

**5<sup>th</sup> Annual  
Maine Partners in Emergency  
Preparedness Conference**

Augusta Civic Center

Augusta, Maine

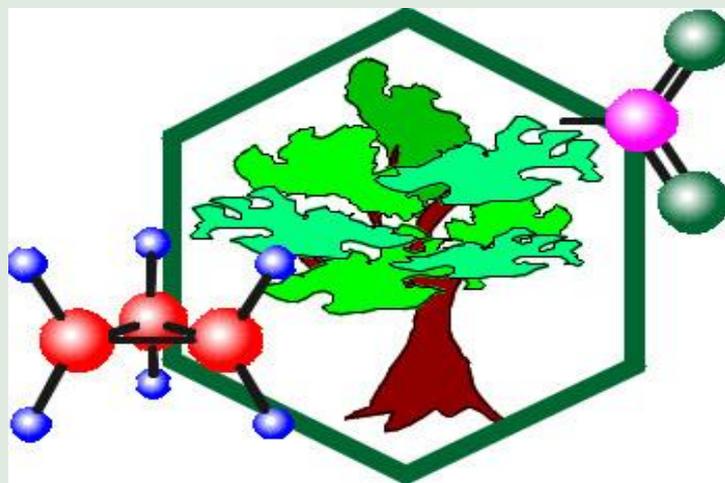
April 23, 2013

**Schools Integrated Chemical Management**

**Dwight Peavey, Senior Scientist**

**U.S. EPA**

Moving Schools from **Hazardous and Toxic Chemicals** Towards Safe, Healthy and Sustainable Science



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# Schools Integrated Chemical Management Program (ICM)



Partnering with schools for 10+ years

Moving 100+ schools to safer, healthier  
& more sustainable chemistry



# ***“Do no harm to our children!”***

- The lack of chemical management in public schools is a local, state, regional, and national problem.
- NSTA Position Statement: ***“Studies show that safety in K–12 school science instruction needs immediate and significant attention.”***



# Chemical Accidents in the News...

"a student accidentally ran water over a sodium metal material placed in a laboratory sink. The violent reaction released a gas...Ultimately, 12 students were transported to the hospital, complaining of respiratory discomfort and/or headaches." –Rob Manning, Oregon Public Broadcasting. Published in The Daily Astorian on Friday January 13, 2012

"On December 1<sup>st</sup>, students at Maple Grove were participating in a lab demonstration that involved the teacher igniting a small amount of methanol in what is known as a "whoosh bottle" demonstration. Unfortunately, this particular demonstration resulted in a larger-than-expected fire and four students were injured, with one of them suffering severe burns requiring him to remain hospitalized for a few days." –Mike Bryant, The Legal Examiner. Published online on December 26, 2011.



"[Lab worker Sheri Sangji was severely burned during a chemical fire at a UCLA lab in 2008. ... Cal/OSHA investigators say Sheri was working with a bottle of t-butyl-lithium, a highly volatile chemical that ignites when exposed to air. According to Cal/OSHA and court documents, she was transferring the chemical using a syringe and accidentally pulled out the plunger...The lab was run by chemistry professor Patrick Harran, who is now facing three felony counts related to Sangji's death for violating state safety regulations. It's the first time a professor in the United States has been charged with a felony for the workplace death of an employee.]" –California News, Friday July 27, 2012

"BOICEVILLE — Seven students and their teacher were injured Tuesday morning in an Onteora High School chemistry class by an explosion that was strong enough to damage windows, according to police and school district officials...the teacher used fewer than 3 grams of [potassium chlorate during a demonstration of its] reaction to food products." –The Daily Freeman, Wednesday, January 20, 2010

"Preston Brown, a graduate student in chemistry at Texas Tech University in Lubbock, lost three fingers of his left hand during a dangerous experiment. Brown was grinding up chunks of nickel hydrazine perchlorate — using a hundred times the recommended amount — when it detonated." – Richard Van Noorden, Nature 472, 270-271 (2011). Published online on April 18, 2011.

# Science classroom explosion injures 7 PA students —November 28, 2012—

CARLISLE, Pa. (AP) — **A small explosion and fire Wednesday in a central Pennsylvania eighth-grade science classroom required hospital treatment for seven students and a teacher.**

Carlisle Area School District Superintendent John Friend told reporters that a fireball occurred **when some sort of chemicals were mixed together**. He said that the teacher put out the fire with an extinguisher, WHTM-TV reported.

Cumberland County public safety spokeswoman Meg Silverstrim said **two of the injured children were taken by helicopter** from Wilson Middle School in Carlisle to Johns Hopkins Hospital in Baltimore.

A Carlisle Regional Medical Center spokeswoman said **five students and a teacher were treated for what she described as minor injuries**, and all six had been released by midafternoon.

