

Citizen Science as Key Components for Identifying Regulatory Gaps:

Lessons from Love Canal, Exxon Valdez, Deepwater
Horizon & Other Man-Made Disasters

Prof. Elizabeth Glass Geltman

National Environmental Monitoring Conference

New Orleans, Louisiana

August 7, 2018, 1-3pm

1:30-2:00pm

Abstract

- In the past few years, a robust debate erupted within the scientific community as to the appropriate role of citizens in gathering and presenting scientific data for use in policy development. Most modern citizen science projects are designed by scientists and ask citizens to take part in gathering data using protocols established by the scientists. Citizen participation is used as a means to expand the number of subjects or samples while at the same time saving costs. While this model of citizen science is relatively new, the concept of citizenry gathering data to present to government and academic scientists because of health and other concerns in order to influence policy is not new. For example, in 1979 the Love Canal Homeowners Association (LCHA) embarked on a study to present evidence of health concerns due to improper disposal of hazardous waste in their neighborhood. This study examines historical health studies conducted by citizen groups to present to government in order to identify regulatory gaps. The study compares the data gathered by citizens to the studies designed by experts in a variety of emergency settings including Love Canal, Exxon Valdez and Deepwater Horizon. The study concludes that while citizens groups may have an inherent bias in gathering data, scientific bias also presented challenges from experts in ultimate study designs. In certain events such as the LCHA study in response to Love Canal, the citizen science was closer to real environmental health concerns than the study developed by the experts. The paper concludes by putting citizen science in a new context.*

Financial Disclosure

Grant funding for this project was provided by: the National Institute of Environmental Health Sciences, 1R25ES027082-01 and CDC/NIOSH New York-New Jersey Education and Research Center. In kind support was provided by the Robert Wood Johnson Foundation and the Network for Public Health Law.

Asking the wrong question:

- Can citizen science enhance public understanding of science?

Can citizen science enhance public understanding of science? - PubMed... <https://www.ncbi.nlm.nih.gov/pubmed/26445860>

PubMed

Format: Abstract [Full text links](#)

[Public Underst Sci](#), 2016 Jan;25(1):2-16. doi: 10.1177/0963662515607406. Epub 2015 Oct 7. [SAGE journals](#)

Can citizen science enhance public understanding of science?

Bonney R¹, Phillips TB², Ballard HL³, Enck JW².

Author information

Abstract

Over the past 20 years, thousands of citizen science projects engaging millions of participants in collecting and/or processing data have sprung up around the world. Here we review documented outcomes from four categories of citizen science projects which are defined by the nature of the activities in which their participants engage - Data Collection, Data Processing, Curriculum-based, and Community Science. We find strong evidence that scientific outcomes of citizen science are well documented, particularly for Data Collection and Data Processing projects. We find limited but growing evidence that citizen science projects achieve participant gains in knowledge about science knowledge and process, increase public awareness of the diversity of scientific research, and provide deeper meaning to participants' hobbies. We also find some evidence that citizen science can contribute positively to social well-being by influencing the questions that are being addressed and by giving people a voice in local environmental decision making. While not all citizen science projects are intended to achieve a greater degree of public understanding of science, social change, or improved science-society relationships, those projects that do require effort and resources in four main categories: (1) project design, (2) outcomes measurement, (3) engagement of new audiences, and (4) new directions for research.

KEYWORDS: lay expertise; participation in science policy; public participation; public understanding of science; science attitudes and perceptions; science education; scientific literacy

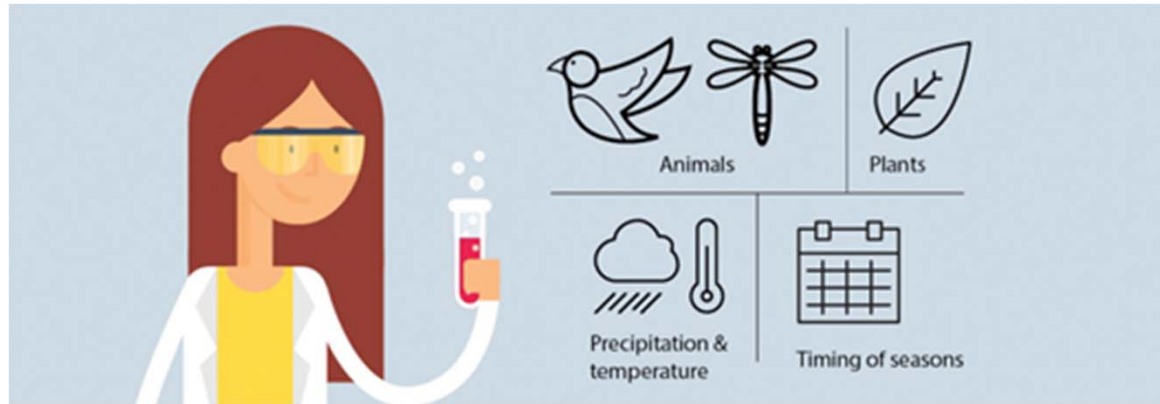
PMID: 26445860 DOI: 10.1177/0963662515607406
[Indexed for MEDLINE]



Publication type, MeSH terms

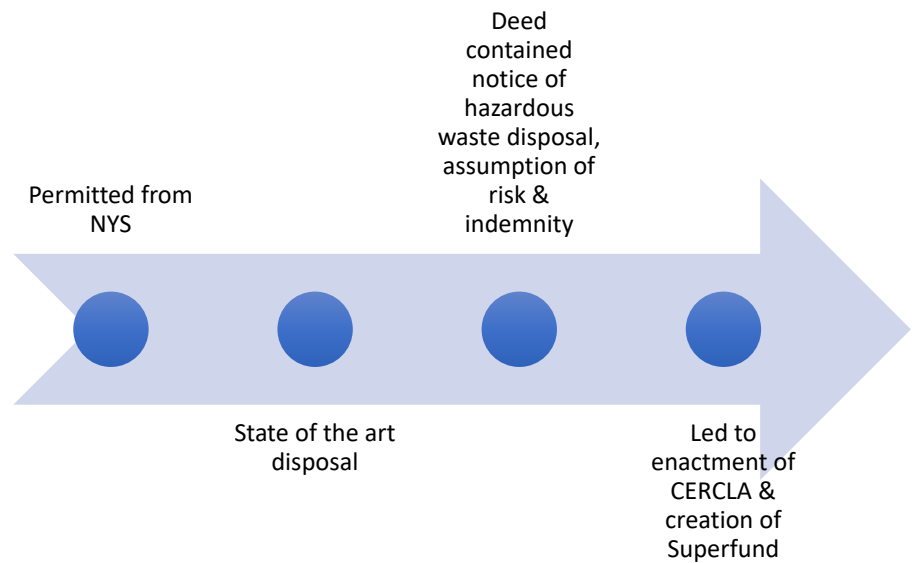
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Importance of Community Involvement in identifying regulatory gaps

