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1st BSC BOTANY  
18BBO24C - CORE PAPER – III ECOLOGY AND  
PLANT GEOGRAPHY

UNIT – IV

Conservation and types (In situ and Ex situ conservation). Red data list, Mega biodiversity centres in Tamilnadu, India and World. Hotspots. Chipko movement and Silent valley project

# CONSERVATION



# In situ

# Ex situ

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## **In situ:**

- Conservation of species in their natural habitat
- E.g. natural parks, nature reserves

## **Ex situ:**

- Conserving species in isolation of their natural habitat
- E.g. zoos, botanical gardens, seed banks

# *In situ* conservation

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Setting up wild life reserves is not just a matter of building a fence around an area and letting it grow “wild”



Without grazing animals heathlands which contain a number of rare species will revert to woodland

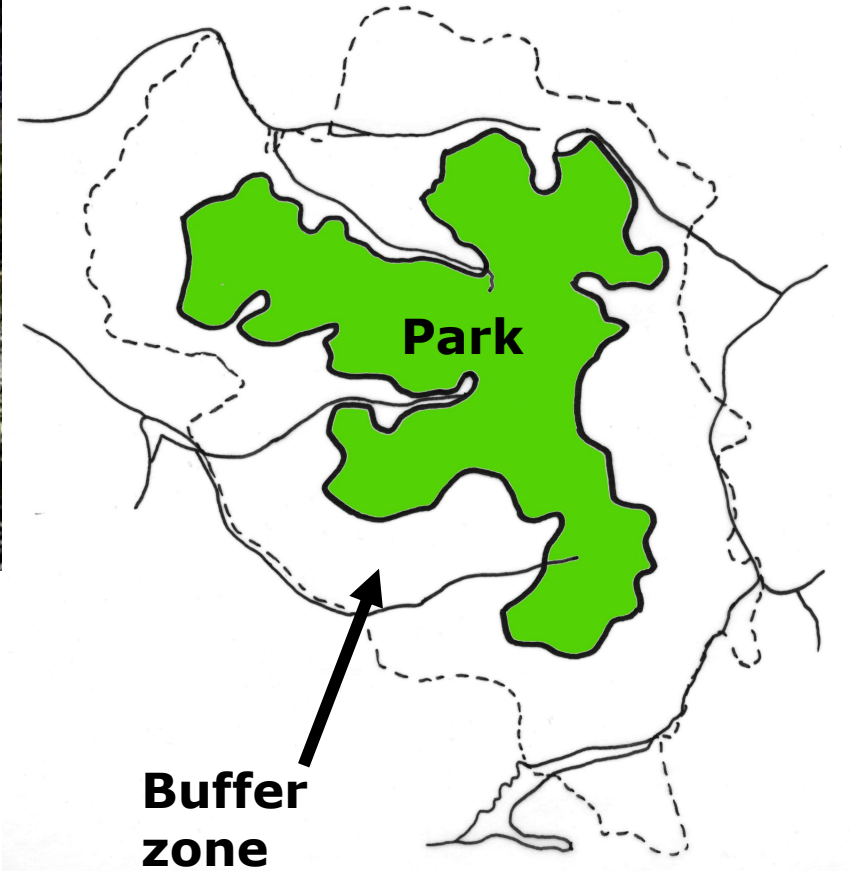
# Nature reserves and national parks

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- ❑ First the area that is suitable for the creation of a reserve has to be identified and delimited
- ❑ This requires surveys to collect data on key species
- ❑ Property may have to be expropriated
- ❑ A legal framework may need to be set up to control human activities in the area and in its immediate surroundings
- ❑ Policing the area may also be necessary

# Les Ecrins National Park, France

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# Nature reserves and national parks

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- ❑ If part of the area has been degraded due to bad land use it may need restoring
- ❑ Alien species that have penetrated the area may need excluding or eliminating
- ❑ Constant management will be needed to maintain the habitat of the species being conserved
- ❑ This may mean arresting natural succession



# The advantages of *in situ* conservation

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- ❑ The species will have all the resources that it is adapted to
- ❑ The species will continue to evolve in their environment
- ❑ The species have more space
- ❑ Bigger breeding populations can be kept
- ❑ It is cheaper to keep an organism in its natural habitat



[Wordpress.com](http://www.shutterstock.com)



# However there are problems

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- ❑ It is difficult to control illegal exploitation (e.g. poaching)
- ❑ The environment may need restoring and alien species are difficult to control



[Sciencemuseum.org](http://Sciencemuseum.org)