# Integrated Chemical Management (ICM):

## Why?!

- To Reduce Risk
- To Reduce Exposure
- To Prevent Accidents
- To Ensure Safety of Your Students
- To Minimize Waste/Pollution
- To Save \$\$\$\$\$\$

# Integrated Chemical Management Program

- Centralized Chemical Storage
- Complete, up-to-date Inventory
- Proper Chemical Management
- Hazardous & Solid Waste management
- Safety Equipment, Signage & Labeling
- “Gatekeeper”
- Chemical Safety Plan
- Student/Parent Safety Contract

# Integrated Chemical Management: 5-Phase Process

1. Sweeping and gathering
2. Separating and inspecting
3. Creating a chemical inventory
4. Establishing the chemical storage area(s)
5. Lab/chemical management program

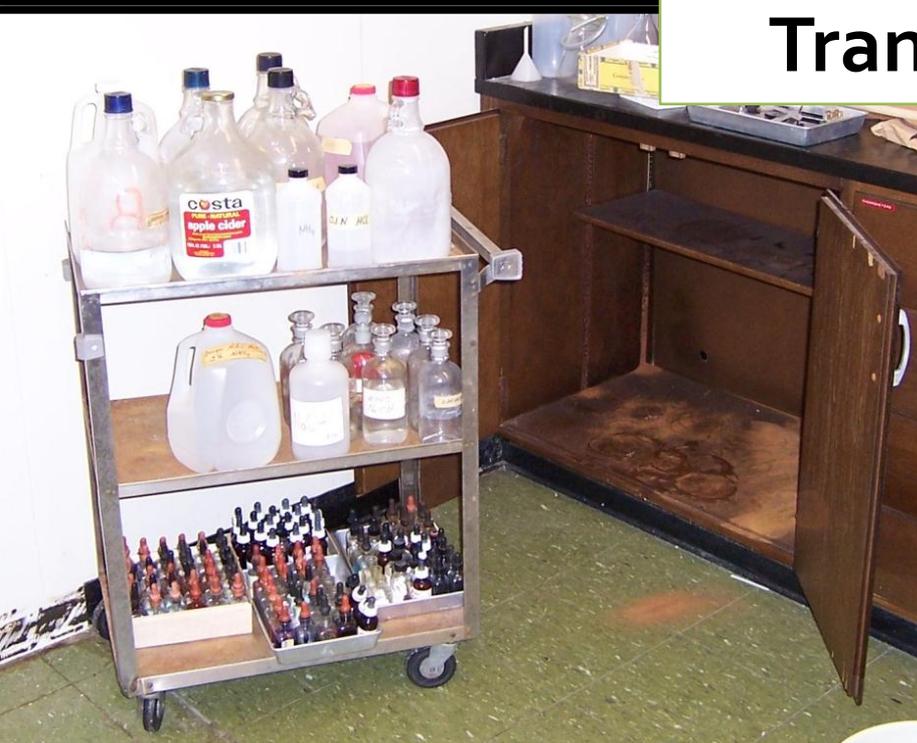


# Sweeping & Gathering





# Chemical Transport





# Separating & Inspecting



# ICM Chemical Inventory Database

- Multi field, "real-time" Excel database
- Includes every stock chemical container
- Chemical, S/L/G, CAS#, Suppliers, Size & Type
- RCRA Waste-Yes/No, RCRA Haz Waste Code
- MSDS's NFPA/HMIS Codes for Health, Flammability & Reactivity & PPE
- Requires posting on shared drive (read only)
- A designated gatekeeper controls the database

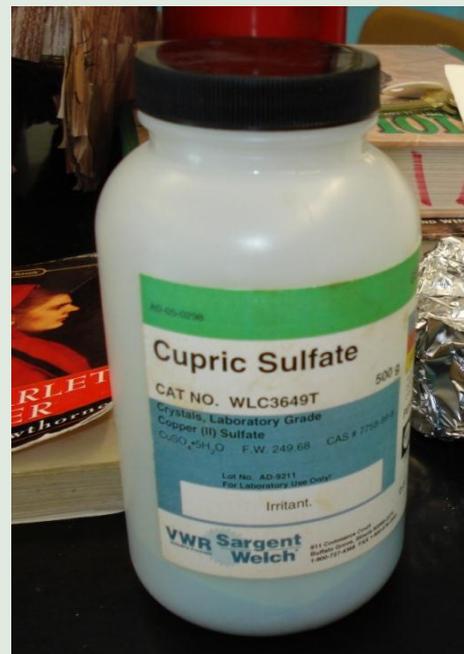
# Creating a Chemical Inventory

Every chemical container entered into Excel database

CHEMICAL NAME	S/G/L	CAS #	SUPPLIER	AMOUNT	T Y P E	Haz Waste	RCRA Code	Health	Flammability	Reactivity	PPE
1- Naphthol	S	90-15-3	FLN	500 G	P	N	N	2	1	0	E
1-Pentanol (See N-Amyl Alcohol)	L	71-41-0	SCR	1 PT	G	Y	D001	2	3	0	H
Abscisic Acid	S	14375-45-2	EDU	25 G	P	N	N	2	1	0	E

# Creating a Chemical Inventory: Basic Chemical Data

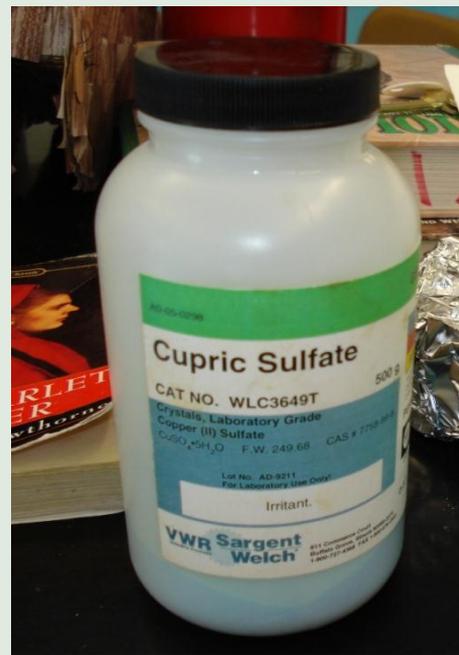
- Chemical name
- Solid/Liquid/Gas
- Chemical Abstract Service number (CAS #)