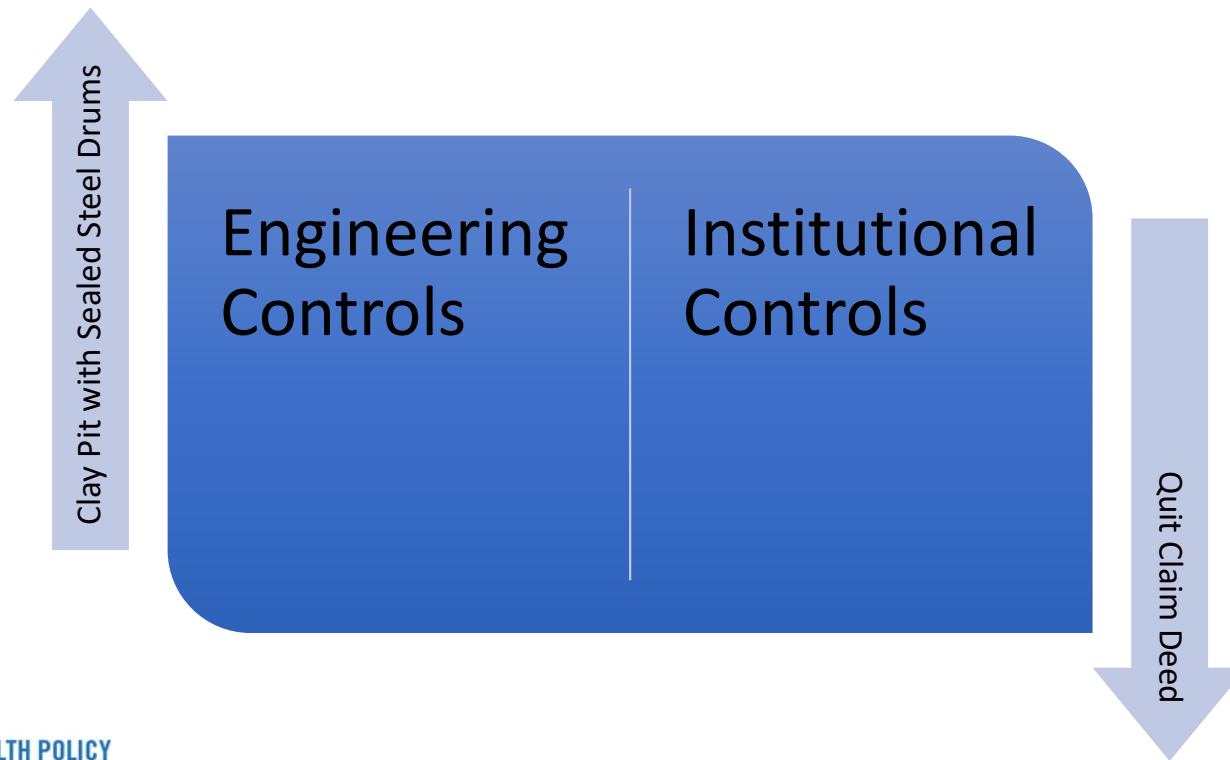


Love Canal

The First Superfund Site



Love Canal: 1940s → 1953 → 1970s



Institutional Control placed in Quit Claim Deed

- This Indenture made the 28th day of April 1953 between Hooker Electrochemical Company . . . and the Board of Education of the School District of the City of Niagara Falls, New York, . . . in consideration of **One Dollars [\$1.00]** does hereby . . . release . . . and assign Forever all that tract or parcel of land situate[d] in the City of Niagara Falls, County of Niagara and State of New York being part of Lot number sixty (60) of the Mile Reserve. . . .
- Prior to the delivery of this instrument of conveyance, the grantee herein has been advised by the grantor that the premises above described **have been filled, in whole or in part, to the present grade level thereof with waste products resulting from the manufacturing of chemicals** by the grantor at its plant in the City of Niagara Falls, New York, and the grantee assumes all risk and liability incident to the use thereof. It is, therefore, understood and agreed that, as a part of the consideration for this conveyance and as a condition thereof, **no claim, suit, action or demand of any nature whatsoever shall ever be made by the grantee, its successors or assigns, against the grantor, its successors or assigns, for injury to a person or persons, including death resulting therefrom, or loss of or damage to property caused by, in connection with or by reason of the presence of said industrial wastes.** It is further agreed as a condition hereof that each subsequent conveyance of the aforesaid lands shall be made subject to the foregoing provisions and conditions.

Community Raised Concern

based on

School Yard Epidemiology



Source: US EPA

Community Movement



Source: US EPA



Evacuation



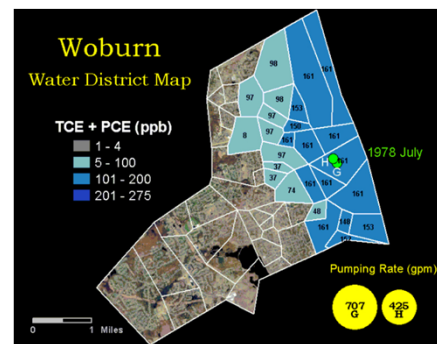
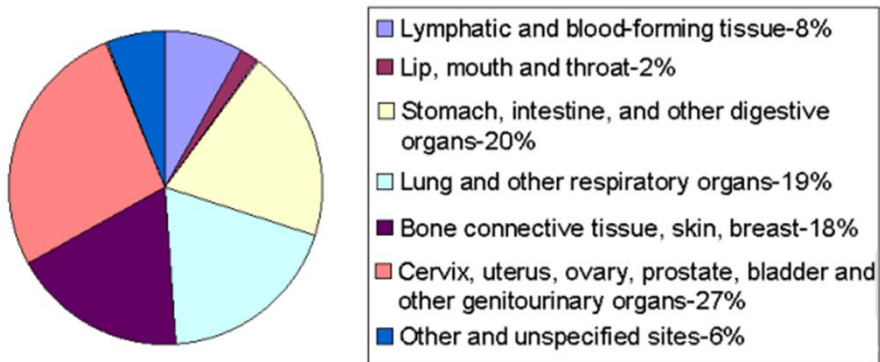
Superfund Toxicology:

Cancer → Endocrine-disrupting

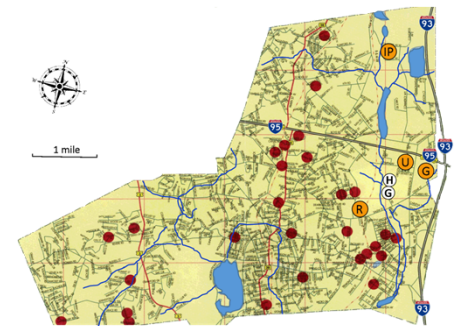
**NY Health Study
Preliminary Cancer Incidence Results
August 2001**

**1981 Massachusetts Department of Public
Health study confirmed a childhood leukemia
cluster**

Love Canal Cancer Incidence



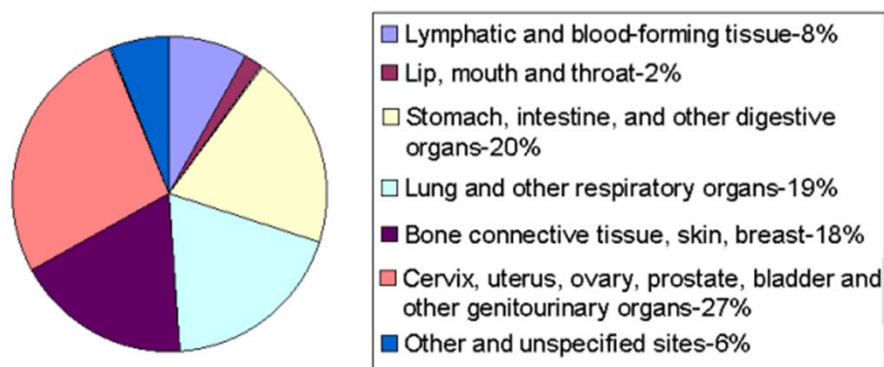
Source: http://serc.carleton.edu/woburn/resources/OSU_animations.html



