


Safe Drinking Water: Science and Law


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Lecture 10
Environmental Politics and Law

Water: The Major Challenges.....

1. Waterborne Diseases
2. Aquifers cross property and jurisdictional boundaries.
3. Point Source Control vs. Surface Runoff
4. Groundwater Depletion and Contamination
5. Private wells (Serving <15 HH) not monitored or regulated.
6. Surface water in the US is undrinkable unless treated.
7. Monitoring and Surveillance Need Much Improvement
8. Public water infrastructure is inadequate to meet even our current needs.
9. Water Rights: Public or Private?
10. Land Use Affects Water Quality

- SDWA COVERS SUPPLIES THAT SERVE
>24 INDIVIDUALS OR
>14 CONNECTIONS
- 53,000 Water Systems Covered in US
 - 43,000 Groundwater
 - 10,000 Surface Water
 - 46% Public, 54% Private
- 15 MILLION WELLS IN US: Serve Individual Residences
 - 45 Million People
 - Unregulated by SDWA

Compliance

- 30 million Americans drink water each year from systems that report violations of health-based standards
- 10,000 systems violated health-based drinking water standards
- 80% of U.S. public water systems have no reported violations
- 86,000 violations of federal requirements to monitor water or to report results

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Safe Drinking Water Act:

What is an MCLG?

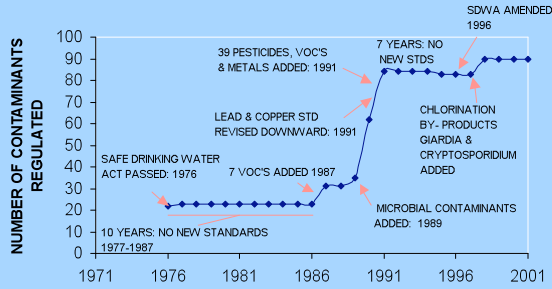
- Maximum Contaminant Level Goal
- Considers only human health risk
- Non-enforceable public health goal

Safe Drinking Water Act:

What is an Maximum Contaminant Level?

- Maximum Contaminant Level
- Highest concentration of contaminant allowed
- Enforceable Limit
- Cost / benefit analysis required under SDWA

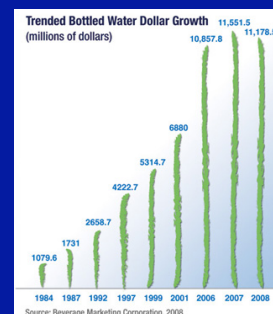
HISTORY OF DRINKING WATER REGULATION TOTAL CONTAMINANTS REGULATED BY YEAR



Why So Few Standards Set, Given So Many Chemical Contaminants?

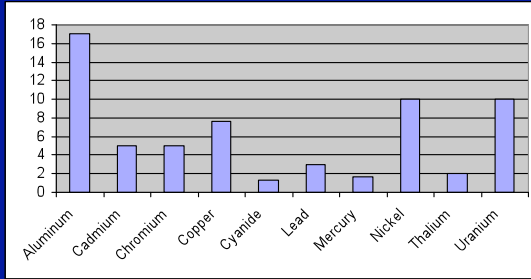
Consumer Protection vs. Source Protection

- Shift in emphasis toward drinking water source protection...

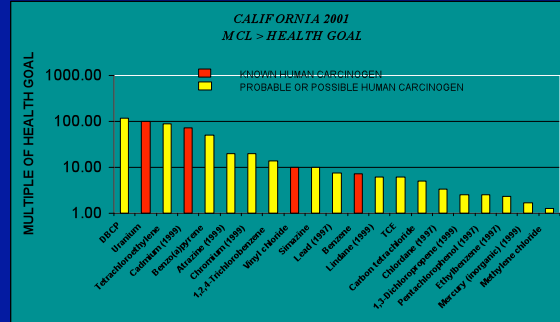


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Allowable MCL / Public Health Goal (Negligible Risk)
State of California
Inorganic Chemicals