CHEMICAL NAME	S/G/L	CAS #
Cupric Sulfate	S	7798-99-8

# Creating a Chemical Inventory: Basic Chemical Product Data

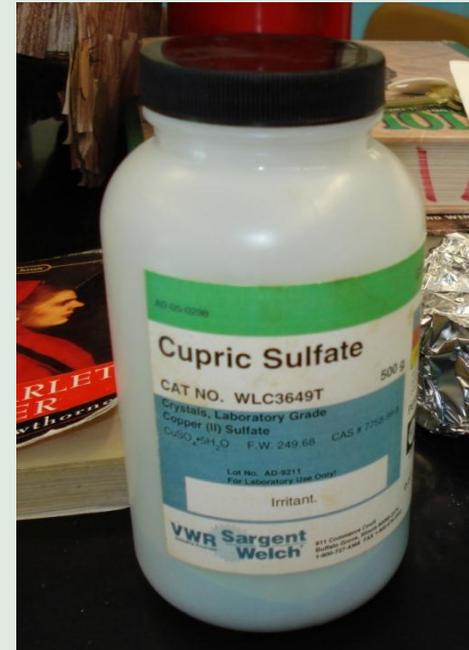
- Supplier: Mfg
- Amount: Max
- Type: Plastic, Glass, etc.



CHEMICAL NAME	S/G/L	CAS #	SUPPLIER	AMOUNT	TYPE
Cupric Sulfate	S	7798-99-8	SGW	500 G	P

# Creating a Chemical Inventory: RCRA Waste Identification

- **RCRA-** Resource Conservation and Recovery Act information: RCRA waste (Y/N), D001, D002, etc.



CHEMICAL NAME	S/G/L	CAS #	SUPPLIER	AMOUNT	T Y P E	Haz Waste	RCRA Code
Cupric Sulfate	S	7798-99-8	SGW	500 G	P	N	N

# RCRA Hazardous Waste Data

- Haz Waste: Yes/No
- RCRA Waste Codes: D001, etc.
- If yes, you are required to properly manage your RCRA hazardous waste (label, storage, & removal)

**HAZARDOUS WASTE**

FEDERAL LAW PROHIBITS IMPROPER DISPOSAL

IF FOUND, CONTACT THE NEAREST POLICE,  
PUBLIC SAFETY AUTHORITY OR THE  
U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERATOR INFORMATION:

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_  
EPA ID NO. \_\_\_\_\_ WASTE NO. \_\_\_\_\_  
ACCUMULATION START DATE \_\_\_\_\_ MANIFEST DOCUMENT NO. \_\_\_\_\_