# *Ex situ* conservation Captive breeding

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- ❑ The Hawaiian goose was practically extinct in the wild
- ❑ 12 birds were taken into captivity
- ❑ A population of 9000 was released back into the wild
- ❑ The experiment failed because the original cause rats had not been eliminated.
- ❑ The rats eat the eggs and the nestlings of the geese



[State Symbols USA](#)

# Pere David's deer success or failure?

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- ❑ Pere David's deer was a native species of China
- ❑ In 1865 18 were taken into zoological collections
- ❑ Meanwhile it became extinct in the wild
- ❑ By 1981 there were 994 individuals scattered through zoological collections



[America Zoo](#)

# *Ex situ* conservation

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- ❑ Captive breeding of endangered species is **a last resort**
- ❑ These species have already reached the point where their populations would not recover in the wild
- ❑ It works well for **species that are easily bred in captivity** but more specialised animals are difficult to keep (aye aye)
- ❑ Isolated in captivity **they do not evolve** with their environment

# Zoos: The land of the living dead?

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- They have a very small gene pool in which to mix their genes
- **Inbreeding** is a serious problem
- Zoos and parks try to solve this by **exchanging specimens** or by artificial insemination where it is possible
- **In vitro fertilisation** and fostering by a closely related species has even been tried (Indian Guar – large species of cattle - cloned)
- Even if it is possible to restore a population in captivity **the natural habitat may have disappeared** in the wild
- Species that rely on this much help are often considered to be **“the living dead”**

# Botanical gardens

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- ❑ Botanical gardens show the same problems as captive breeding of animals
- ❑ Originally the role of botanical gardens was economic, pharmaceutical and aesthetic
- ❑ Their range of species collected was limited
- ❑ The distribution of botanical gardens reflects the distribution of colonial powers
- ❑ Most are found in Europe and North America
- ❑ But plant diversity is greatest in the tropics

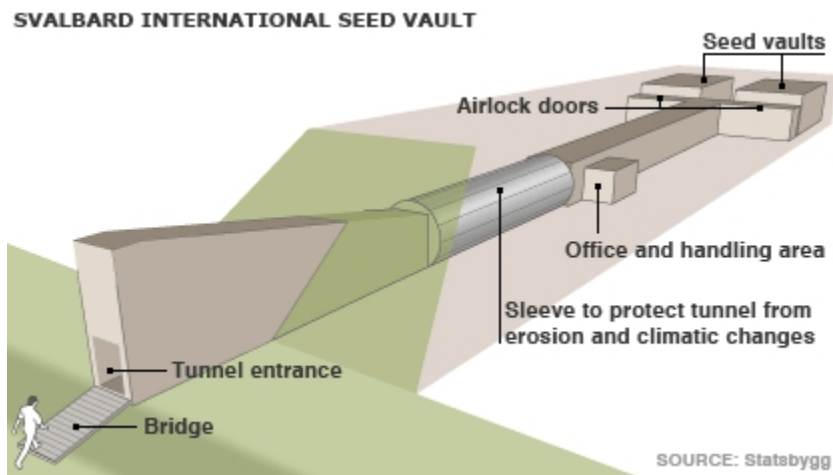
# Seed banks

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- ❑ Seeds can be maintained for decades or even centuries if the conditions are controlled
- ❑ <5% humidity and  $-20^{\circ}\text{C}$
- ❑ Not all species are suited to this treatment
- ❑ Seeds need to be regularly germinated to renew stock or the seeds will eventually lose their viability
- ❑ Seed banks are at risk from power failure, natural disasters and war
- ❑ Duplicate stocks can be maintained
- ❑ Seeds kept in seed banks do not evolve with changes in the environment

# The doomsday vault - Spitzbergen

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[BBC](#)



[Bergen Nat Acc of Arts](#)



# International agencies

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- ❑ **CITES**  
(The Convention in International Trade in Endangered Species)
- ❑ Set up in 1988 to control and encourage the **sustainable exploitation** of species
- ❑ The CITES conferences determine the status of a species and whether or not its exploitation requires regulation
- ❑ Species are placed into different appendices depending on their status



[CITES](#)

# CITES Appendices

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- **Appendix 1:** Total ban on exploitation
- **Appendix 2:** Limited exploitation subject to quotas
- **Appendix 3:** Species requiring protection in certain states only
- Species are reassessed every 2 years