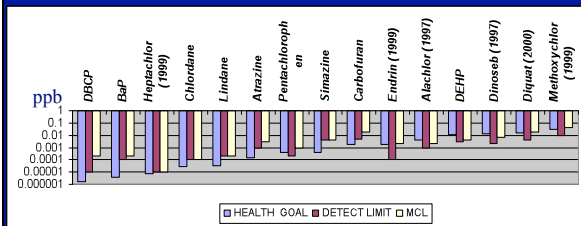


No One is Regulating Cumulative Cancer Risk



CALIFORNIA
HEALTH GOALS V. ALLOWABLE CONTAMINATION

<http://www.dhs.ca.gov/ps/ddwem/chemicals/PHGs/reviewstatus.htm>



SAMPLING DESIGN SUFFICIENCY

- Systems of 25 to 1,000 people: one sample per month.
- Recent Compliance Reduces testing to 4 times / year
- Some types of systems can qualify for annual monitoring.
- Triazine Herbicides in Midwest

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Equity in Costs of Treatment & Filtration

Granular activated carbon ("GAC") "best technologies"

- \$ 0.10 to \$ 0.85 per 1000 gallons of treated water for large and medium systems,
- \$ 1.50 per 1000 for small systems.

Filtration Systems:

•\$500 to over \$1000 per household for systems serving populations in the 25 to 100 range, to less than \$ 100 per household for the largest PWSs.

Atrazine

*20 Year Controversy
Closes a Chapter in Jan 2003*

Crop Uses

- ☞ Agricultural Uses
- ☞ Food Crops
 - ☞ Field corn, sweet corn (fresh and processed), sugarcane, sorghum, winter wheat, guava, macadamia nuts
- ☞ Non Food Crops
 - ☞ Hay, pasture, summer fallow
- ☞ Silviculture
 - ☞ Forestry or woodlands, conifers, woody ornamentals, Christmas trees

Use Profile

- ☞ Residential/Industrial/Recreational Uses
 - ☞ Residential Turf (Lawn care operators and homeowner applied), parks, institutional turf
 - ☞ Golf courses, sod, landscape maintenance
 - ☞ Roadways, industrial facilities

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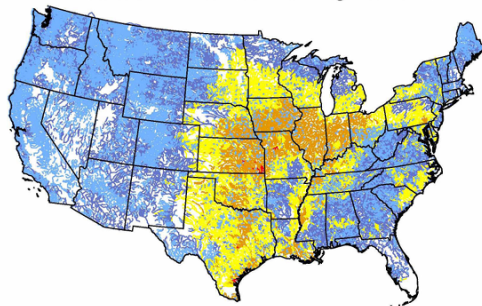
- \$225 million per year in the U.S. on chemical treatments
- Greens are the most intensively treated part of the golf course.
- \$1,300 per acre for their 35,000 acres of putting surface.

Major Crop Use by Percent Crop Treated

Crop	Total Acres Treated (1,000)	Percent Crop Treated
Field Corn	59,500	75
Sorghum	6,500	59
Sugarcane	650	76
Sweet Corn, Processed	270	58
Sweet Corn, Fresh	110	50

Source: EPA, Average of 1990-2000 Data

Predicted annual mean concentration of atrazine in streams based on 2007 atrazine use on agricultural land



Predicted concentration of atrazine, in micrograms per liter

- <0.03
- 0.03 - 0.3
- >0.3 - 3
- >3
- Not estimated

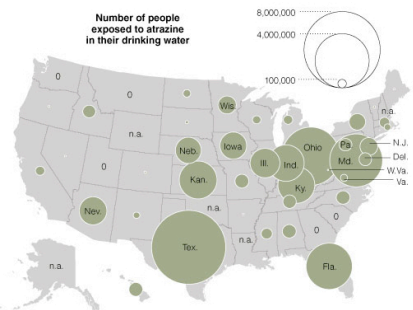
The New York Times

August 23, 2009

Atrazine Levels Across the Nation

Atrazine, the popular weed killer, often washes into water supplies. Levels vary significantly, and the E.P.A. says Americans are not exposed to unsafe amounts. But new research suggests that it may be more dangerous than previously thought.