\_\_\_\_\_

DOT PROPER SHIPPING NAME AND UN OR NA NO. WITH PREFIX

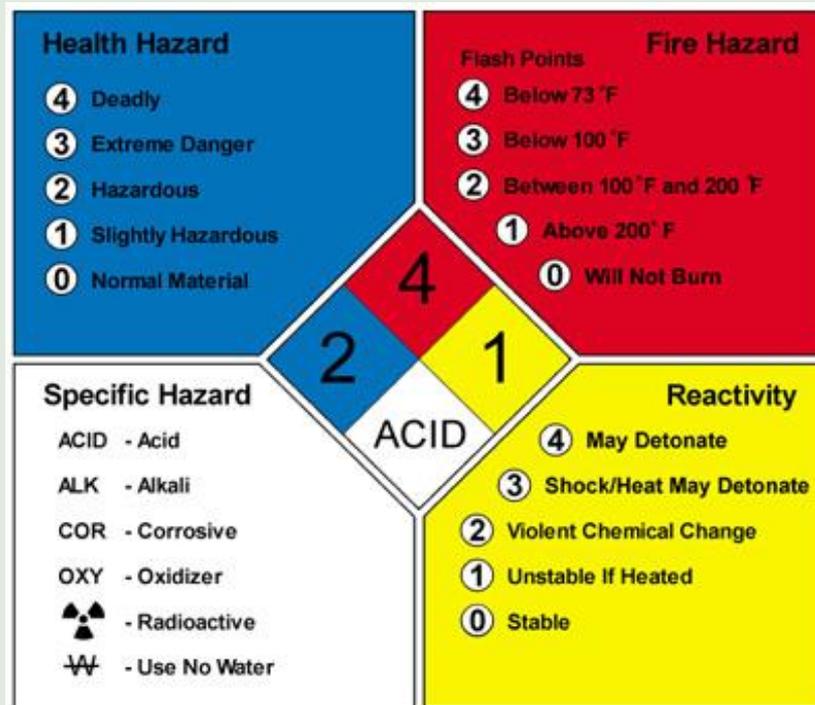
**HANDLE WITH CARE!**

# Waste Management Program

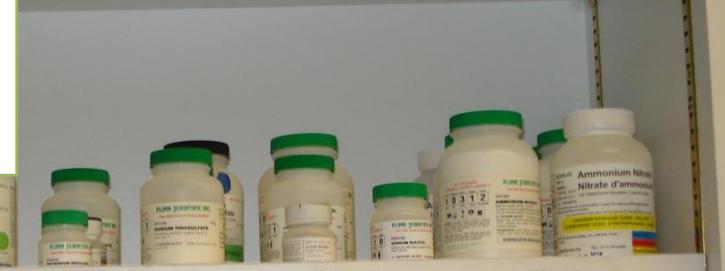
- Chemical Waste Training
- Protocols/Procedure/Contract
- Hazardous Chemical
- Universal Wastes
- RCRA Hazardous Waste
- Haz Waste Storage & Labeling
- Yearly Haz Waste Removal
- Prevent & Avoid RCRA Haz Chemistry

# Creating a Chemical Inventory: Chemical Hazard Data

- **NFPA**- National Fire Prevention Association chemical hazard data
- **PPE**- Personal Protective Equipment data



CHEMICAL NAME	S/G/L	CAS #	SUPPLIER	AMOUNT	T Y P E	Haz Waste	RCRA Code	Health	Flammability	Reactivity	PPE
Cupric Sulfate	S	7798-99-8	SGW	500 G	P	N	N	2	0	0	E



# Establishing Chemical Storage Area(s)

# Modified FLINN Chemical Storage System

## Inorganic

1. Metals, Hydrides
2. Acetates, Citrates, Oxalates, Tartarates, Iodine, Phthalates, Halides, Iodides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens
3. Amides, Nitrates, Nitrites, Azides
4. Hydroxides, Oxides, Dioxides, Silicates, Carbonates, Marble, Drierite, Carbon, Charcoal
5. Sulfides, Selenides, Phosphides, Carbides, Nitrides
6. Chlorates, Bromates, Iodates, Chlorites, Hypochlorites, Perchlorates, Perchloric Acid, Peroxides, Hydrogen Peroxide
7. Arsenates, Cyanides, Cyanates, Ferri + Ferrocyanates
8. Borates, Chromates, Dichromates, Manganates, Permanganates
9. Acids (except Nitric) (Nitric Acid is isolated and stored by itself.)
10. Sulfur, Phosphorous, Arsenic, Phosphorous Pentoxide
11. Inorganic Miscellaneous

## Organic

1. Acids, EDTA-Disodium, Amino Acids, Anhydrides, Peracids
2. Alcohols, Glycols, Sugars, Amines, Amides, Imines, Imides
3. Hydrocarbons, Esters, Aldehydes, Oils
4. Ethers, Ketones, Ketenes, Halogenated Hydrocarbons, Ethylene Oxide
5. Epoxy Compounds, Isocyanates
6. Peroxides, Hydroperoxides, Azides
7. Sulfides, Polysulfides, Sulfoxides, Nitriles
8. Phenols, Cresols
9. Dyes, Stains, Indicators
10. Organic Miscellaneous

# Example: Inorganic 2 (I2)

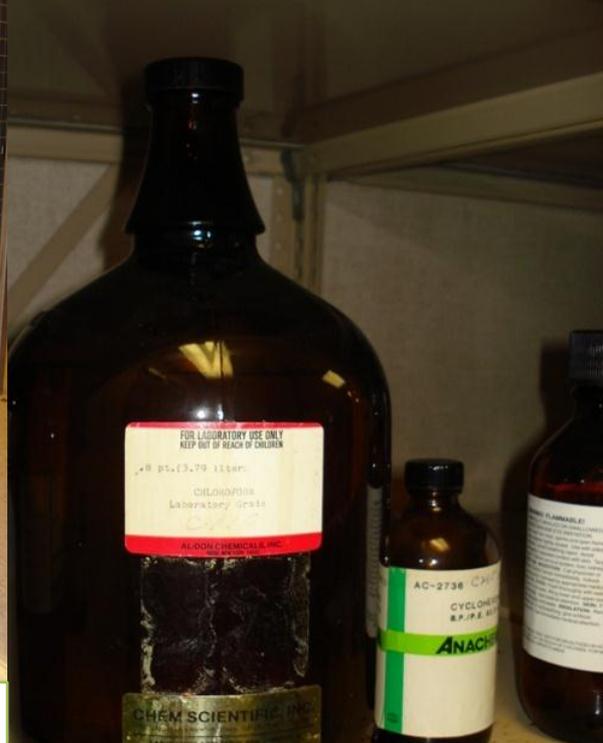
- Acetates, Citrates, Oxalates, Phthalates, Tartarates
- Bromides, Chlorides, Fluorides, Iodides, Iodine
- Phosphates
- Sulfates, Sulfites, Thiosulfates





