

Water Quality, Tobacco Product Waste, and Toxicity: What to Do About the Butts

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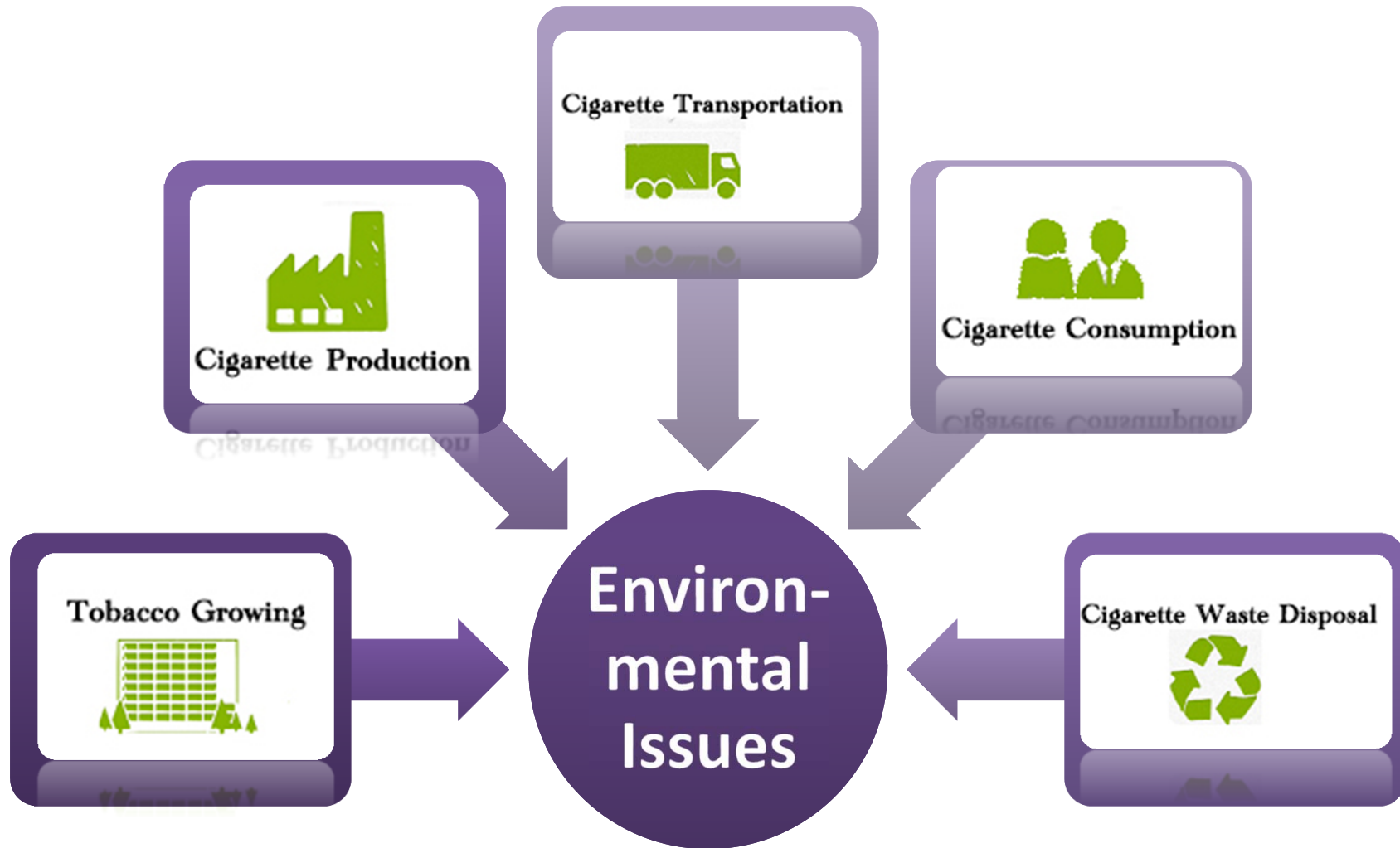


The Smoking Epidemic: It ain't over until the fat lady sings

- Smoking prevalence: 15.6% (>38 million smokers in U.S.)
 - Low SES, minorities
- 480,000 deaths/yr
- \$289 billion in direct and indirect losses/yr
- 5.6 trillion cigarettes smoked globally/yr, 17 billion in California



Environmental Life Cycle of Cigarettes



Tiny Toxic Trash= Tobacco Product Waste (TPW)



