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**TO: SF Regional Water Quality Control Board**

**FROM: Felicia Madsen and Athena Honore**

**DATE: March 6, 2007**

**SUBJECT: Trash Pollution in San Francisco Bay**

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**Summary**

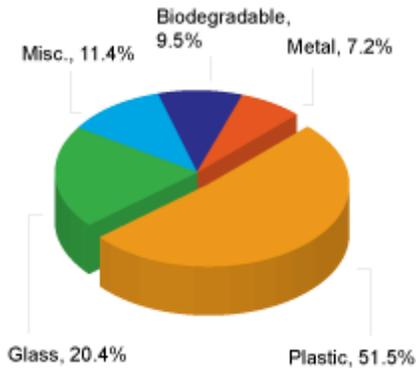
- Trash is a pollutant of concern significantly affecting San Francisco Bay beneficial uses, such as recreation and habitat.
- Trash accumulates in the Bay faster than it can break down. Trash impacts on Bay wildlife and water quality are growing and may soon reach the catastrophic levels already experienced around the world.
- Management actions can reduce trash impacts: trash separators, screens, and booms in storm drains and waterways are successful at diverting trash from waterways.

**How much trash is in waterways and San Francisco Bay?**

- Initial assessments by the San Francisco Bay Regional Water Quality Control Board (Regional Board) staff and other groups indicate that trash and marine debris are impairing water quality. However, more studies are needed to fully quantify how much trash is in the region's waterways.
- Local efforts show the magnitude of the problem
  - Municipal and volunteer group shoreline/creek cleanups
    - 686,000 pieces of trash on Bay Area shorelines and creeks, Coastal Cleanup Day 2006
    - 200,000 pounds of trash, Coastal Cleanup Day 2005
    - 408,000 pounds of trash since 1998, Santa Clara Valley Urban Runoff Pollution Prevention Program
  - The Regional Board's Surface Water Ambient Monitoring Program (SWAMP) program piloted an assessment study of trash in Bay Area streams.
    - 3 pieces of trash along foot of stream: average trash level
    - 2 pieces of trash per 100 feet per day: mean wet season accumulation rate
    - The Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) uses this method to assess 19 creekside trash hot spots in the South Bay.
  - Photo-documentation from creek groups: dramatic images show trash dominating water flows (see below)

**What happens to trash in the Bay?**

- 90% of trash in waterways takes years or decades to decompose: glass, metal, and especially plastic will accumulate on the Bay floor, shoreline, and floating drifts
  - Cold saltwater preserves plastic items, slowing the degradation process
- The Regional Board SWAMP study of Bay Area creek trash found that only 10% of trash is readily biodegradable.



Trash Item	Time to Biodegrade
Banana	3-4 weeks
Cigarette butt	1-5 years
Rubber shoe sole	50-80 years
Aluminum can	80-100 years
Plastic bottle	Thousands of years, if ever

Source: National Park Service

Source: A Rapid Trash Assessment Method Applied to Bay Area Creeks, SWAMP, SFRWQCB

**Trends: Exponential rise in marine debris**

- San Francisco Bay is accumulating trash at unprecedented levels
  - 60% more trash generated now than in 1960 in the U.S. (more disposable items)
  - Plastic waste is growing
    - 300 pounds per person per year in the U.S., 50% more than ten years ago
    - Plastic industry projects a steady increase
- Growth in trash exceeds the environment’s ability to absorb it
  - Plastic does not biodegrade
  - Worldwide, marine debris is growing exponentially
    - A 2000 study in Japan found marine debris increasing tenfold every 2-3 years
    - “Every little piece of plastic ...that made it into the ocean is still out there.” Anthony Andrady, polymer chemist and trash researcher
    - North Pacific Gyre: an accumulation of mostly plastic trash the size of Texas