## Over the Counter (OTC) Products





# Non-Traditional Flammables???



Before



# Acids

After

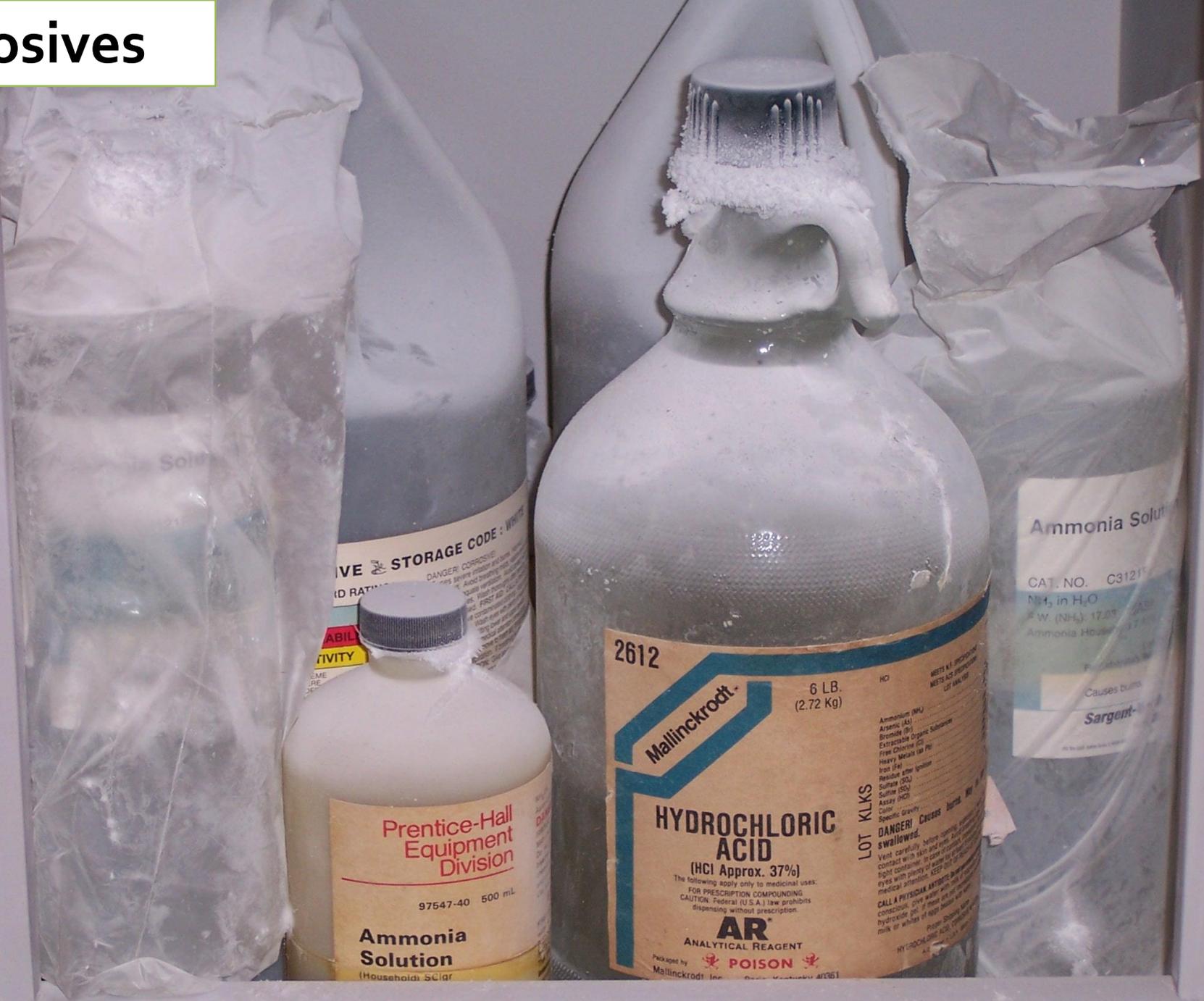




# Corrosives

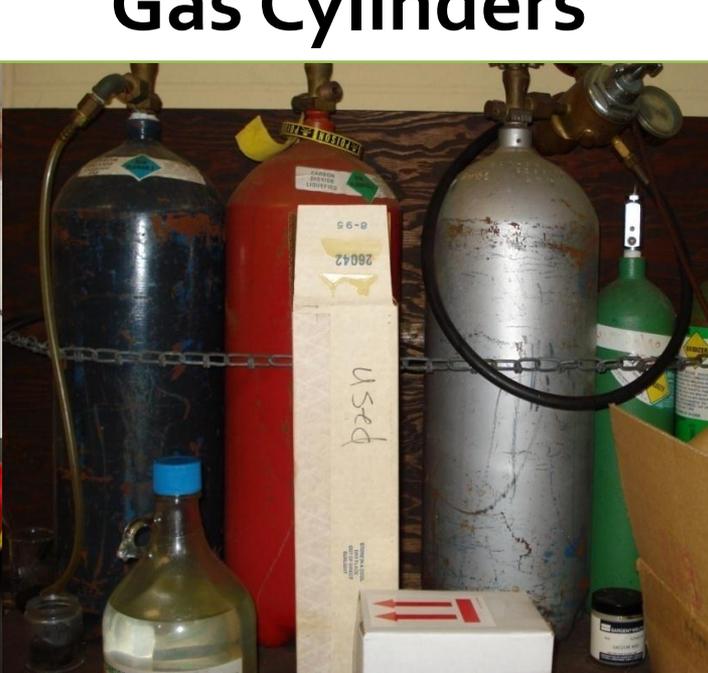


# Corrosives



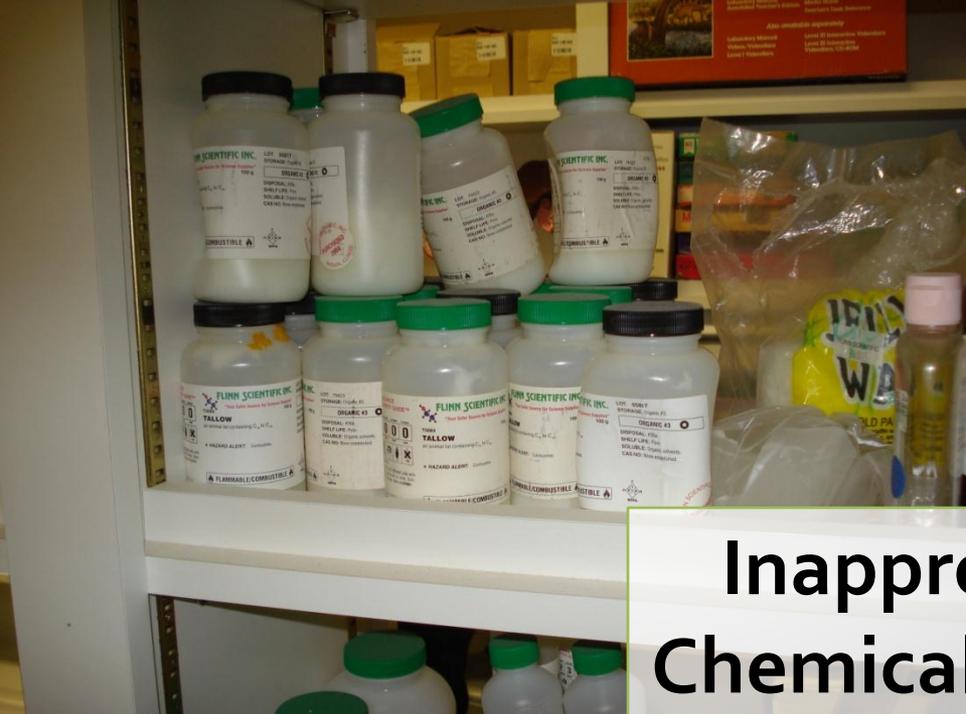


# Gas Cylinders



# Dropper Bottles





# Inappropriate Chemical Storage





FLINN SCIENTIFIC  
"Your Safer Source"  
S0213 100 g  
dri-NA<sup>®</sup>  
granular, sodium-lead alloy, 8.8% sodium  
sodium  
HAZARD ALERT: Solution is a  
strong oxidizer. It will react violently with  
dri-NA contains 8.8% sodium. Store in a  
cool, dry place.  
FLAMMABLE/COMBUSTIBLE

POLY QUINONES  
ACID TAN  
CHEMICAL COMPANY  
FOR REAGENT-TYPE  
W. W. WELCH SCIENTIFIC  
CHICAGO, ILL.  
Mallinckrodt  
ACID  
OXALIC  
TECHNICAL CRYSTALS  
 $H_2C_2O_4 \cdot 2H_2O$  P. W. 124.07  