Top Ten Items Picked Up Over 27 Years of Coastal Cleanup

Item rank	Item	No. of Debris Items	Percentage of Total Debris Items
1	cigarettes/filters	52,907,756	32%
2	food wrappers/containers	14,766,533	9%
3	caps, lids	13,585,425	8%
4	cups, plates, forks, knives, spoons	10,112,038	6%
5	beverage bottles (plastic)	9,549,156	6%
6	bags (plastic)	7,825,319	5%
7	beverage bottles (glass)	7,062,199	4%
8	beverage cans	6,753,260	4%
9	straws/stirrers	6,263,453	4%
10	rope	3,251,948	2%
Top ten total debris items		132,077,087	80%
Total debris items worldwide		166,144,420	100%

Source: Ocean Conservancy, 2011

How much toxic waste is that?

- 5.6 trillion smoked each year globally, >4 trillion dumped somewhere each year
- Weight of 20 cigarette filters is 3.4 gm;
- Estimated discarded butt waste from U.S. cigarette consumption (290 billion) in 2011 is about **49.8 million kg in US, 3 million kg in CA;**
- Does not include packages, lighters, matches, and other tobacco products (cigars, e-cigs, and smokeless tobacco pouches).

Environmental effects?

- **Aquatic environment:**
 - Leachates contain heavy metals
 - Sediment contamination: bottom feeding fish
 - Sea birds, turtles, pets, other animals may consume
- **Laboratory:** Toxic to water fleas and micro organisms (nicotine and ethyl phenol)
- **Urban and beach environments:** degradation/nuisance
- **Cost:** Clean ups by communities