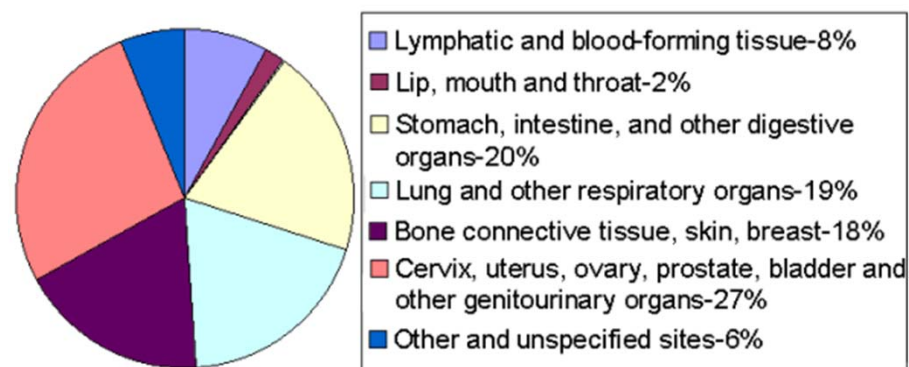
Sources: https://www.health.ny.gov/environmental/investigations/love_canal/cancinci
<http://archives.lib.state.ma.us/bitstream/handle/2452/393139/ocn948190559.pdf?sequence=1&isAllowed=y>
http://sphweb.bumc.bu.edu/otlt/MPH-Modules/PH/Woburn/Woburn_print.html

Love Canal Follow-up Health Study Preliminary Cancer Incidence Results August 2001

Love Canal Cancer Incidence

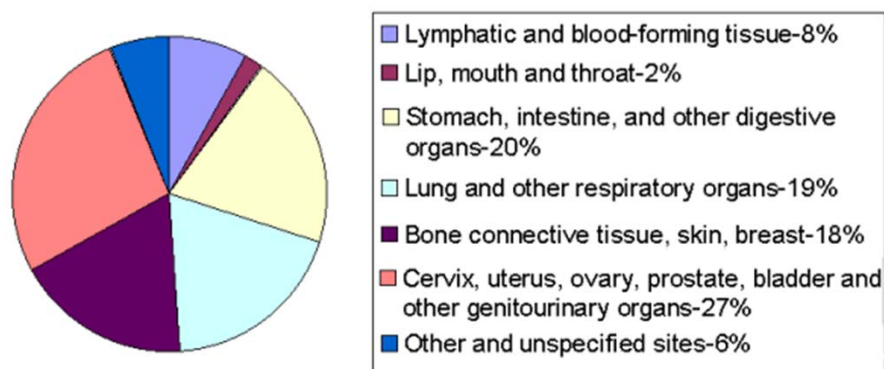


Niagara County Cancer Incidence

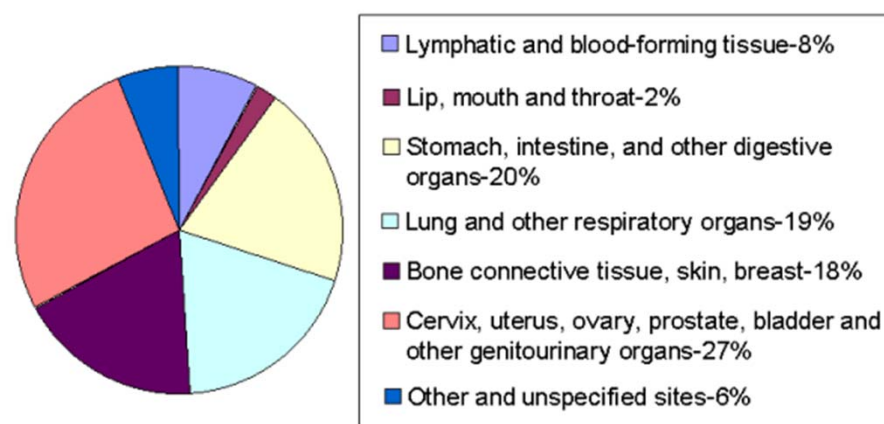


Love Canal Follow-up Health Study Preliminary Cancer Incidence Results August 2001

Love Canal Cancer Incidence



Upstate New York Cancer Incidence



Source: https://www.health.ny.gov/environmental/investigations/love_canal/cancinci
Compare https://www.health.ny.gov/environmental/investigations/love_canal/reproductive_outcomes.htm

Love Canal Follow-up Health Study Cancer Study Community Report April 2009

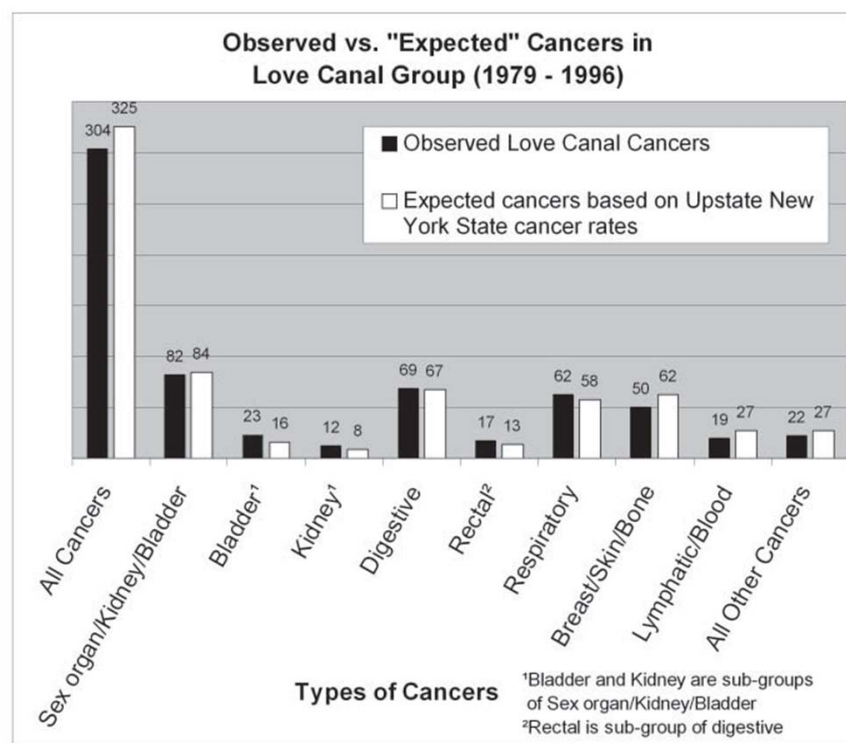
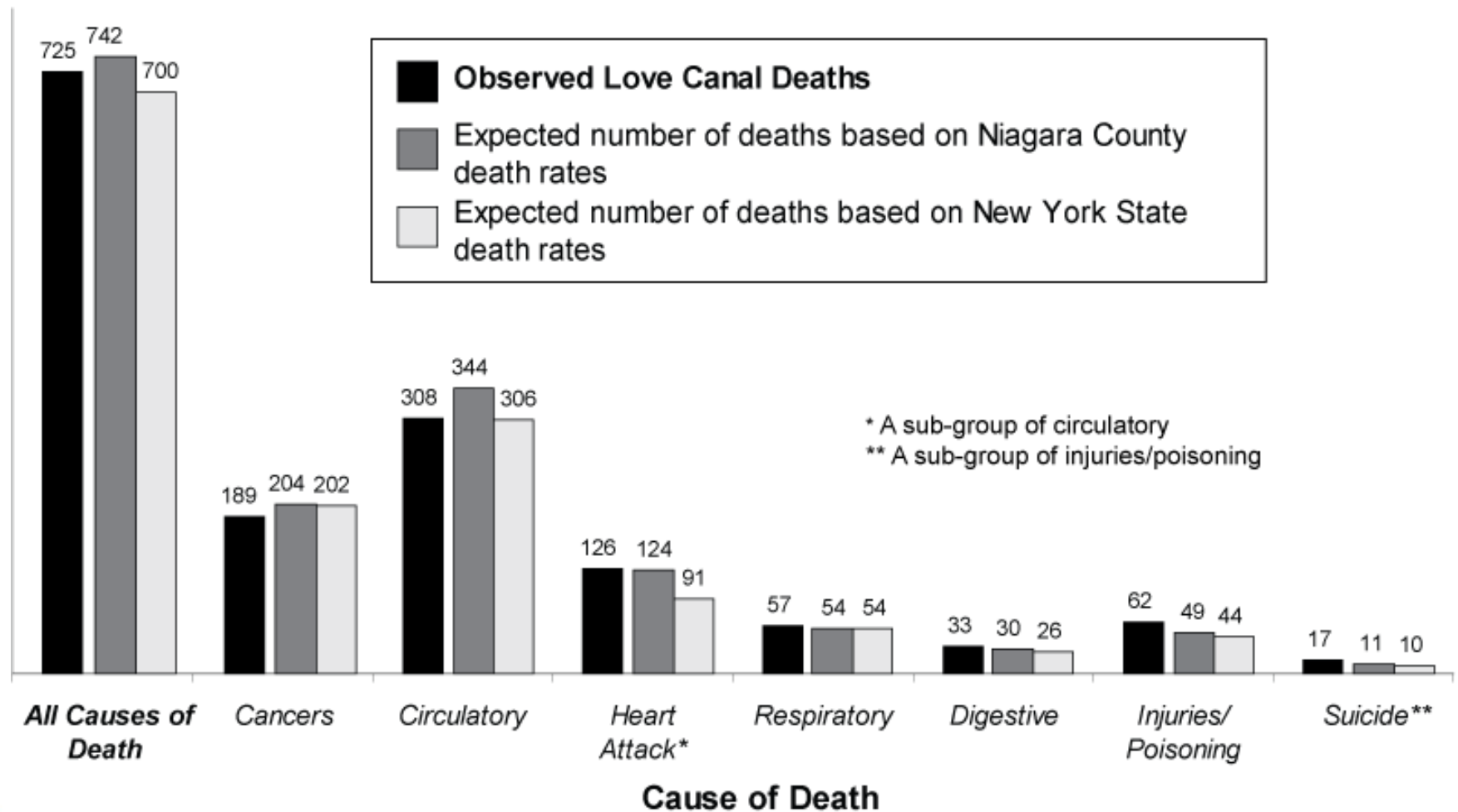