MALLINCKRODT CHEMICAL WORKS  
LONDON & NEW YORK  
POISON

1.0M  $FeSO_4$

SODIUM SULFATE SOLUTION  
HAZARD ALERT: Although this material  
is not considered to be particularly hazardous,  
hazardous reactions may occur when  
mixtures of chemicals are always possible.  
Precautionary practices should be observed.

FOR LABORATORY USE ONLY  
KEEP OUT OF REACH OF CHILDREN  
13-1454 g) C0130-1  
Oxalic Oxide  
Lumps  
Laboratory Grade  
4.00 88-188  
MALLINCKRODT CHEMICAL WORKS

Housekeeping Issues

# Mercury, Mercury, Mercury Everywhere





**Mercury Containing Devices**



# Water Reactives

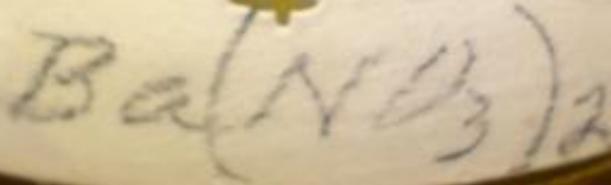
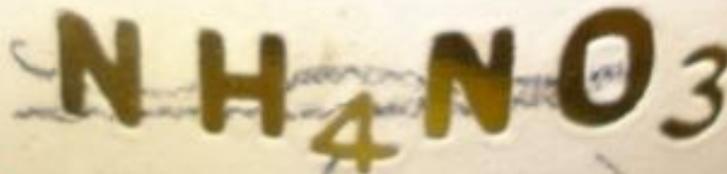


# Take Your Pick



What is it???

AMMONIUM  
NITRATE



Comp  
HCl  
1105

2m  
CUSA

Proper Labeling??????????