The SDSU Fish Toxicity Study, 2011

Topsmelt- Marine

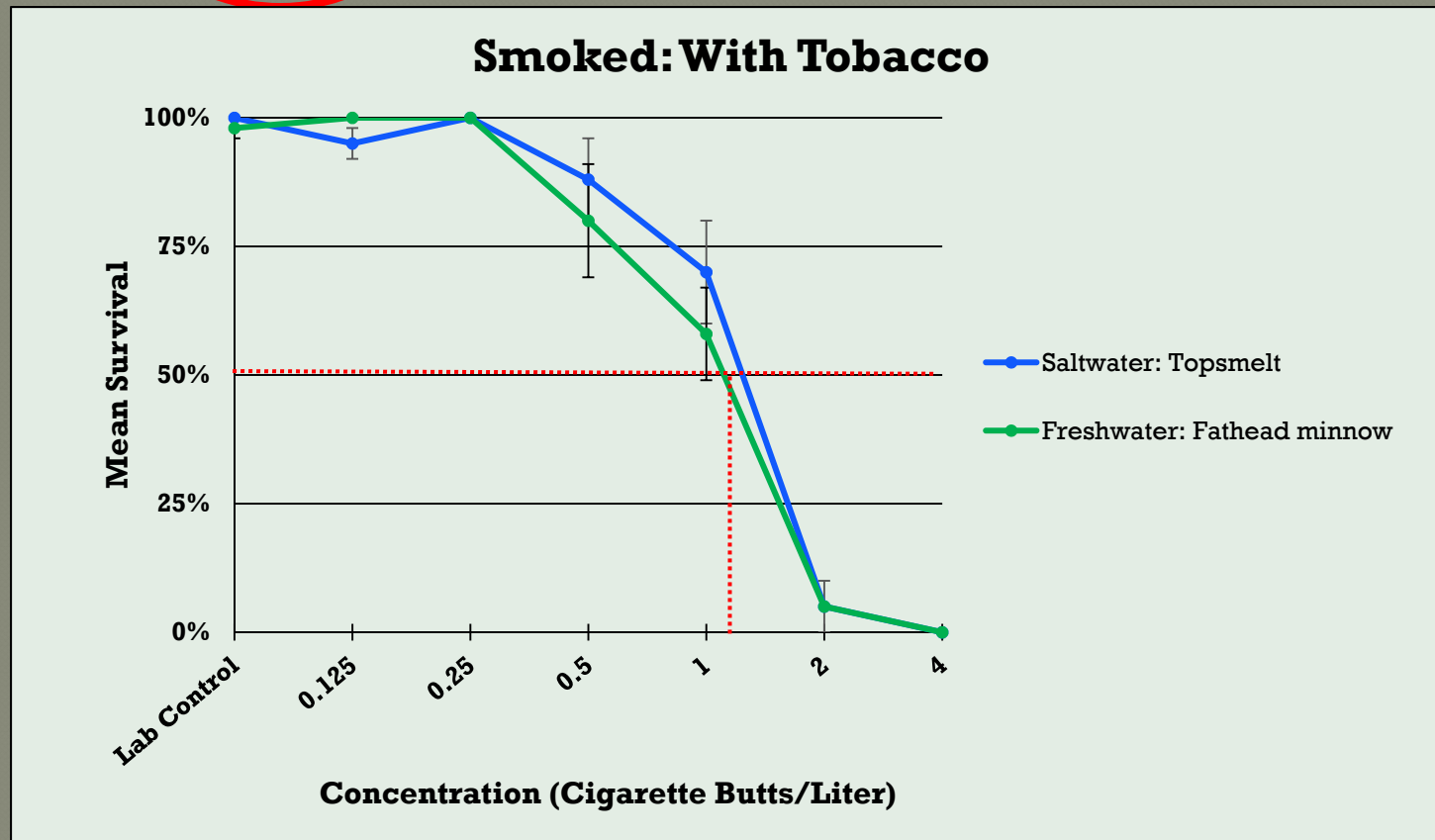
Fathead Minnow- Freshwater



Photos:
Elli Slaughter, MPH
(2010)



LC50:
1 butt/L



Other possible environmental health impacts

- **Sublethal effects:** Estrogenicity, tumorigenicity, and teratogenesis.
- **Bio accumulation:** in the environment and food chain.
- **Biotransformation:** Toxic chemicals (e.g., nicotine) can transform to carcinogenic tobacco specific nitrosamines (TSNAs)

New research evidence:

- Cigarette butt leachate is toxic to fish as well as invertebrates (mussels)
- Metals, nicotine, and breakdown products do bioaccumulate in test organisms.
- Need biomarker in the environment (storm water drainage)

