


Pesticide Applicators Professional Association Mountain View, CA January 12, 2011

PAPA Seminar
Mountain View
January 12, 2011

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

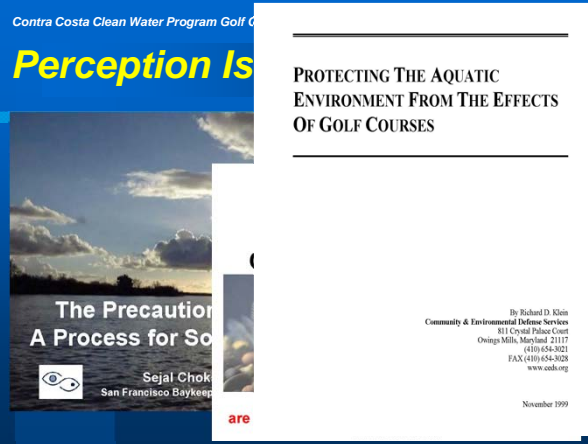


- The Sponsors
 - City of Pittsburg
 - Contra Costa Co Cleanwater Program
- NPDES Permit
- Water Quality Protection
- Address Golf Course Perceptions

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Contra Costa Clean Water Program Golf Course Study

Perception Is



PROTECTING THE AQUATIC ENVIRONMENT FROM THE EFFECTS OF GOLF COURSES

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November 1999

Sejal Chok
San Francisco Baykeeper

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Perception Is Reality

Beyond Pesticides Daily News Blog

Aquatic Organisms Harmed by Golf Course Pesticides

Beyond Pesticides, May 5, 2008. A new study indicates that some pesticides applied to golf courses in the Presqu Shoreline of central Ontario may have an impact on aquatic organisms in adjacent waterbodies. The study is published in the April issue of *Environmental Toxicology and Chemistry*.

Golf courses affect the environment by altering the habitat through the release of nutrients and pesticides. The Presqu Shoreline region of central Ontario, Canada, is a major recreational area, is especially susceptible to the impacts of golf courses as a result of the geology and hydrology of the region. The Shield area is characterized by many lakes, rivers, and streams. Golf courses in this area typically have turf on top of a sand base which allows chemicals used on the courses to migrate into surrounding bodies of water.

Cosmetic Use of Lawn Chemicals Banned in Ontario

Beyond Pesticides, April 23, 2008. Ontario is moving to reduce exposure to toxic chemicals by banning the sale and cosmetic use of pesticides. Legislation to be introduced today would make Ontario's pesticide rules among the toughest in North America. Retail stores selling a variety of pesticides by name or brand names (the generic brand) by public health experts are showing growing evidence of the potential health risks of pesticides, particularly for children. The law would mean you often need to spray to weed out other pesticides used for farming or forestry. Golf courses would still be able to use pesticides, but must meet certain conditions to minimize environmental impacts. Pesticides would still be allowed for control of mosquitoes and other insects determined by licensed health officials.


"Our generation is becoming more and more aware of the potential risks in our environment, not only to our health, but to our children's health. That's why we're taking action on behalf of the next generation of Ontarians, and reducing their exposure to chemicals," said Premier Dalton McGuinty.

"Many municipalities have already shown leadership in banning or restricting cosmetic use pesticides. Now, extending that protection to all families wherever they live," said Environment Minister John Giamberini.

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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

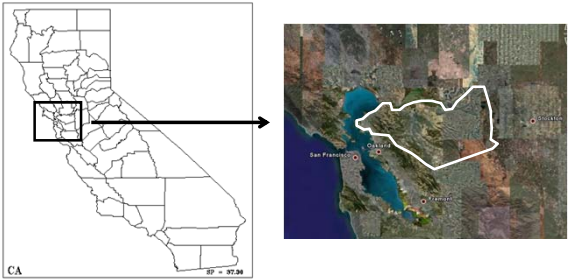


Golf in Contra Costa Co.