# WWF (World Wide Fund for Nature formerly World Wildlife Fund)

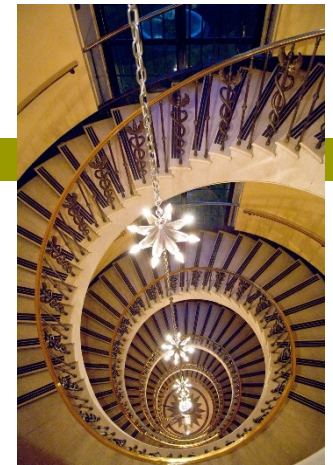
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- ❑ Set up in 1961 as a **non-governmental organisation**
- ❑ **Raises funds** for conservation
- ❑ **Lobbies parliaments** for conservation
- ❑ Runs **education programmes**
- ❑ Provides **advice** to government conservation agencies
- ❑ **Raises awareness** on conservation issues



[WWF](http://www.wwf.org)

# Laws and Regulatory Foundations for Risk Assessment

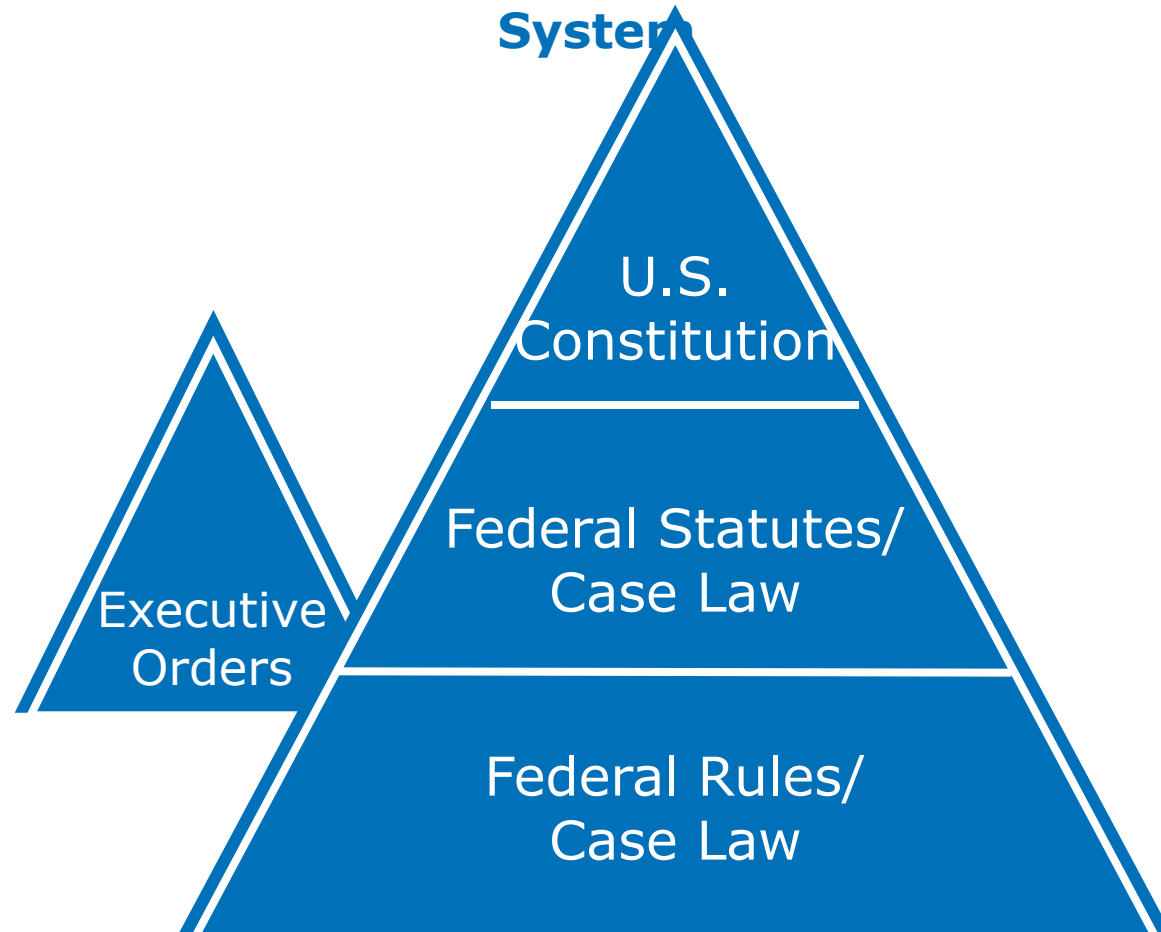


# Environmental Law and Regulation in the U.S.

## Sources of Environmental Directives

- Federal statutes
- State statutes
- Executive orders
- Judicial decisions
- Federal and state regulations
  - Implement the environmental directives

## Hierarchy of Authority in the Federal System



**Disclaimer:** The views in this presentation are those of the authors and do not necessarily reflect the views or policies of the EPA.