Figure 2: Observed vs. "Expected" Deaths in Love Canal Group (1979 - 1996)



Source:
https://www.health.ny.gov/environmental/investigations/love_canal/mortality_community_report.htm

1979 Love Canal Homeowners Association (LCHA) Study

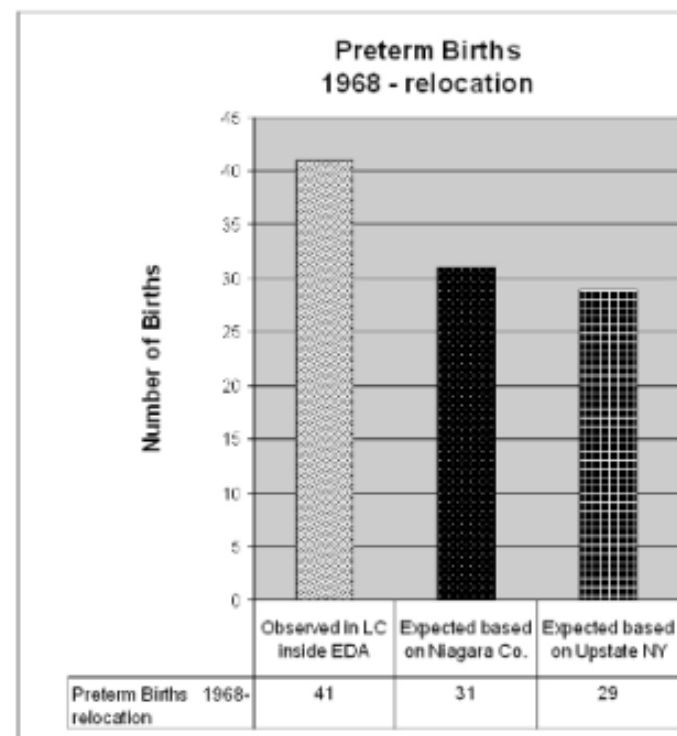
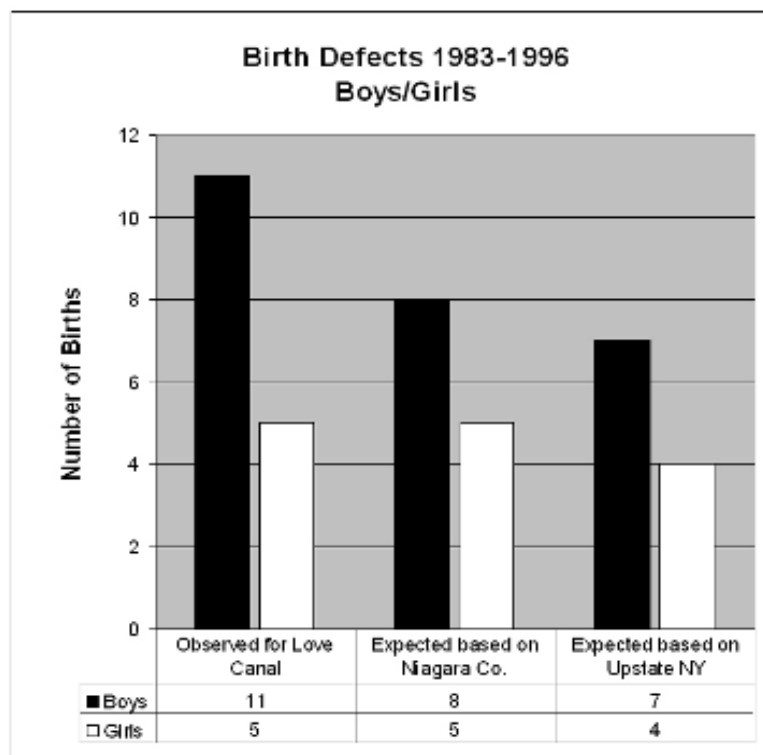
- Found increase in:
 - miscarriages
 - still births
 - crib deaths
 - birth defects
 - nervous breakdowns
 - hyperactivity
 - epilepsy
 - urinary tract disorders
- 56% born (between 1974-1978) had a birth defect, including:
 - three ears
 - double row of teeth
 - mental retardation
 - 3X as many defects in wet areas.
- Miscarriages increased 300%
 - most in women who lived in the historically wet areas



Sources: US EPA: https://www.health.ny.gov/environmental/investigations/love_canal/cancinci