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

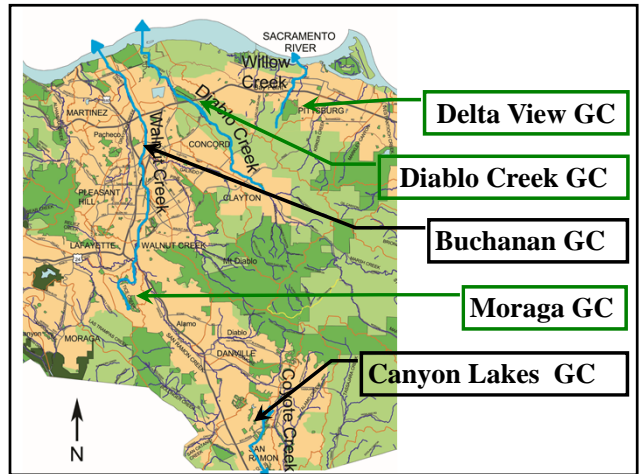
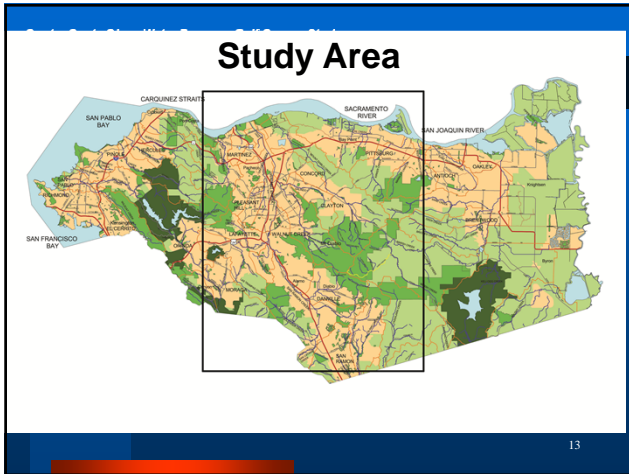
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Study Area



CA 07 = 07.00

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Overview (con't)

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

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Overview (con't)

● Organic Fertilizer

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

Milorganite
Milorganite® 6-2-0 Classic
PROFESSIONAL TURFGRASS - ORGANIC NITROGEN FERTILIZER

- NON-BURNING ORGANIC NITROGEN
- RICH IN WATER-SOLUBLE NITROGEN
- 6% ORGANICALLY COMPLETED IRON - AIDS DEEP GREEN COLORING
- CONSISTENT QUALITY

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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)

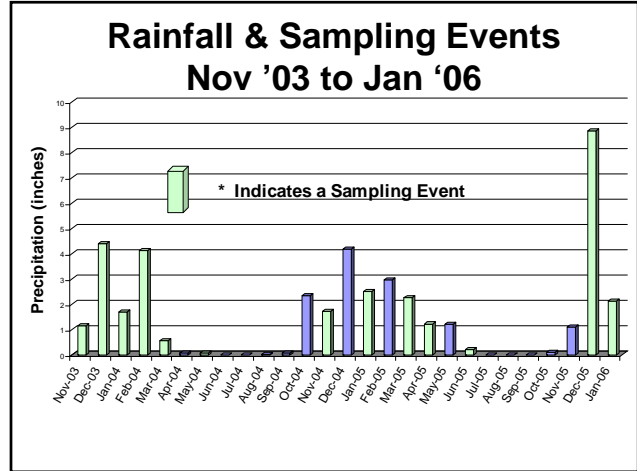
- **Grab Samples**
 - Up and Down Stream of the Course
 - Sampled Primarily During Wet Weather Flow
- **Analysis**
 - Nutrients (NPK) & General Chemistry
 - Aquatic Toxicity (Algae & Water Flea)



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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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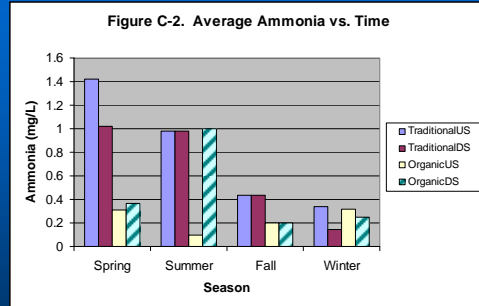
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Results: Water Quality

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

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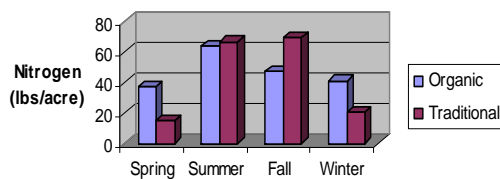
Results: Water Quality