# EPA and State Roles in Environmental Regulation

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## EPA

- Conduct research
- Perform risk assessments
- Set national standards
- Monitor compliance
- Enforce national standards

## States

- Develop state-level standards
- Monitor compliance
- Enforce state and national standards
- Issue permits

# Overview

**Air**

**Water**

**Hazardous  
Waste**

**Toxics &  
Pesticides**

AIR POLLUTION



CONTROL



# Air Pollution Control - EPA

**Air Pollution Control Act**

1955

**Clean Air Act**

1970

**Clean Air Act Amendments**

1990

Amendments  
1963 1965 1966 1967

Clean Air Act Amendment  
1977

EPA

1948

1954

1972 1973



Los Angeles, California



Donora, Pennsylvania



Birmingham, Alabama



New York, New York

# CAA & CAAA – Key Provisions

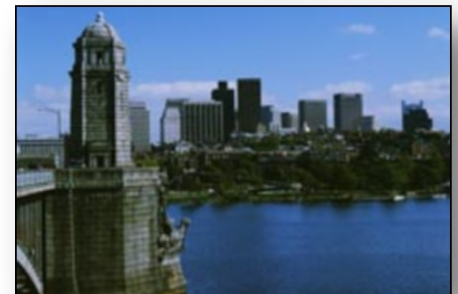
## **Clean Air Act (CAA)**

- National Ambient Air Quality Standards (NAAQS)
- Emission standards for vehicles and fuels



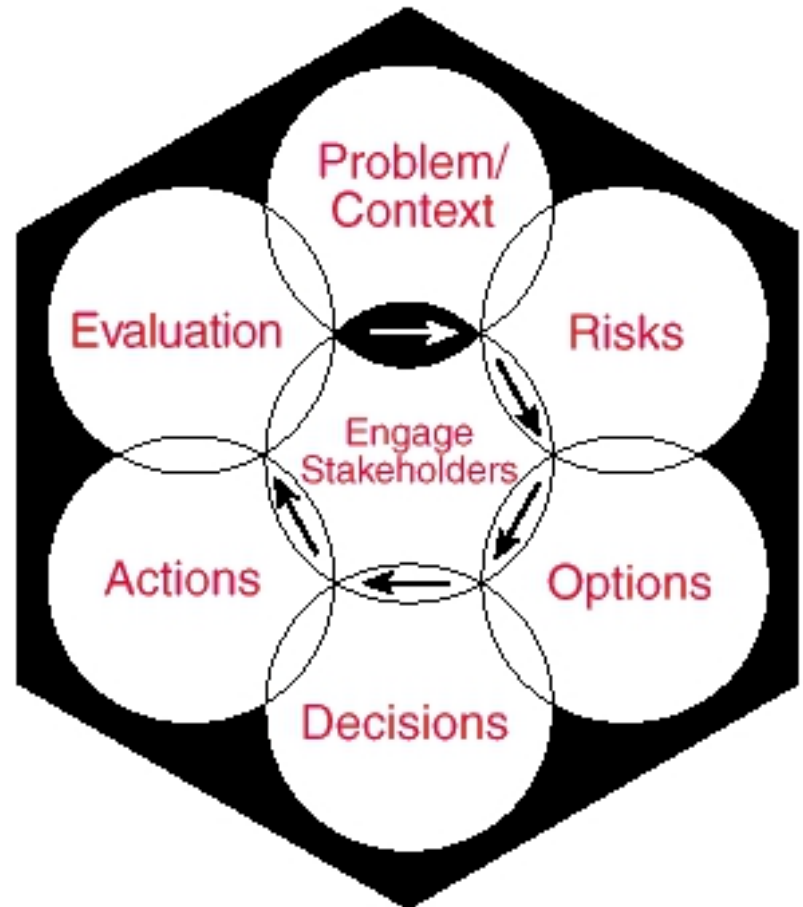
## **Clean Air Act Amendments (CAAA)**

- Air toxics
- Stratospheric ozone layer
- Acid rain
- Commission on Risk Assessment and Risk Management



# Brief History of Human Health Risk Assessment

- Presidential Commission on Risk Assessment and Risk Management (CRARM)
  - Addressed residual risks from HAPs
  - Developed an integrated risk management approach
  
- Continued evolution at EPA
  - Multiple chemical (cumulative) risk assessment
  - Community-scale and national-scale assessments



# Commission on Risk Assessment and Risk Management

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## **CRARM reported on:**

- Use of risk assessment in setting standards;
- How to estimate, quantify, and report risk from exposure to chemicals;
- How to quantify and describe uncertainty in estimating human health risk; and
- Risk management policies and methodologies.