# Moving Toward Healthier, Safer & More Sustainable Chemicals

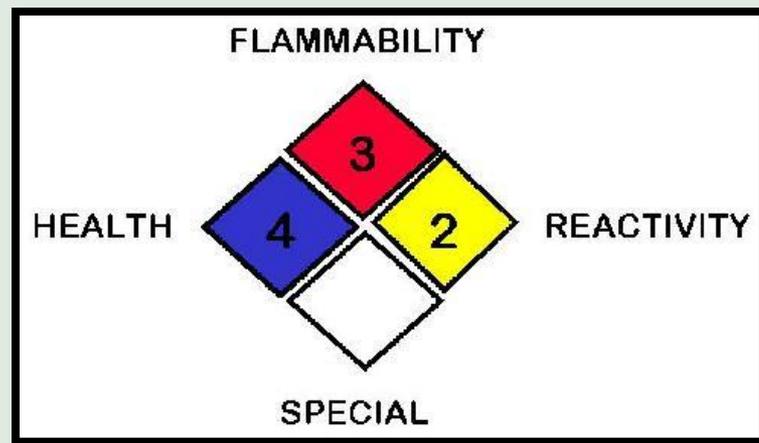
- **What** chemicals do you have?
- **Where** are these chemicals?
- **When/How** are these chemicals used?
- **Why** have *ALL these CHEMICALS?*

# What is RISK?

**RISK = Hazard X Exposure**

**Hazard =**

- **Health**
- **Flammability**
- **Corrosivity/Reactivity**



# Chemicals of Unreasonable Risk

- Metals:
  - Pb, Hg, Cd, Ba, Co
- Chromates & Cyanides
- Water reactive: Na & K
- Hydrofluoric acid
- Chromic acid
- Sulfides
- Azide
- Thermit
- Air reactive: P
- Paradichlorobenzene
- Naphthalene
- Formaldehyde
- Benzene, Phenol
- Oxidizers: 30% H<sub>2</sub>O<sub>2</sub>, Chlorates & Permanganates
- Boric acid (ECHA VHC)
- Phenolphthalein (ECHA VHC)
- Lecture Gas Cylinders

“BARRE, VT - A chemical spill forced first responders to clear out Spaulding High School Friday. Five people were taken to the hospital for treatment as a precaution”

## Chemical spill forces evacuation at Spaulding High School

 Recommend  105 people recommend this. [Sign Up](#) to see what your friends recommend.

*Posted: Aug 03, 2012 2:09 PM EDT*

*Updated: Aug 06, 2012 5:00 PM EDT*

By Anson Tebbetts - [bio](#) | [email](#)



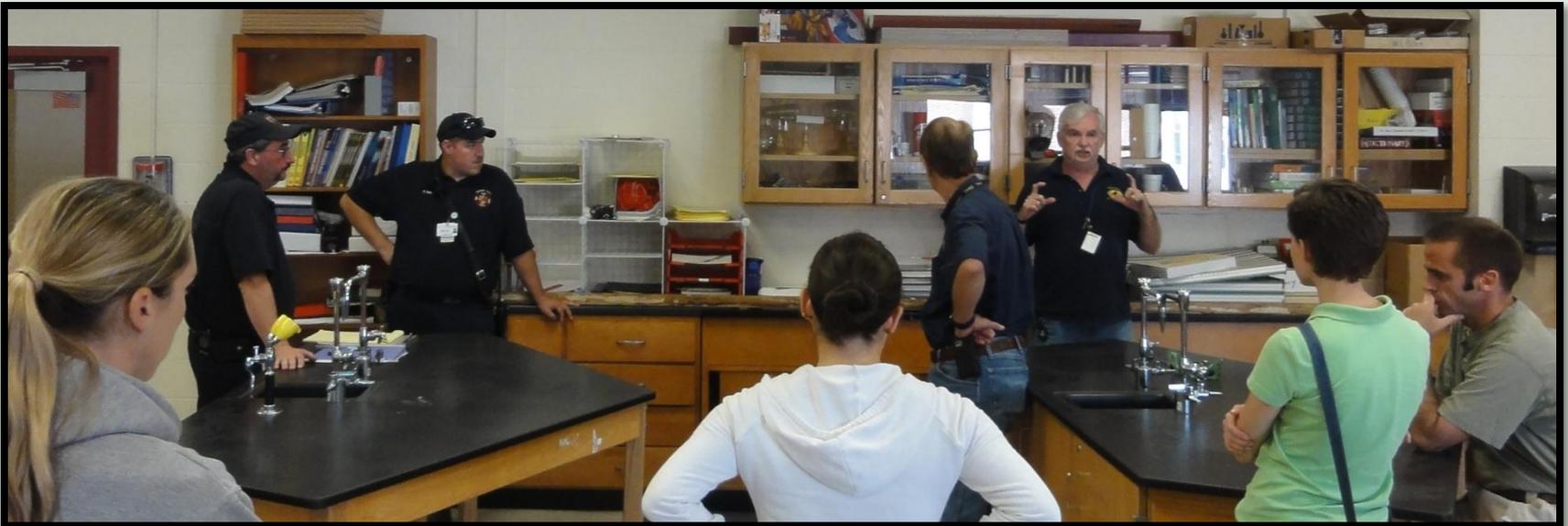
# VERMONT SERC: SPAULDING HIGH SCHOOL INTEGRATED CHEMICAL MANAGEMENT (ICM) PARTNERSHIP

AUGUST 20-22, 2012



# EPA'S ICM TEAM

- Dr. Dwight Peavey | EPA Region I Senior Scientist
- Len Wallace | EPA Region I Environmental Scientist
- Nicholas Leonardi | EPA Region I SEE
- Marina Goreau | EPA Student Intern | Brandeis University '12
- Amy Budahn | EPA Summer Student Intern | Boston University MPH Candidate
- Rachel Soule | Intern Coordinator | Brandeis