Potential Pathways of TPW to Human Health Risk

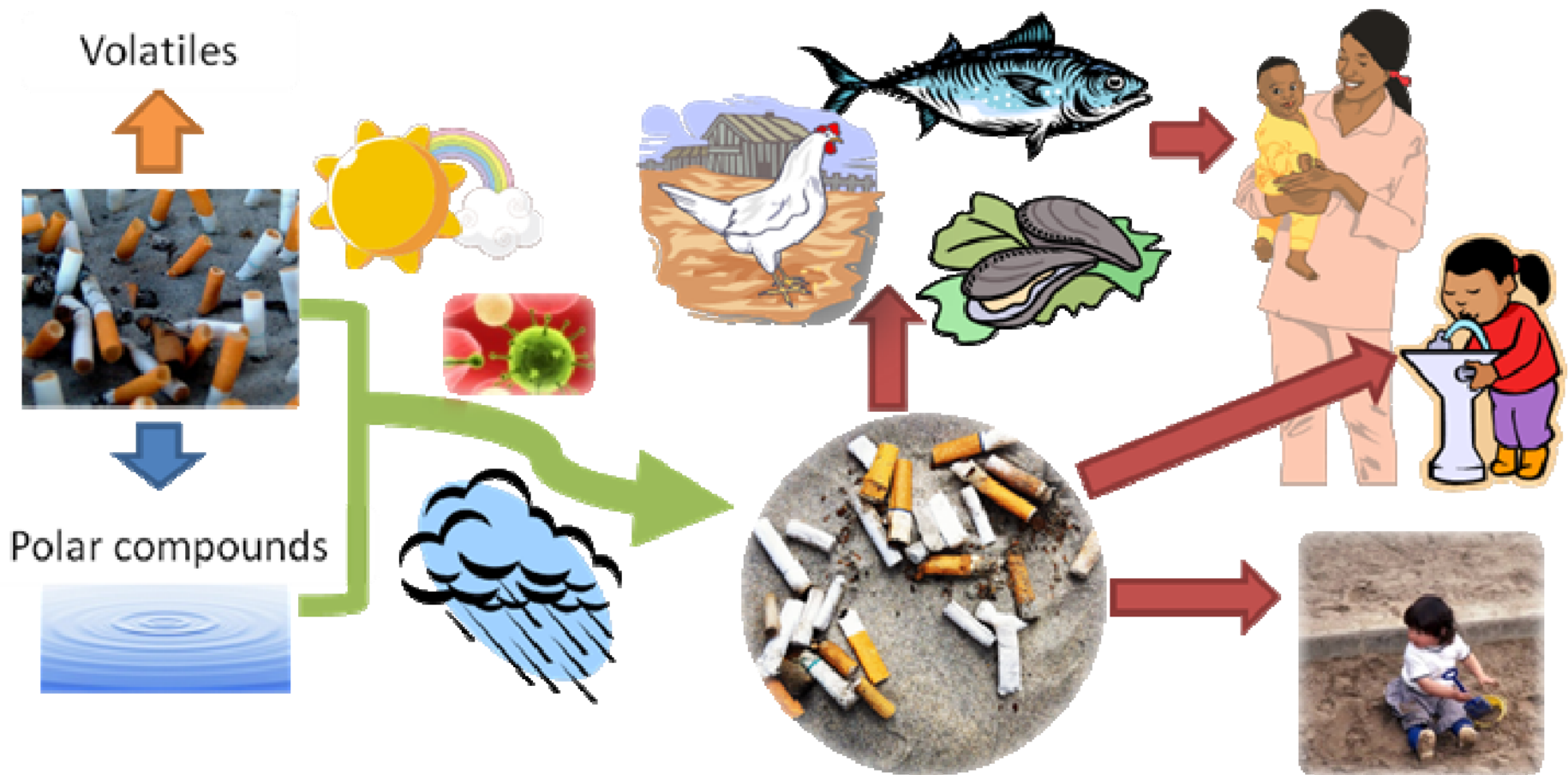


Image courtesy of Eunha Hoh, 2011

Current TPW mitigation efforts

- **Awareness raising** for smokers and non-smokers
 - PR Campaigns
 - Social Media
 - Butt cleanups
- **Banning outdoor smoking**
 - Beaches, parks, restaurants, streets
- **Anti-litter laws** (fines of up to \$1000 per event)
- **Take back and recycling** (Terracycle)?
- **Litter fees** (San Francisco)



Outdoor smoking bans

- 150 municipalities across the USA prohibit smoking on beaches
- 650 communities prohibit smoking in parks
- 1700 college campuses nationwide (19%) are completely smoke free, others with designated smoking areas and partial bans (all UC and CSU)
- Many communities prohibit smoking outdoors

SDSU Campus Butt Cleanup



20,000 butts in 1 hour



Raising awareness

- **Butt cleanups** can demonstrate environmental burden and generate interest
 - What happens to the butts?
- **Social/PR media** can increase awareness
 - Truth (<https://truthinitiative.org/news/5-ways-cigarette-litter-impacts-environment>)
 - CA Tobacco Control Program (<http://tobaccofreeca.com/topics/environment/>)

Extended Producer Responsibility (EPR) and Product Stewardship (PS)

- **Internalizes environmental cost** of products into price of cigarettes;
- **Shifts economic burden** of away from government and taxpayers;
- **Provides *incentives*** to change design of products that can minimize environmental harms (E.g., removing the filter from tobacco market)

The Filter Fraud



*Photo by Chris Register,
Clean Virginia Waterways*

- Made of **cellulose acetate**, a **non-biodegradable** plastic
- Designed to accumulate particulate smoke components including toxic chemicals
- *Biodegradable filters* are not marketable and would increase TPW
- Recycling? These are toxic items...how to manage?

Banning sale of filters: Source reduction for aquatic waste?

Health Concern

- Filters have no health benefit
- They encourage people to start smoking and avoid quitting
- Like flavorings, they make smoking more palatable

Environmental Concern

- Non-biodegradable plastic add-ons
- Up to 65% of butts improperly discarded
- Accumulate in aquatic biomes (>5mm in size)
- Degrades communities
- Meet criterion for toxicity in lab studies

Water Quality Control Plan **for Inland Surface Waters, Enclosed Bays, & Estuaries of California (Trash Amendment)**

Benefits of filter sales ban + inlet screens + street sweeping to achieve full compliance for ***Trash Amendment***.

- Human health benefit (reduced smoking)
- Cost savings for maintenance due to using curb inlet screens rather than devices inside catch basins
- Less ecotoxicity because butts do not sit in catch basins leeching toxicants into runoff
- Visually cleaner streets and sidewalks

Current Research Agenda

- Identify specific lethal chemicals in butt waste leachates (in storm water drainage)
- Determine potential for food chain entry and toxicity of TPW through bio-amplification, bioaccumulation, and biotransformation
- Evaluate human health effects of switching to unfiltered cigarettes (carcinogens, nicotine, puffing, quitting, and cigarette consumption)

Conclusions



- TPW is toxic, mostly non-biodegradable waste and must be better regulated
- Filters are >5mm in size and should be captured or reduced at source
- The tobacco industry, retailers, and other beneficiaries of the tobacco market should bear product design, legal, economic, and other responsibilities for TPW mitigation (EPR)
- Local action critically important

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Photo: Courtesy of Surfers Against Sewage, UK