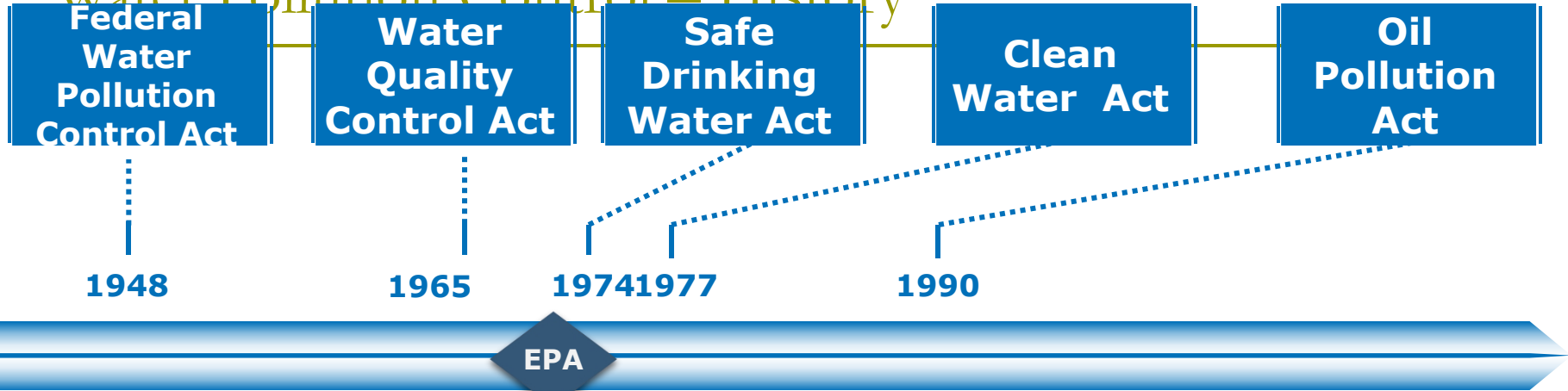
## **Accomplishments:**

- Cumulative Exposure Project
- Risk Characterization Policy broadened to include social, economic, public values, and other factors along with scientific data.
- Office of Children's Health Protection

# WATER POLLUTION CONTROL



# Water Pollution Control – History



1960s  
1969

1990



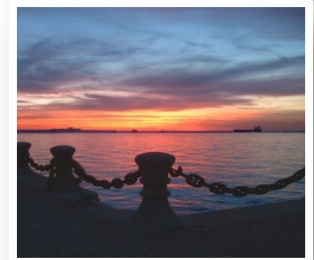
Cuyahoga River



Exxon Valdez Oil Spill in Alaska

# CWA – Key Provisions

- ❑ Establish effluent limitations
- ❑ States and tribes set water quality standards based on EPA's ambient water quality criteria
- ❑ Create control technology standards for new industrial point sources
- ❑ Publish list of toxic substances and associated effluent limitations
- ❑ Establish the National Pollutant Discharge Elimination System (NPDES)
- ❑ Clean Water Rule (CWR)
  - Published in Jun 2015; stayed by Court Order in Oct 2015
  - Sept-Nov 2017: Public outreach meetings to provide feedback on new rule to review and rescind or revise the CWR
  - <https://www.epa.gov/wotus-rule/outreach-meetings>



# SDWA – Key Provisions

## Safe Drinking Water Act (SDWA) –

- Establish national drinking water standards
- Set Maximum Contaminant Level Goals (MCLGs) and Maximum Contaminant Levels (MCLs)
- Regulate underground injections







HAZARDOUS  
WASTE  
REGULATION  
(Superfund)

# Hazardous Waste Regulation – History

**RCRA**

**CERCLA**

**SARA**

1976

Love Canal

1978

1980

Valley of Drums

1981

1986

1,279 NPL Sites

2010

**EPA**

1978

1981

1984



**Love Canal protests**



**Valley of Drums in Bullitt County, Kentucky**



**Clean up of PCBs in Hudson River**



# CERCLA Superfund – Key Provisions

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**COMPREHENSIVE** – EPA can respond to “release” or “substantial threat” of release into environment of hazardous substance or pollutant/chemical that will endanger health or welfare

**ENVIRONMENTAL RESPONSE** – EPA can remove the contaminant or remediate the site or both

**COMPENSATION** – Superfund established \$1.6 billion in 1980, increased to \$8.5 billion in 1986 under SARA (Superfund Amendments and Reauthorization Act)

**LIABILITY ACT** – Potentially responsible parties pay. EPA can clean up first by accessing Superfund

CERCLA also established Agency for Toxic Substances and Disease Registry.