Love Canal: A Special Report to the Governor & Legislature: April 1981

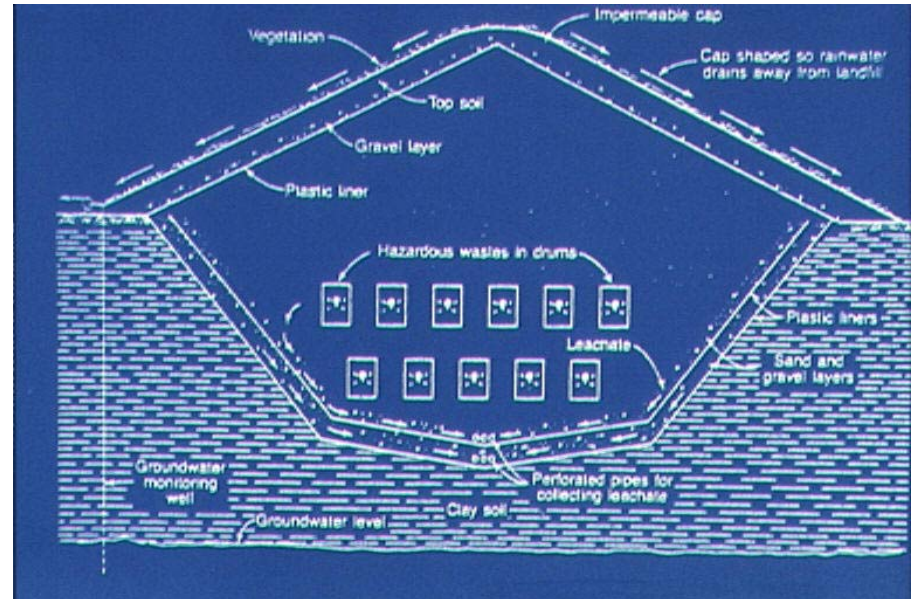
Location	Live Births	Children with Low Birth Weight ⁺			Children with Congenital Defects		
		Number	Percent	p ^{**}	Number	Percent	p ^{***}
99 th Street*	39	1	2.56	++	4	10.26	>.05
97 th Street*	26	0	0.00	++	0	0.00	++
Rest of Love Canal Area	227	24	10.57	.017	17	7.49	>.05
Water	83	13	15.66	.001	10	12.05	>.05
Non Water	144	11	7.64	>.05	7	4.86	++



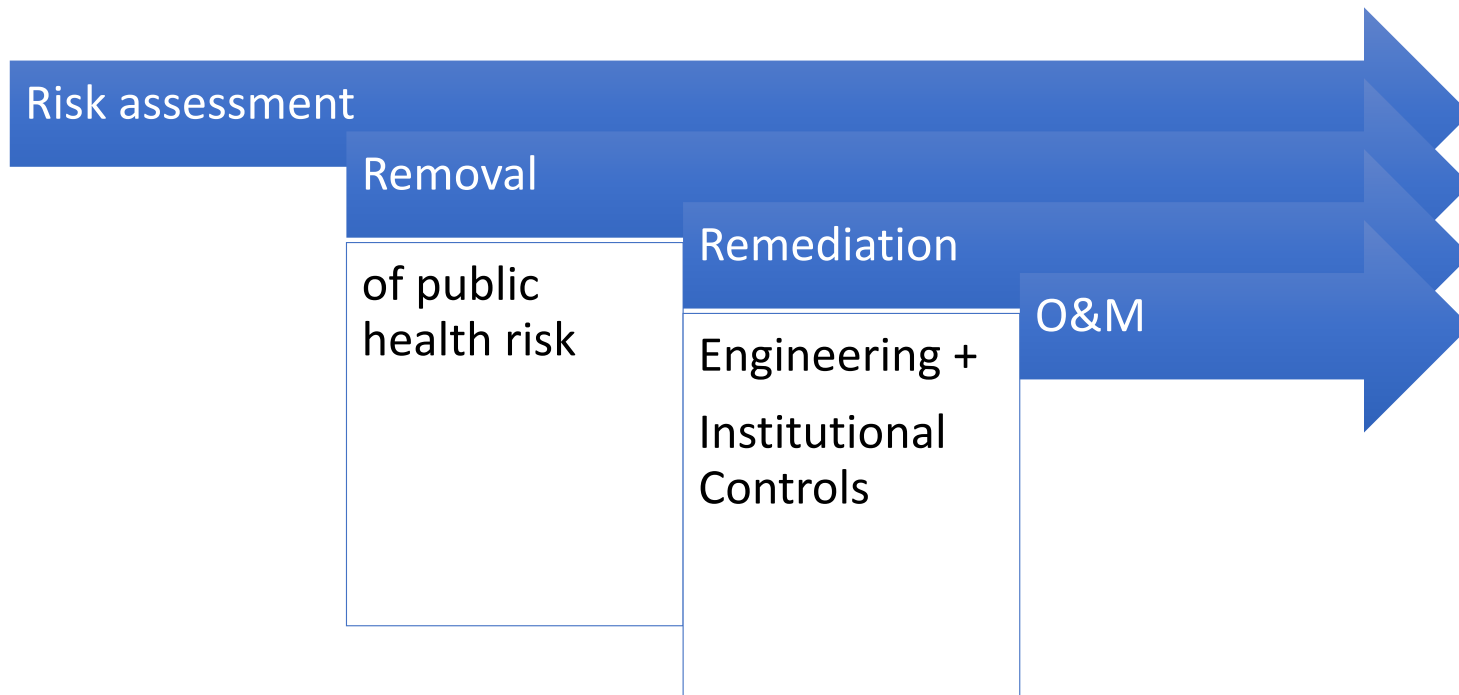
Source:
https://www.health.ny.gov/environmental/investigations/love_canal/reproductive_outcomes.htm

Modern Superfund Technology

- Still a glorified clay pit
- All technology ages
- All technology has limitations
- Understanding of health effects changes



Superfund Site Cleanup Protocol



Love Canal Today



Black Creek Village, Niagara, NY (formally Love Canal)



Exclusive: Are Love Canal chemicals still making people sick? - T... <https://buffalonews.com/2018/06/01/new-lawsUIT-claims-love-cana...>

Sections Search

(https://buffalonews.com/2018/06/01/new-lawsUIT-claims-love-cana...)

THE BUFFALO NEWS



Chemicals from the Love Canal hazardous waste site were found in stormwater off Road Avenue near the 99th Street School in Niagara Falls on April 15, 1979. Officials posted signs to keep children and passersby out of the hazard zone. (News file photo)

Exclusive: Are Love Canal chemicals still making people sick?

By Dan Herbeck (https://buffalonews.com/author/dan_herbeck/) | Published June 1, 2018 | Updated June 1, 2018

1 of 9

8/6/18, 1:06 PM

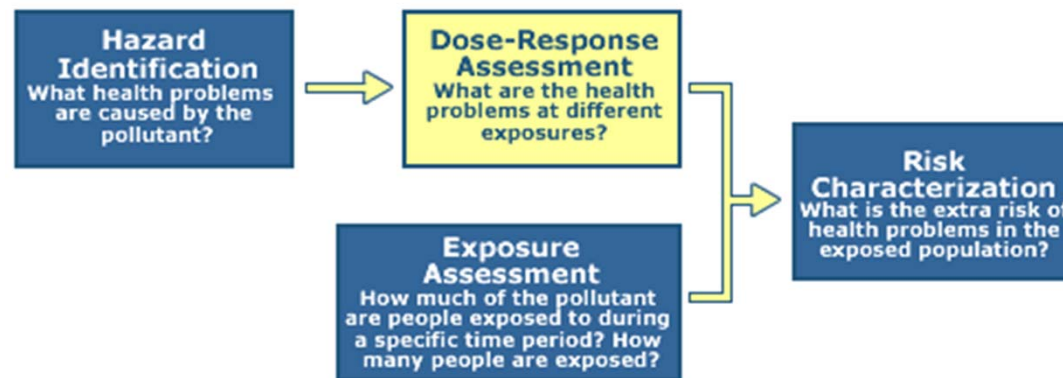
- "Niagara Falls residents have been living in the vicinity of the Love Canal site on the promise that the approximately 22,000 tons of ... chemical waste ... was safely contained and did not pose, and would not pose, a threat of any kind to them, their children or their property," the New York City-based attorneys said in court papers. "That promise has not been kept."