Number of people exposed to atrazine in their drinking water



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Atrazine – Regulatory History

- ☞ First registered in 1958
- ☞ Atrazine also regulated under:
 - ☞ The Safe Drinking Water Act (SDWA); and
 - ☞ The Clean Water Act (CWA)
- ☞ Triazines Special Review began in 1994 for carcinogenicity concerns
- ☞ Parking Lot is Full

Structurally Similar Chemicals

- ☞ Atrazine
- ☞ Simazine
- ☞ Propazine
- ☞ Common Chlorinated Metabolites

Safe Drinking Water Act: MCL & MCLG

- ☞ 1991 MCL = 3 ppb
- ☞ MCLG = 3 ppb
- ☞ Compliance based on running annual average -- quarterly samples or single annual sample

Atrazine – Cancer classification

- ☞ Late 80s, classified as a “possible human carcinogen”
- ☞ In June 2000, EPA Scientific Advisory Panel recommended reclassification as “not a likely human carcinogen”

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Prior Regulation

- ☞ Deleted rangeland, millet, and pineapple uses
- ☞ Restricted Use classification (except lawn care, turf, and conifer uses)
- ☞ Institution of a well-head protection plan (50 foot setbacks)
- ☞ Prohibition of chemigation

Dance of Regulation

- ☞ Reduction of maximum seasonal application rate for corn and sorghum to 3 lb ai/A (from 4)
- ☞ Reduction of maximum rate on non-cropland and total vegetation to 10 lb ai/A (from 40)
- ☞ Required post emergent applications to corn be made before corn reaches 12 inches in height

18 States Hurt By Bad Water From Others

WASHINGTON, June 3 (AP) — Using a computer to analyze the movement of a pollutant, a Government study has found that most of the water pollution problems in 18 states originate outside their borders.

Richard Smith and Richard Alexander of the United States Geological Survey sampled water throughout the nation for presence of the chemical phosphorus and then analyzed the pollutant's movement by computer.

A check of phosphorus in streams, rivers and large reservoirs showed the biggest problem with out-of-state pollution to be along the Ohio, Missouri and Mississippi Rivers, the scientists said in a report released on Friday.

States along those rivers that receive more than half their water pollution from elsewhere were Arkansas, Illinois, Indiana, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Tennessee and West Virginia. But similar problems were also found in Connecticut, Delaware, Maryland, Massachusetts, New Jersey, North Dakota, Utah and Washington.

USGS FINDS ATRAZINE HUNDREDS OF MILES FROM SITE OF APPLICATION

NYT: June 4, 2001

- For 18 States: Most Water Pollution Originates from Out of State Sources

- States With >50% of Pollution from Out of State:

- AK, IL, KS, IN, KY, LA, MS, MI, TN, WV, CT, DL, MD, MA, ND, UT, WA

Midwest Water Has Pesticides, Report Finds

WASHINGTON, Oct. 18 (AP) — Millions of Americans swallow five widely used farm pesticides in their drinking water, according to a study by the Environmental Working Group, a private organization that seeks stricter regulations of pesticides.

In releasing its study today, the group said that more than 3.5 million people in 121 Midwestern towns and cities faced an elevated risk of cancer as a result of the pesticides.

The study said that, in all, 141 million Americans routinely consumed the following weed killers: alachlor, atrazine, cyanazine, metolachlor and simazine. They are commonly used on corn and soybeans, and the environmental group focused its study on the Corn Belt.

The Federal Environmental Protection Agency said the group's report should be viewed with concern but not alarm. It denied that large numbers of people faced a higher risk of cancer.