**Trash and marine debris threatens wildlife and impairs water quality**

- Trash impacts wildlife
  - Trash items such as six-pack rings can entangle and kill organisms
  - Wildlife ingest trash (“junk” food)
    - Larger animals can die from starvation/intestinal blockage by plastic
      - 90-100% of seabirds studied in Pacific, Atlantic Oceans ingested plastic
      - 40% mortality rate from plastic ingestion in albatross chicks
    - Plastic absorbs other chemical contaminants such as PCBs and DDT from surrounding waters, delivering high levels to wildlife
    - Smaller filter feeders take up plastic particles along with plankton
      - North Pacific Gyre: plastic bits outnumber plankton 6 to 1
  - Floatables inhibit growth of aquatic vegetation, decrease spawning areas and habitat.
    - Plastic film from bags and wrappers can block oxygen exchange, smothering Bay floor vegetation and bottom-dwelling organisms
- San Francisco Bay beneficial uses impaired by trash:
  - Water contact recreation (REC1), non-water contact recreation (REC2), wildlife habitat (WILD), estuarine habitat (EST), marine habitat (MAR), rare threatened or endangered species (RARE), migration of aquatic organisms (MIGR), reproduction and early development of fish (SPWN), commercial & sport fishing (COMM), shellfish harvesting (SHELL), wetland habitat (WET), cold freshwater habitat (COLD)
  - Trashed beaches deter tourists, affecting the economy
  - High trash levels in Bay, shoreline, and creeks send the message that natural resource areas have no value.

**Where does trash come from?**

- Marine debris is trash that escapes solid waste collection systems
  - Overfull or inadequate trash cans or dumpsters (i.e. in shopping malls, ballparks, recreation areas, or schools)
  - Littering (from pedestrians or cars)
  - Dumping (household garbage or large items)
- Only 10% of waterborne trash is from marine activities (i.e. boating, shipping); 90% is from land

**How does trash reach San Francisco Bay?**

- Urban runoff carries trash down the watershed to San Francisco Bay. Wind blows lighter items over land to streams or directly to Bay.
- The Bay Area’s hundreds of creeks are a major conveyor of trash to the Bay.
- High flows during storm events can move large items (shopping carts, tires).
- The storm drain system conveys trash from city streets to thousands of outfalls at creeks or the Bay.

**What items make up waterborne trash?**

- Unlike other water pollutants, trash is macroscopic and composed of many different items.
  - Common finds in waterways: cigarette butts, plastic bags, fast food wrappers and containers, plastic and glass bottles, cans, balls, motor oil containers, packing materials, diapers, batteries

**Current regulatory measures on trash**

- Basin Plan prohibits trash discharge
  - Explicit prohibition on discharges of “rubbish, refuse, bark, sawdust, or other solid wastes into surface waters or at any place where they would contact or where they would be eventually transported to surface waters”
- Current municipal efforts, such as street sweeping and anti-litter ordinances, provide a baseline but are not sufficient
- Current stormwater permits do not address trash as a pollutant of concern

**Upcoming regulatory decision points**

- June 2007      CCMP update may add trash reduction objectives to document. Advisory only.
- June 2007      MRP provisions for municipalities to reduce Bay trash discharge will be finalized. Could require measurable reductions in trash discharge.
- 2008            Next opportunity to 303d list waterbodies impaired by trash. 303d listing qualifies areas for TMDL to remediate pollution problem. Data submitted by 2/28/07.
  - In the San Francisco Bay region, only Lake Merritt is currently 303d listed for trash.
  - The listing has triggered funds for cleanup and installation of vortex separators at 5 locations.
- 2010-11        Earliest implementation of potential San Francisco Bay TMDL for trash