Source: <https://buffalonews.com/2018/06/01/new-lawsUIT-claims-love-canal-chemicals-still-causing-health-problems/>

Superfund Toxicology:

Cancer → Endocrine-disrupting & other health effects from persistent low level exposure

The 4 Step Risk Assessment Process



Significant Public Health Concern

53 million people live within 3 miles of a Superfund remedial site: 17% of US population

12 million people live within 1 mile of a Superfund site: 4% of US population

TRI facilities (blue) and **Superfund NPL** sites (red)

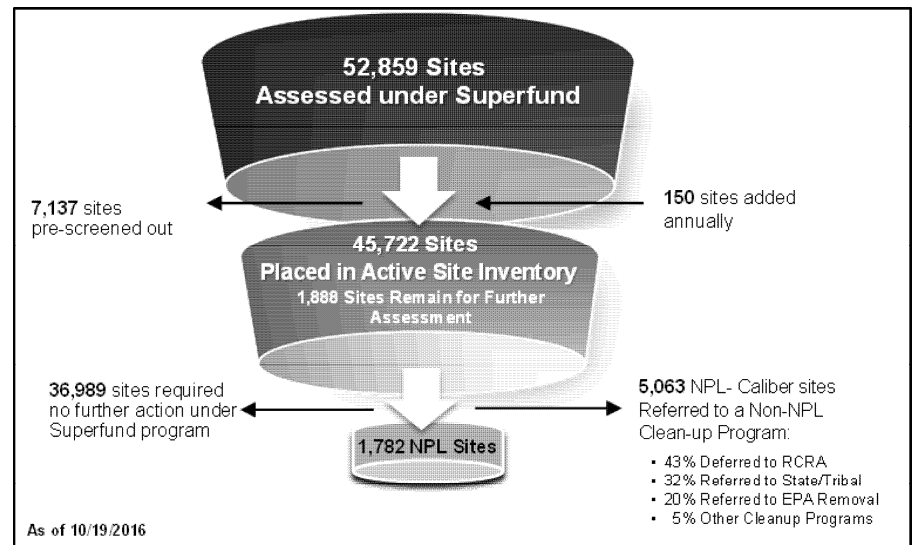
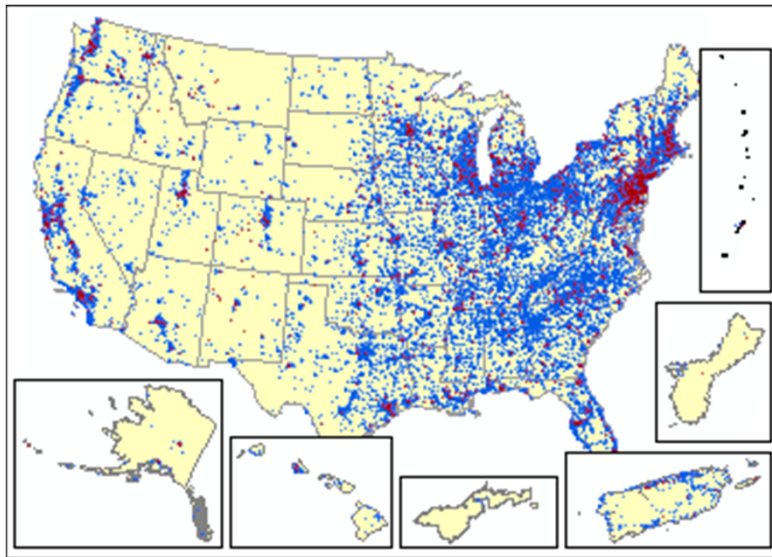


Figure 1. Status of EPA Site Assessments

Effective May 2018 HRS includes soil vapor

Figure 4. HRS Structure with Subsurface Intrusion Addition

HRS Pathways	Ground Water	Surface Water			Soil Exposure and Subsurface Intrusion		Air
		DW	HFC	ENV	Soil Exposure	Subsurface Intrusion	
Factor							
LR / LE Likelihood of Release / Exposure							
WC Waste Characteristics							
T Targets							
	S_{GW}	$S_{SW} = DW + HFC + ENV$			$S_{SESI} = \text{Soil Exposure} + \text{Subsurface Intrusion}$ (where: Soil Exposure = Resident + Nearby)		S_A

S_{GW} = Ground Water Migration Pathway Score

S_{SW} = Surface Water Migration Pathway Score

S_{SESI} = Soil Exposure and Subsurface Intrusion Pathway Score

S_A = Air Migration Pathway Score

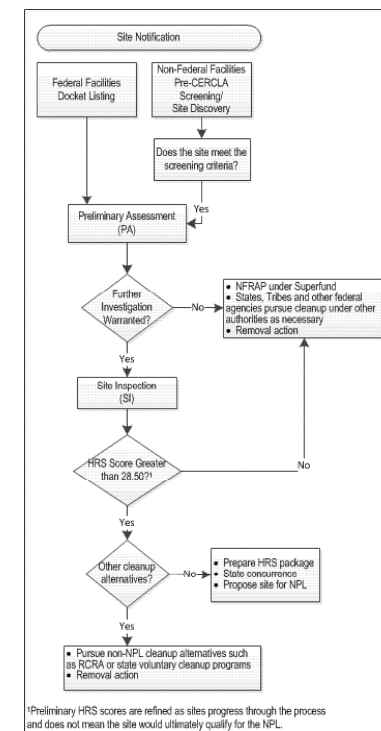


Figure 2. Site Assessment Process

Source: 40 CFR Part 300;

Addition of a Subsurface Intrusion Component to the Hazard Ranking System, 82 Fed. Reg. 2760 (Jan. 9, 2017).

Review of RCRA Expanded Public Participation begun May 2018

Regulations.gov - Docket Folder Summary

<https://www.regulations.gov/docket?D=EPA-HQ-OLEM-2018-0102>

Certain browser plug-ins or extensions, such as Grammarly, may interfere with submitting comments on the comment form. If you have issues, please disable browser plug-ins and extensions and try submitting your comment again. If you need additional assistance, please contact the Help Desk at 1-877-376-5457.



RCRA Expanded Public Participation ICR Renewal

Docket Folder Summary [View all documents and comments in this Docket](#)

Docket ID: EPA-HQ-OLEM-2018-0102
Agency: Environmental Protection Agency (EPA)

Summary:
Frist FR notice for an ICR renewal

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Docket Details

Related RINs: None
Related Dockets: None
Short Title: RCRA Public Participation
Keyword(s): Waste Treatment and Disposal, Hazardous Waste
Subtype: Information Collection Request (ICR)
Type: Nonrulemaking
Location: HQ-OLEM
Primary Documents
[View All \(1\)](#)

[Agency Information Collection Activities: Proposals, Submissions, and Approvals: RCRA Expanded...](#)

Notice
Posted: 03/21/2018
ID: EPA-HQ-OLEM-2018-0102-0001

Comment Period Closed
May 21, 2018 11:59 PM ET

Supporting Documents

No documents available.