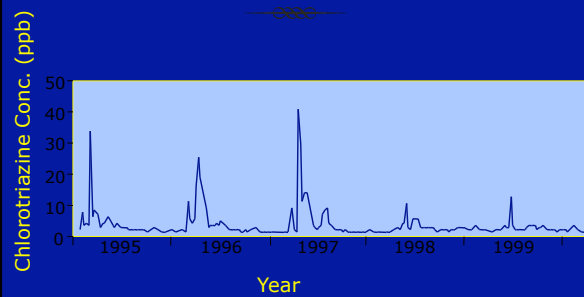
Environmental Working Group

- 3.5 Million Drinking Herbicides in Water
- Alachlor, Atrazine, Cyanazine, Metolachlor, Simazine.
- Used Primarily on Corn & Soybeans

New York Times: Oct. 19, 1994

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Typical Seasonal Pulses (Surface Water)



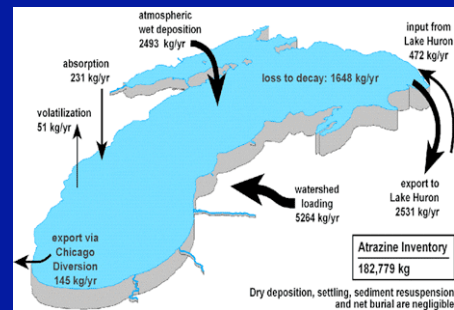
Atmospheric transport

- ❖ USGS: 0.6% of applied atrazine was annually deposited in rainfall over one study area.
- ❖ Atrazine degradation products, DEA and DIA were also detected in rainfall samples.
- ❖ The atrazine from rainfall is slowly accumulating in Lake Superior.
- ❖ 1 ppb in precipitation in areas where it is not used,
- ❖ 40 ppb in rainfall of midwestern agricultural areas where it is heavily applied.

Degradation of Atrazine in Aquatic Environment

- CR The half-life for six studies (lakes, experimental pond) varies from 41 to 237 days with a mean of 159 days.
- CR Lake Michigan study by EPA shows that atrazine is quite persistent due to the conditions of
 - CR cold water,
 - CR low productivity,
 - CR high pH (8.2),
 - CR low nitrate, and
 - CR low dissolved organic carbon (1.5 mg/L).
- CR Estimated half-life in Lake Michigan is 31 years

EPA Study: Lake Michigan—Atrazine Mass Balance



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"Atrazine-exposed males have ovaries in their testes and much smaller larynges [voice boxes]," Hayes says.

The herbicide also lowers the levels of testosterone in sexually mature male frogs by a factor of 10.

Tyrone Hayes. Assoc. Prof. UC Berkeley.

The U.S. Geological Survey found atrazine at levels as high as 21 ppb in groundwater and 42 ppb in surface waters during the growing season in the Midwest.

Therefore the chances that amphibians are exposed to atrazine levels of 0.1 or more are extremely high.

EPA Scientific Advisory Board/Panel

- *Ron Kendall Texas Tech Syngenta Contractor*
- *Failed to Replicate Hayes Results*
- *Hayes Was Former Syngenta Contractor*
- *Syngenta Argued Hayes Didn't Control for many laboratory conditions.*
- *Hayes argued: Syngenta approved protocol.*
- *You can't take the politics out of the science...*

Hayes on Human Implications of Findings...

Hayes (2002) found that atrazine causes sexual deformities in frogs, at a level 30 times lower than EPA's tap water standard of 3 parts per billion.

"The effects of atrazine on frogs could be a sign that the herbicide is subtly affecting human sex hormones, too, interfering with androgens, such as testosterone, that control male sex characteristics."

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*Workers Sue Syngenta's
St. Gabriel, LA*

NRDC: Coverup of Prostate Cancer Study?

*14 / 600 Prostate Cancer
Among Those Working 10 or more years at Plant*

"I worked 'eyeball' deep in the powder [atrazine]" and ate "meals ... in areas covered with atrazine dust."

Another worker recalled his supervisors telling him that "atrazine could be eaten without any adverse health effects."

www.nrdc.org

*Corporate Failure to Disclose
Knowledge of Risk*

Is a Violation of FIFRA

NRDC Claimed Syngenta Failed to Notify
EPA of:

1. Frog Studies
2. St Gabriel, LA plant prostate cancers

*International Reaction to Contamination
Why Wait for Proof of Disease?*

Belgium, France, Germany, Italy, Norway, Sweden, and Switzerland have banned use of atrazine.

These countries have banned all pesticides that tend to occur in drinking water at levels higher than 0.1 ppb, Pastoor says, primarily on the basis of occurrence in water, not health studies.