**LA TMDL: The strongest approach to trash reduction**

- Trash TMDL covers Los Angeles River and Ballona Creek
  - TMDL was challenged by several municipal lawsuits; none were upheld except to add CEQA analysis. Order will be finalized 2007.
- TMDL requires permittees to reduce trash discharge to watershed over ten years to zero trash
  - Trash is defined as manufactured items that can be retained by a 5mm screen
- The zero trash requirement was subsequently modified to installation of full-capture end-of-pipe structural controls, partial capture systems, and/or institutional controls
  - Full-capture devices: vortex separators and mesh bags at outfalls
  - Partial capture devices: catch basin screens or inserts
  - Institutional controls refer to public education, business outreach, enhanced street sweeping, and installation of additional trash receptacles
- Los Angeles passed Prop. O, a funding measure for clean water, with 76% voting Yes

- 3 further trash TMDLs are in development for unrelated areas that had been 303d listed for trash: Machado Lake, Santa Clara River, and Ventura County

### **Toolbox of trash management actions**

- Unlike mercury, PCBs, and copper, proven methods can remove trash from urban runoff
- *Current measures (status quo)*
  - Several baseline measures are already standard practice in cities
    - Sweep streets to pick up loose trash (varying frequency)
    - Provide creek cleanups once or twice a year
    - Encourage volunteer Adopt-a-Creek groups to clean creeks
    - Clean storm drain catch basin inlets once a year to prevent leaf blockages and flooding
    - Educational/advertising campaigns directed at students or the general public
  - These methods have not solved the problem of trash in waterways
- *Additional measures*
  - Numerous methods can make significant reductions in trash discharge
    - Retrofit catch basin inlets with screens in high-trash-generating areas
    - Install vortex separators (“trash traps”) inside storm drain pipes. Pump stations, where storm drain outfalls are below sea level and must be pumped up to discharge to the Bay, are ideal locations.
      - Vortex separators pull out almost 100% of trash for removal to landfill
    - Install mesh bags at storm drain outfalls to capture trash
    - Install floating trash booms (“necklaces”) that catch floating trash, for removal to landfill
    - Increase number of trash receptacles and pickup frequency
    - Divert storm drain flows to sewage treatment plant during dry season (when plant has capacity)
    - Outreach to individual businesses to reduce trash
    - Require measurable reductions in trash discharge
    - Increase enforcement for littering and dumping
    - Increase storm drain inlet cleanout frequency
  - Measures have been successfully piloted in LA, Australia
  - Many structural control methods will trap sediments as well, reducing sediment-associated pollutants such as PCBs and mercury.
  - Structural control methods incur costs for installation and ongoing maintenance
- *Funding*
- Creative measures to fund trash management have been successfully adopted
  - Special district to assess stormwater treatment fees and bypass Prop 218 hurdles (Santa Cruz)
  - Local bond measures such as Oakland’s Measure DD or LA’s Prop. O
  - State resource bonds already passed, such as Prop. 1E
    - Current efforts to designate a portion of 1E funds for trash abatement devices

### **Photographs (see following pages)**

- Trash in Bay Area creeks
  - Coyote Creek
  - Guadalupe River
  - Suisun Marsh
- Trash control devices
  - Mesh bags at storm drain outfalls
  - Trash booms
  - Vortex separators