Comments [View All \(3\)](#)

orking class , the poor hurt on flawed reports ,
e Deficit almost 800 Billion Dollars. 80 Billion spent

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3

Comments Received *

Agency Contact

Peggy Vyas
Environmental Protection
Specialist
EPA
vyas.peggy@epa.gov
703-308-5477

*This count refers to the total comment/submissions received on this docket, as of 11:59 PM yesterday. Note: Agencies review all submissions, however some agencies may choose to redact, or withhold, certain submissions (or portions thereof) such as those containing private or proprietary information, inappropriate language, or duplicate/rear duplicate examples of a mass-mail campaign. This can result in discrepancies between this count and those displayed when conducting searches on the Public Submission document type. For specific information about an agency's public submission policy, refer to its website or the Federal Register document.

8/6/18, 1:15 PM

12384

Federal Register / Vol. 83, No. 55 / Wednesday, March 21, 2018 / Notices

and recommend to the EPA Administrator any new NAAQS and revisions of existing criteria and NAAQS as may be appropriate. The CASAC shall also advise the EPA Administrator of areas in which additional knowledge is required to appraise the adequacy and basis of existing, new, or revised NAAQS; describe the research efforts necessary to provide the required information; advise the EPA Administrator on the relative contribution to air pollution concentrations of natural as well as anthropogenic activity; and advise the EPA Administrator of any adverse public health, welfare, social, economic, or energy effects which may result from various strategies for attainment and maintenance of such NAAQS. As required under the CAA section 109(d), the CASAC is composed of seven members, with at least one member of the National Academy of Sciences, one physician, and one person representing state air pollution control agencies. The SAB Staff Office is seeking nominations of experts to serve on the CASAC with expertise in: Air quality, biostatistics, ecology, environmental economics, environmental engineering, epidemiology, exposure assessment, medicine, risk assessment, and toxicology. The SAB Staff Office is especially interested in scientists with expertise described above who have knowledge and experience relating to criteria pollutants (carbon monoxide, lead, nitrogen oxides, ozone, particulate matter, and sulfur oxides). For further information about the CASAC membership appointment process and schedule, please contact Mr. Aaron Yow, DFO, by telephone at 202-564-2050 or by email at ayow-ar@epa.gov.

Selection Criteria for the CASAC

Nominees are selected based on their individual qualifications. Curriculum vitae should reflect the following:

- Demonstrated scientific, credentials and disciplinary expertise in relevant fields;
- Willingness to commit time to the committee and demonstrated ability to work constructively and effectively on committees; and
- Background and experience that would help members contribute to the diversity of perspectives on the committee, e.g., geographical, economic, social, cultural, educational backgrounds, professional affiliations, and other considerations.

For the committee as a whole, consideration of the collective breadth and depth of scientific expertise; and

a balance of scientific perspectives is important. As the committee undertakes specific advisory activities, the SAB Staff Office will consider two additional criteria for each new activity: absence of financial conflicts of interest and absence of an appearance of a loss of impartiality. How to submit nominations: Any interested person or organization may nominate qualified persons to be considered for appointment to this advisory committee. Individuals may self-nominate. Nominations should be submitted in electronic format (preferred) using the online nomination form under "Public Input on Membership" on the CASAC web page at <http://www.epa.gov/casac>. To be considered, all nominations should include the information requested below. EPA values and welcomes diversity. All qualified candidates are encouraged to apply regardless of sex, race, disability or ethnicity. The following information should be provided on the nomination form: contact information for the person making the nomination; contact information for the nominee; the disciplinary and specific areas of expertise of the nominee; the nominee's curriculum vitae; and a biographical sketch of the nominee indicating current position, educational background, research activities; sources of research funding for the last two years; and recent service on other national advisory committees or national professional organizations. To help the agency evaluate the effectiveness of its outreach efforts, please indicate how you learned of this nomination opportunity. Persons having questions about the nomination process or the public comment process described below, or who are unable to submit nominations through the CASAC website, should contact the DFO, as identified above. The DFO will acknowledge receipt of nominations and will invite the nominee to provide any additional information that the nominee feels would be useful in considering the nomination, such as availability to participate as a member of the committee; how the nominee's background, skills and experience would contribute to the diversity of the committee; and any questions the nominee has regarding membership. The names and biosketches of qualified nominees identified by respondents to this Federal Register notice, and additional experts identified by the SAB Staff Office, will be posted in a List of Candidates on the CASAC website at <http://www.epa.gov/casac>.

Public comments on each List of Candidates will be accepted for 21 days from the date the list is posted. The public will be requested to provide relevant information or other documentation on nominees that the SAB Staff Office should consider in evaluating candidates. Candidates may be asked to submit the "Confidential Financial Disclosure Form for Special Government Employees Serving on Federal Advisory Committees at the U.S. Environmental Protection Agency" (EPA Form 3110-40). This confidential form is required for Special Government Employees (SGEs) and allows EPA to determine whether there is a statutory conflict between that person's public responsibilities as an SGE and private interests and activities, or the appearance of a loss of impartiality, as defined by Federal regulation. The form may be viewed and downloaded through the "Ethics Requirements for Advisers" link on the CASAC home page at <http://www.epa.gov/casac>. This form should not be submitted as part of a nomination.

Dated: March 13, 2018.
Khanna Johnston,
Deputy Director, EPA Science Advisory Staff
Office.
(EPA Doc. 2018-03754 Filed 3-20-18; 8:45 am)
BILLING CODE 6060-67

ENVIRONMENTAL PROTECTION AGENCY EPA-HQ-OLEM-2018-0102, FRL-9975-89-OLEM

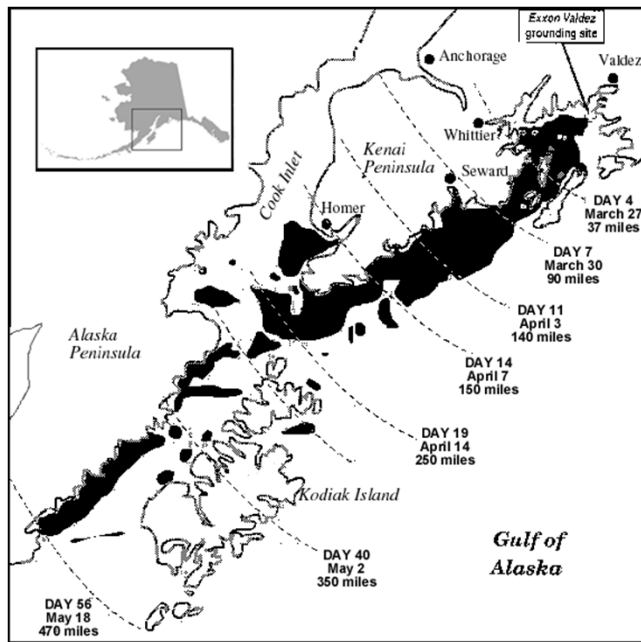
Agency Information Collection Activities: Proposed Collection; Comment Request: RCRA Expanded Public Participation

AGENCY: Environmental Protection Agency (EPA).
ACTION: Notice.