## SARA Superfund – Key Provisions

### **Superfund Amendments and Reauthorization Act –**

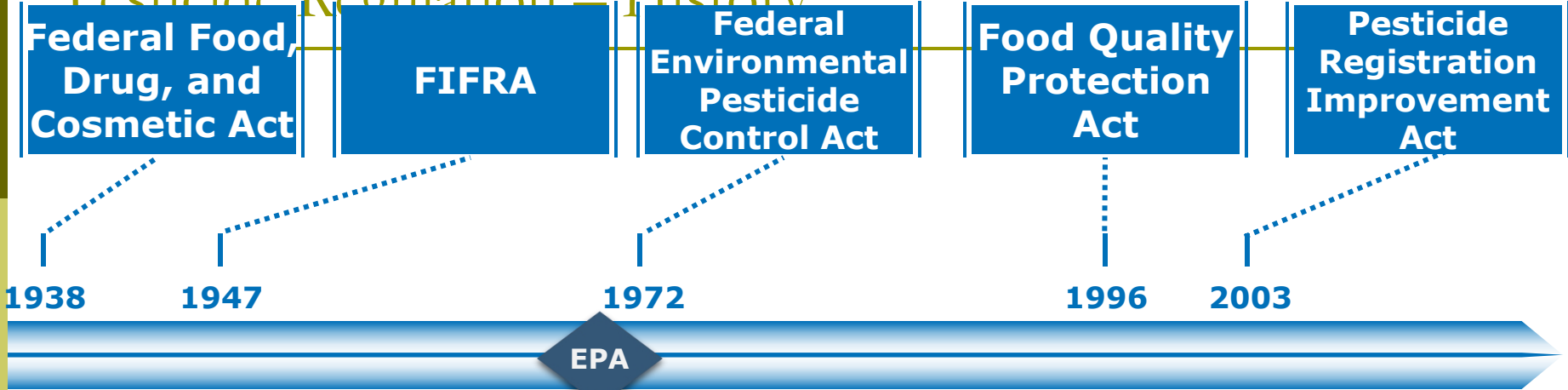
- ▣ Increased Superfund to \$8.5 billion
- ▣ Required increased State and public participation
- ▣ Required same cleanup at Federal sites
- ▣ Encouraged voluntary settlements with potentially responsible parties



# PESTICIDE REGULATION



# Pesticide Regulation - History



1942



Loading pesticide into a plane used in malaria control work

1962



Rachel Carson's *Silent Spring* published

1996



Increased focus on food quality



# FIFRA – Key Provisions

## **Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) –**

- Requires registration of pesticides
- **Regulates pesticide use**
  - Gives EPA authority to remove pesticides from the market
    - Suspend a product's registration
    - Cancel a product's registration

