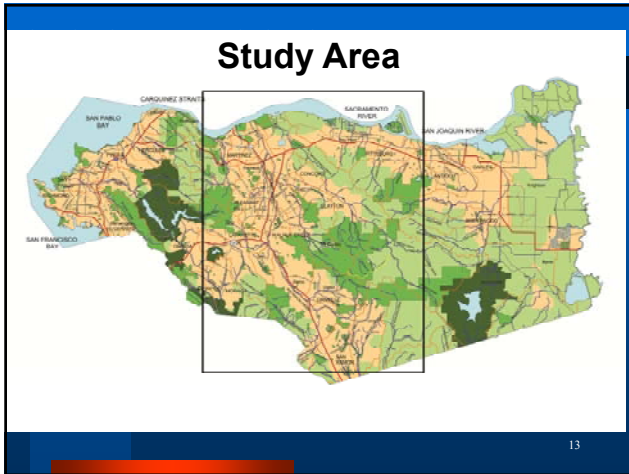
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Study Area



CA 02 = 07.00

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Overview (con't)

**“Organic”
vs.
“Traditional”
Fertilizer**

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Overview (con't)

Milorganite® 6-2-0 Classic

PROFESSIONAL TURFGRASS - ORGANIC NITROGEN FERTILIZER

- **Organic Fertilizer**
 - Not synthesized
 - Examples:
 - Manure (steer, poultry, etc.)
 - Meal (bone, feather, meat, blood, fish, etc.)
 - Biosolids (i.e., wastewater treatment byproducts)

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Overview (con't)

- **Traditional Fertilizer**
 - “Synthetic” or “Man-made”
 - Mineral origin or product of a chemical manufacturing process
 - Examples:
 - Salts: Ammonium phosphate, potassium nitrate
 - Derivatives of nitrogen: Sulfur or polymer-coated, methylene urea



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Methods

- **Traditional Courses**
 - Buchanan Fields
 - Canyon Lakes (2 sites)
- **Organic Courses**
 - Delta View
 - Diablo Creek
 - Moraga




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Methods (con't)

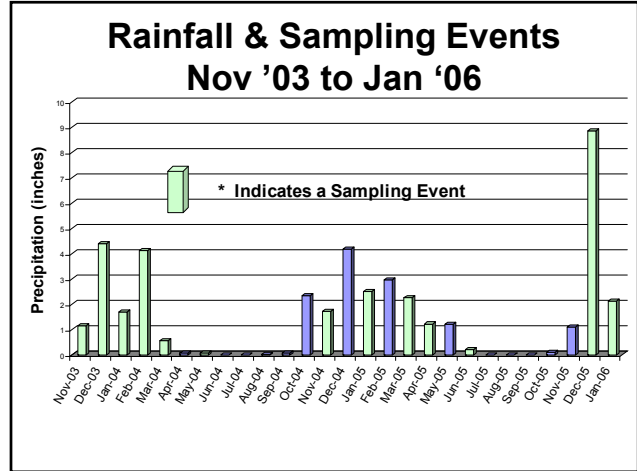
- **Grab Samples**
 - Up and Down Stream of the Course
 - Sampled Primarily During Wet Weather Flow
- **Analysis**
 - Nutrients (NPK) & General Chemistry
 - Aquatic Toxicity (Algae & Water Flea)



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Results

- 3 storm seasons
- 13 rain storms
- 46 sample events
- > 1,000 water quality measurements made

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Results: Water Flea Toxicity

- No Ceriodaphnia (Water Flea) toxicity
- **Significance:** No insecticides leaving courses studied

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Results: Water Quality

- Little or No Change in Water Quality
 - Upstream v. Downstream
 - Organic v. Inorganic
- **Significance:** No obvious nutrient contributions

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Results: Water Quality

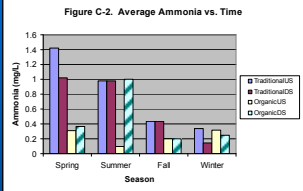


Figure C-2: Average Ammonia vs. Time

Bottom-line #1: More NH₃ detected with traditional courses
Bottom-line #2: NH₃ leaves organic courses in summer