SUMMARY: The Environmental Protection Agency (EPA) is planning to submit the information collection request (ICR), RCRA Expanded Public Participation (EPA ICR No. 1688-09, OMB Control No. 2010-0149) to the Office of Management and Budget (OMB) for review and approval in accordance with the Paperwork Reduction Act (PRA) (44 U.S.C. 3501 et seq.). Before doing so, the EPA is soliciting public comments on specific aspects of the proposed information collection as described below. This is a proposed extension of the ICR, which is currently approved through August 31, 2018. An Agency may not conduct or sponsor and a

Citizen Input

Exxon Valdez Spill -- 1989



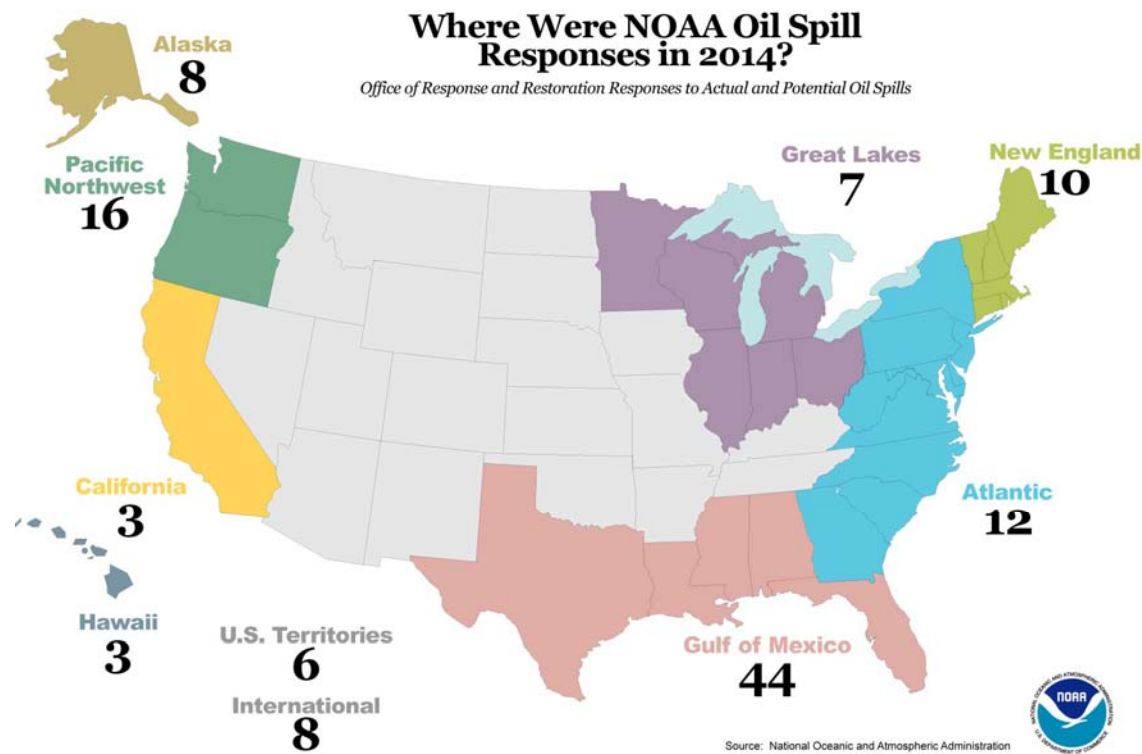
Deep Water Horizon --2010



Sources:

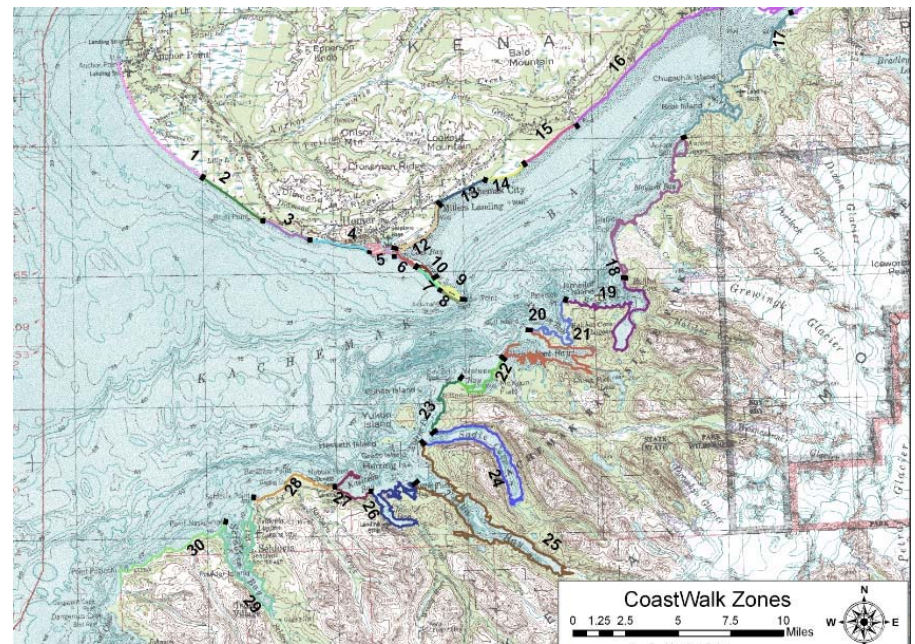
<http://www.evostc.state.ak.us/index.cfm?FA=facts.map>; NOAA

Chronic Problems & Crowd Sourcing Both Investigation & Response



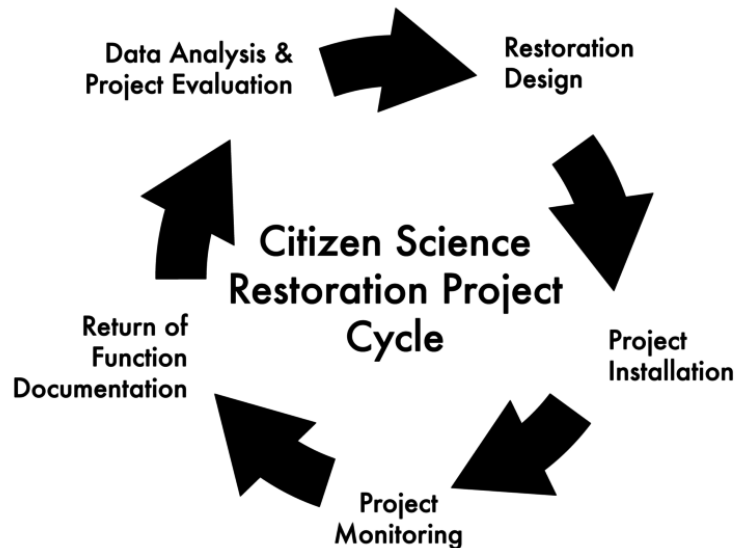
Example: Alaska Coast Watch

- Community-based coastal monitoring
 - The Kachemak Bay CoastWalk developed in the *Exxon Valdez* oil spill restoration program
 - focus on the nearshore environment
- Monitoring beachcast seabirds
- Mortality study on the northern sea otter
 - data collection protocols for dead sea otters
 - U.S. Fish and Wildlife Service provides training for volunteers to participate in collection of dead sea otters



Source: https://www.akcoastalstudies.org/jobs-volunteers/131-programs/index.php?option=com_content&view=article&id=55:citizen-monitoring&catid=130&Itemid=103

Example: MDI Biological Laboratory's Community Environmental Health Laboratory (CEHL)



- Citizen-assisted restoration ecology
- Restoring eelgrass in the waters off the coast of Maine over the last decade.
- Multiple points of engagement:
 - assessing sediment characteristics to make predictions about best sites for restoration,
 - designing and trialing restoration methods,
 - documenting project success,
 - assessing the habitat function of restored habitat by enumerating species on eelgrass blades,
 - mapping eelgrass spread from restored patches, and
 - contributing to the [“Eelgrass in Maine”](#) project at [Anecdota.org](#) to document the extent of eelgrass loss along the coast of Maine.

Source: <https://mdibl.org/research/environmental-sustainability/citizen-science/>

Questions?

Contact: elizabeth.geltman@sph.cuny.edu

Preliminary Findings: <http://lawatlas.org/dataset/state-laws-on-soil-vapor-intrusion>