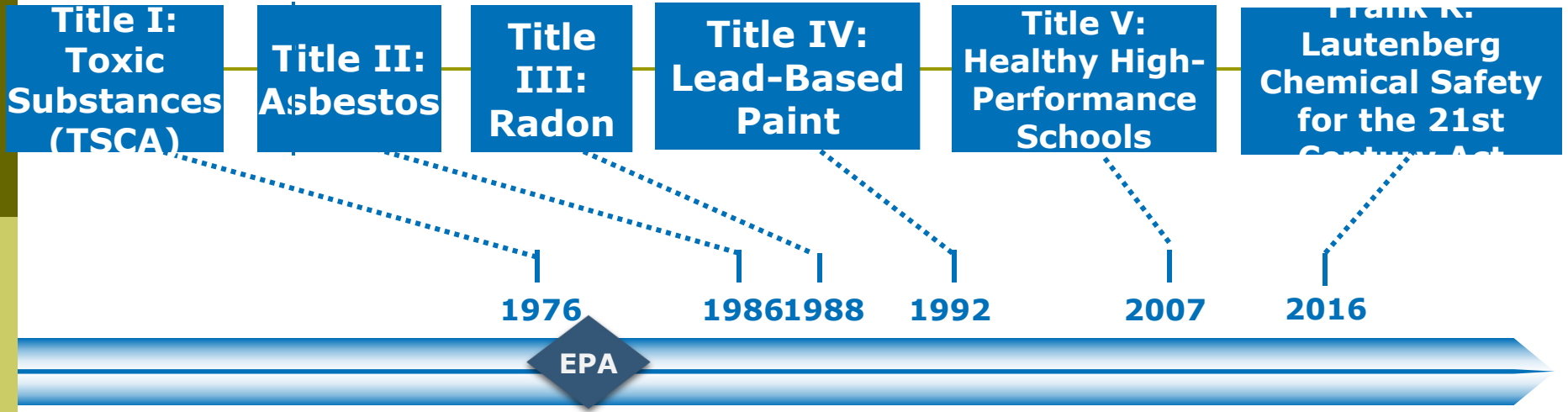


# TOXIC SUBSTANCES REGULATION





# Toxic Substances Regulation – History

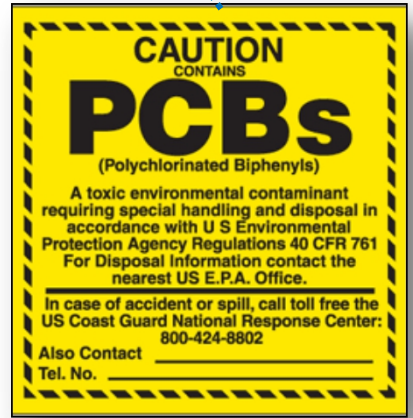


1937



Harvard School of Public Health meeting on chlorinated diphenyl

1979



Asbestos removal



# TSCA – Key Provisions

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## **Toxic Substances Control Act (TSCA) includes –**

- ▣ Title I: Control of Toxic Substances
- ▣ Title II: Asbestos Hazard Emergency Response Act  
(AHERA)\*
- ▣ Title III: Indoor Radon Abatement Act\*
- ▣ Title IV: Lead-Based Paint Exposure Reduction Act\*
- ▣ Title V: Healthy High-Performance Schools\*

## “New” TSCA – i.e. Lautenberg Chemical Safety Act Amendments

- ❑ Mandatory duty on EPA to evaluate existing chemicals –clear and enforceable deadlines
- ❑ Chemicals assessed against a risk-based safety standard
- ❑ Must consider risks to susceptible and highly exposed populations
- ❑ Unreasonable risks identified in the risk evaluation must be eliminated
- ❑ Expanded authority to more quickly require development of chemical information when needed

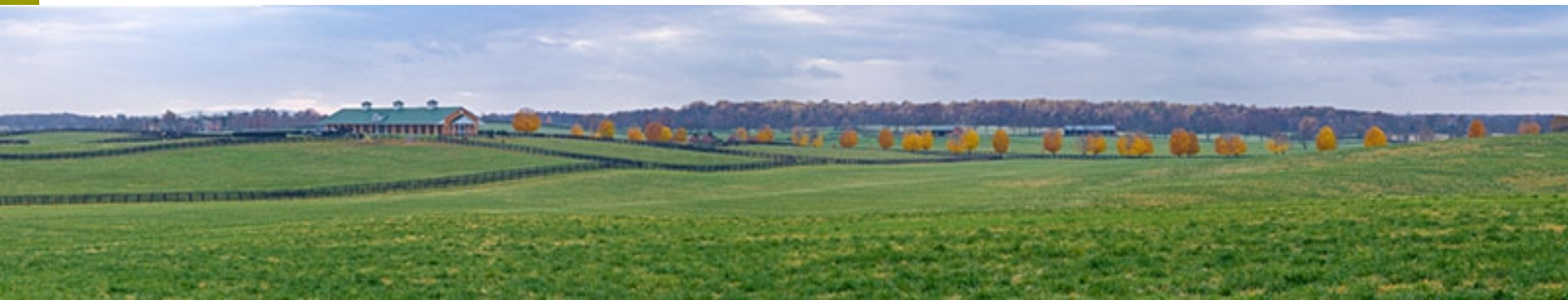
*From U.S. EPA public meeting August 2016*



# Requirements

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- Integrate and assess available information on hazards and exposures for the “conditions of use” of the chemical substance, including information relevant to specific risks of injury to health or the environment and information on potentially exposed or susceptible populations
  - *“Conditions of use” – circumstances under which a*



# Risk Prioritization Rule

- ❑ EPA must establish a risk-based process to identify whether a substance is a “high” or “low” priority for risk evaluation
  - *High-Priority*. The chemical may present an unreasonable risk of injury to health or the environment due to potential hazard and potential route of exposure, including to susceptible populations
  - *Low-Priority*. The chemical does not meet the standard for High-Priority