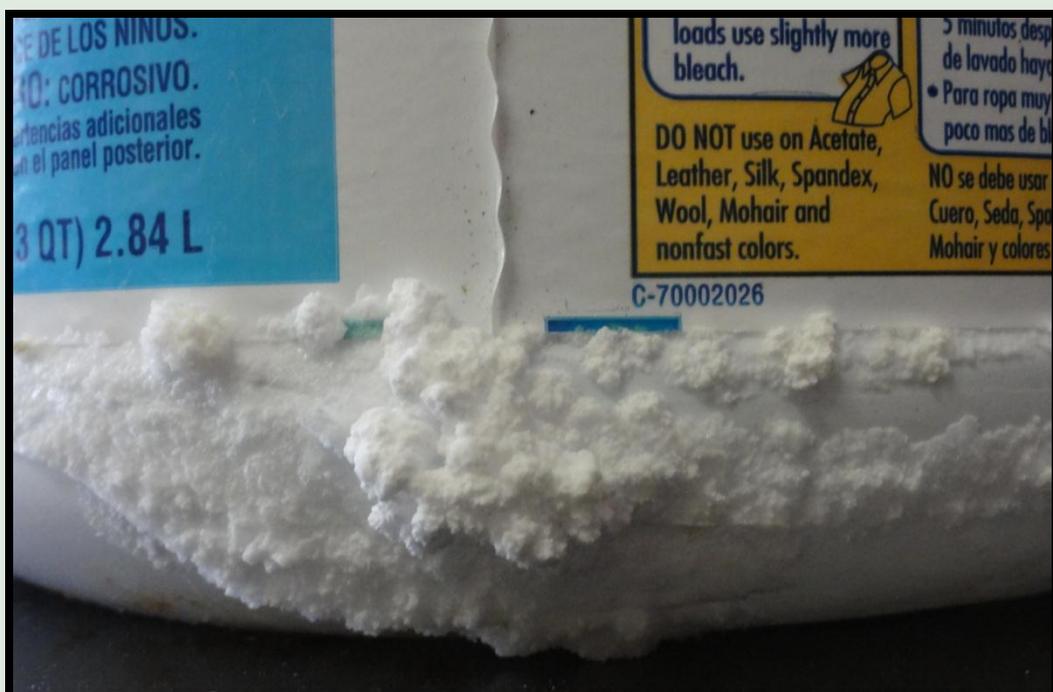


INSTALLATION INSTRUCTIONS  
INSTRUCTIONS DE MONTAGE











# WHAT IS IT?



# COLLECT, INSPECT, & SEPARATE













ONATES

SILICATES

LFIDES

CARBIDES

BROMATES

CHLORATES

IODATES

FERROCYANIDES

FERRICYANIDES

THIOCYANATES

BORA

CHROMATES

MOLYBDATES

PERMANGANATES

SULFUR

CHARCOAL

ORGANICS

ORGANIC ACIDS

ORGANIC ACIDS

SUGARS

STARCH

ORGANICS



ALWAYS CHECK IN WITH YOUR INSTRUCTOR FIRST!

WEAR PROPER PROTECTION AT ALL TIMES!

...IT COULD BE SHOCKING!

Over 100  
\$200



No Horseplay In Lab!

never wore goggles

LABORATORY

accept







# RESULTS:

## BEFORE & AFTER

### Before

- Inventories ~ 800 containers
- Over the counter items: ~300+
- Water reactive chemicals: sodium metal & potassium metal
- Thermit

### After

- ▶ **Remaining inventory NFPA:**
  - ▶ **Highest health = 3**
  - ▶ **Flammability = 3**
  - ▶ **Reactivity, = 2**
- Disposed ~ 120 containers
- Total disposed = 28,732 grams or 28.7 KG
- Solutions Disposed = 476 liters\*  
Including Neutralized acids
- ▶ **Recommended reduction: 100+ chemicals**

# ROOT CAUSE OF PROBLEM

- No laboratory chemical hygiene (OSHA) plan
  - No chemical hygiene officer
  - No real-time chemical inventory
  - No mandatory chemical safety training
- Lack of understanding of risk
  - No toxicology training
- No formal hazardous waste training
- Failure to evaluate chemicals by hazard
- Lack of oversight & accountability

# Recent School ICM Success

## Stories

- Medford High School, Medford MA
  - Original inventory: 1,457 chemicals
  - Current inventory: <300 chemicals
- “Old” Everett High School, Everett MA
  - Building transferred to city
  - Chemicals removed: >1,200 chemicals & photography
- Revere High School, Revere MA
  - Original inventory: 1,200 + chemicals
  - Chemicals removed: >900 chemicals
- Saugus High School, Saugus MA
  - Original inventory: 700+ chemicals
  - Current inventory: <250 chemicals

# Benefits of Integrated Chemical Management:

- Reduce risk of accidents
- Decrease chemical exposure
- Ensure chemical security
- Provide accurate inventory
- Proper solid & hazardous waste disposal
- Control chemical purchasing
- Minimize liability
- Save money & prevent pollution
- **Promote safer, healthier & more sustainable science**

# WHY WE ARE HERE!



**Do no harm to our children!**

# Questions???