**Trash in Bay Area creeks**



Photo by L.M. Johmann © 2006

**Coyote Creek - San Jose, CA**

**May 6, 2006**

**Coyote Creek 2004**



Guadalupe River, 2006



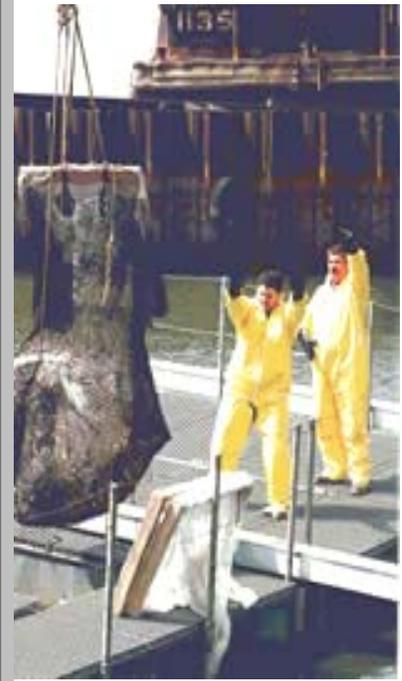
Suisun Marsh, 2006



**Trash control devices**  
End of pipe capture nets



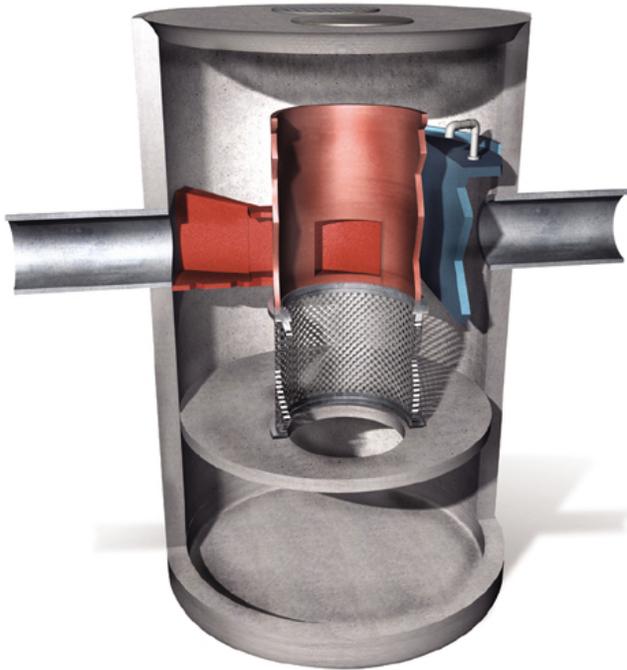
**End of Pipe unit collects trash in nets after storm in a city park.**



Trash boom at Oakland Coliseum



Vortex separator unit  
Photos from Lake Merritt, Oakland



**Addendum:**

Images from Save The Bay members responding to call for data for 303d Impaired Waterways list.

- Images show current conditions: taken January and February, 2007.
- 100 photos were taken by concerned citizens, of trash problems in their neighborhoods.
- Images document a range of trash issues in 15 locations around the Bay Area.
- Selected items are presented here, and the full set can be viewed at <http://www.flickr.com/photos/savethebay/sets/72157594532049775/>
  - Hundreds of other photographs of waterborne trash were also submitted to Regional Board.



Berkeley Marina  
Trash from storm drains and littering



San Rafael Marina, Pickleweed Park  
Trash from storm drains and littering



San Rafael Marina, Pickleweed Park  
Trash from storm drains and littering



Wildcat Creek, Richmond  
Homeless encampment



Wildcat Creek, Richmond  
Dumping site



Wildcat Creek, Richmond  
Litter



Guadalupe River, San Jose  
Dumping site



Guadalupe River, North San Jose  
Litter deposited by river on banks



Guadalupe River, North San Jose  
Trash buildup behind obstacles in river



Guadalupe River, San Jose  
Waterborne trash deposit



Guadalupe River, North San Jose  
Waterborne trash deposit



Richmond Marsh, Richmond  
Trash washed up at high tide



Richmond Marsh, Richmond  
Trash washed up at high tide – closeup



Los Gatos Creek, Los Gatos  
Waterborne trash deposit



Coyote Creek, San Jose  
Wrecked car in creek



Schoolhouse Creek, Berkeley  
Egret feeding among plastic bags  
discharged from storm drain



Strawberry Creek, Berkeley  
Trash intersection between tidal wash  
and storm drain discharge



Stevens Creek, Mountain View  
Waterborne trash deposit



Stevens Creek, Mountain View  
Waterborne trash deposit – closeup



Coyote Creek, San Jose  
Trash builds up regularly in many spots



Coyote Creek, San Jose  
Close-up of trash raft



Guadalupe River, San Jose  
Accumulation of waterborne trash



Guadalupe River, San Jose  
Trash from runoff and littering



Coyote Creek, San Jose  
Bend in creek accumulates trash



Guadalupe River, San Jose