# Stakeholder involvement

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- EPA believes that input from interested stakeholders and the public is critical to successful implementation of the new law.
- Opportunities for input may include briefings, webinars, public meetings, comment periods, etc.
- [Sign-up for updates](https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/frank-r-lautenberg-chemical-safety-21st-century-act) on EPA's stakeholder engagement efforts.
  - <https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/frank-r-lautenberg-chemical-safety-21st-century-act>

# PROTECTION OF CHILDREN

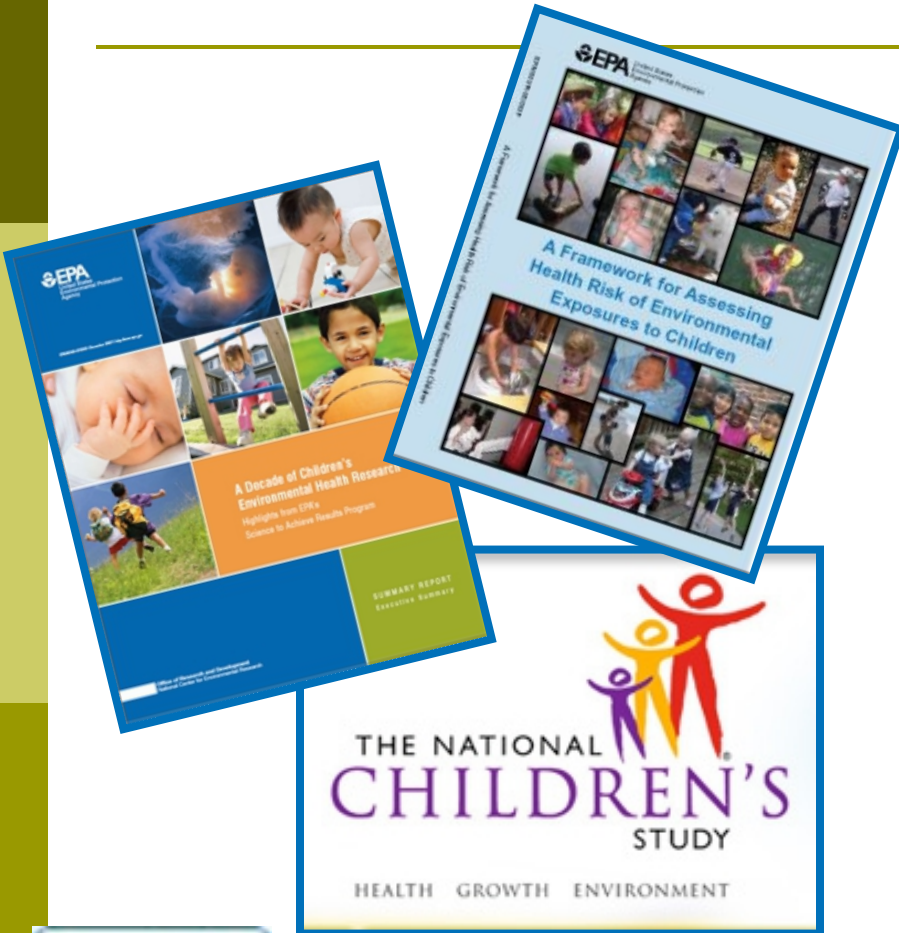


# Executive Order (EO) 13045

## Protection of Children from Environmental Health Risks and Safety Risks

### Each Federal agency shall:

- Make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and
- Ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks,



President's Task Force on Environmental Health Risks and Safety Risks to Children







# Class Activity

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In addition to the Congressional Acts and Executive Orders that we have discussed, judicial decisions have also shaped EPA's regulatory foundation.

- Read the summary of your assigned case (beginning on page 38 of your Reading Packet).
  - Confer with your group to write a summary of the case in 25 words or less.
- We will share summaries after 10 minutes.

# Summary of Acts

## Air

Clean Air Act

CAA Amendments  
of 1990

## Water

Safe Drinking  
Water Act

Clean Water Act

Oil Pollution Act

## Hazardous Waste

Resource  
Conservation and  
Recovery Act

Comprehensive,  
Environmental  
Response, Recovery,  
and Liability Act

Toxic Substances  
Control Act

Superfund  
Amendments  
Reauthorization Act

## Toxics & Pesticides

Federal Insecticide,  
Fungicide, and  
Rodenticide Act

Food Quality  
Protection Act

Toxic Substances  
Control Act

Pesticide  
Registration  
Improvement Act