Results: Agronomy

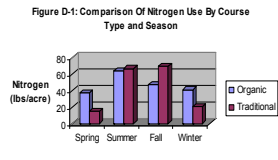
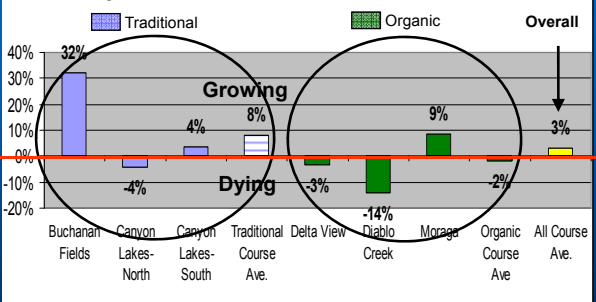


Figure D-1: Comparison Of Nitrogen Use By Course Type and Season

Bottomline: Both techniques result in similar total N applied

Results: Algae

Percent Change in Algae (Upstream v. Downstream)



Legend: Traditional (Blue), Organic (Green), Overall (Yellow)

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Results: Algae




- **Trends**
 - Organic Courses: 2% downstream reduction
 - Traditional Courses: 8% downstream enhancement
- **Significance**
 - Algae-limiting agents leaving organic courses
 - Nutrients leaving traditional courses
- **Magnitude**
 - Small
 - Variable

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Conclusions



- Does the choice of fertilizer (organic v. traditional) influence surface water quality adjacent to golf courses ? **Yes**
- Are pesticides leaving golf courses?
No (insecticides)
Unknown (herbicides/fungicides)

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Conclusions (con't)

- **What does influence surface water quality adjacent to golf courses ?**
 - Buffers
 - Be “ Fertilizer Smart”
 - Turf BMPs



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Use of Buffers



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Be "Fertilizer Smart"

- Apply based on soil & plant tissue testing & according to label direction
- Make multiple applications in small amounts
- Select & use slow release fertilizer carefully
- Do not apply before rainfall

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Turf BMPs

- Irrigate based on ETo
- Establish and maintain healthy turf
- Maintain high heights of cut
- Recycle grass clippings
- Use IPM
- Periodically monitor surface and groundwater quality

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Understanding "The Risk Myth"

$$\text{Risk} = \text{Toxicity} \times \text{Exposure}$$

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The Risk Myth: Toxicity Terms

- **LC₅₀**
 - Lethal Concentration that kills 50% of a test population
 - Typically expressed in mg/L
- **LD₅₀**
 - Lethal Dose that kills 50% of a test population
 - Typically expressed in mg/Kg of animal body weight

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The Risk Myth: Toxicity Data

Product Name	Active Ingredient	LC50	
		mg/L	Species
Various	Glyphosate IPA Salt	79 -120	Fathead Minnow
Nautique	Copper Carbonate	2 to 21	Fathead Minnow
Sonar	Fluridone	12	Rainbow Trout
Reward	Diquat Dibromide	12	Rainbow Trout
Copper Sulfate	Copper Sulfate Pentahydrate	1	Fathead Minnow

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USEPA Classification	Acute Aquatic LC ₅₀ (mg/L)
Practically Non-Toxic	>100
Slightly Toxic	10-100
Moderately Toxic	1-10
Highly Toxic	0.1-1
Very Highly Toxic	< 0.1

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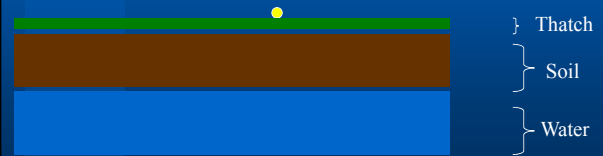
The Risk Myth: Exposure

- Dermal (Absorption)
- Oral (Ingestion)
- Inhalation (Inhalation)
- But, what happens to the chemical on the way to the receptor.....?

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The Risk Myth: Environmental Fate of Pesticides



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The Risk Myth: Environmental Fate of Pesticides

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The Risk Myth: Environmental Fate of Pesticides

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The Risk Myth: Managing Exposure

- You Can't Change Toxicity...
- ...So Manage Exposure
 - Understand Environmental Fate
 - Use BMPs
 - Read the Label
 - Make An Informed Pesticide Selection

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BMPs: Use of Buffers

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BMPs: Integrated Pest Management

- Know Your Pest
- Establish Thresholds
- Scout
- Use Mechanical, Cultural and Chemical Tools
- Repeat

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Questions?



Mike Blankinship
(530) 757-0941
mike@h2osci.com