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

Results: Agronomy

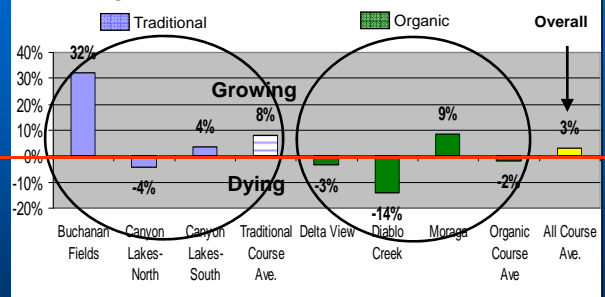
Figure D-1: Comparison Of Nitrogen Use By Course Type and Season



Bottomline: Both techniques result in similar total N applied

Results: Algae

Percent Change in Algae (Upstream v. Downstream)



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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
 - Highly 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

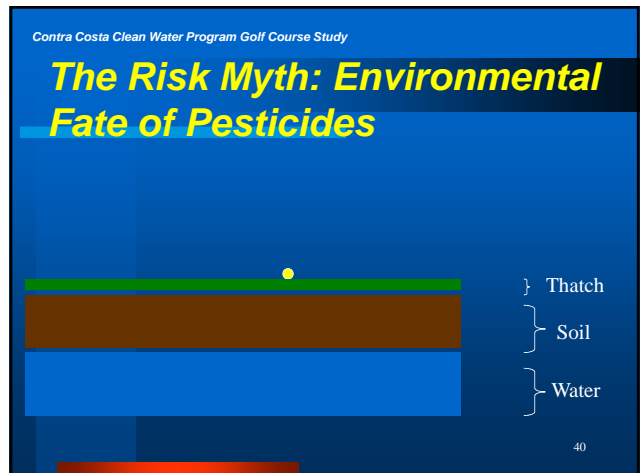
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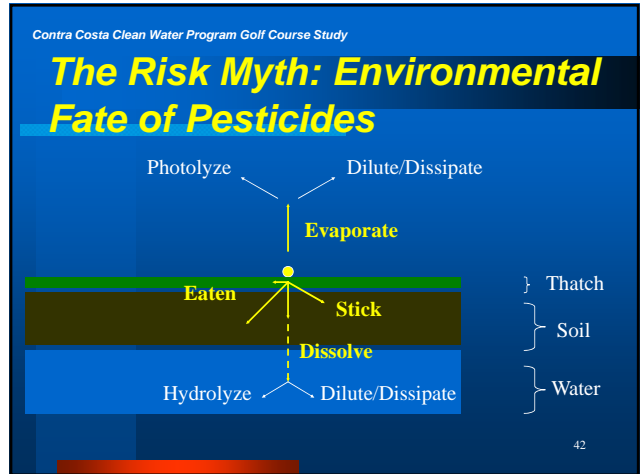
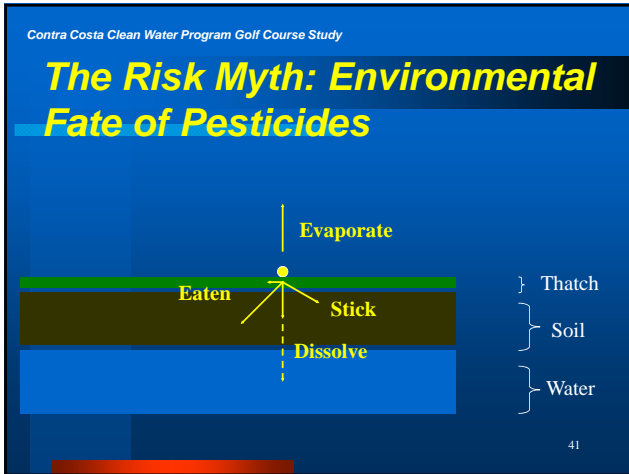
USEPA Classification	Acute Aquatic LC ₅₀ (mg/L)
Practically Non-Toxic	>100
Slightly Toxic	10-100
Moderately Toxic	1-10
Highly Toxic	0.1-1
Very Highly Toxic	< 0.1

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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: 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: Integrated Pest Management

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

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Questions?



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