



# ***GreenScreen for Safer Chemicals: Applications and New Developments***

**ANSI MONTHLY CHEMICALS ONLINE MEETING**

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Our mission is to design and deliver strategic solutions for green chemicals, sustainable materials and environmentally preferable products.





# What is the GreenScreen™?

- A method for comparative Chemical Hazard Assessment (CHA) developed by CPA
- Builds on the USEPA DfE approach and other national and international precedents (OECD, GHS)
- Freely and publicly accessible, transparent and peer reviewed

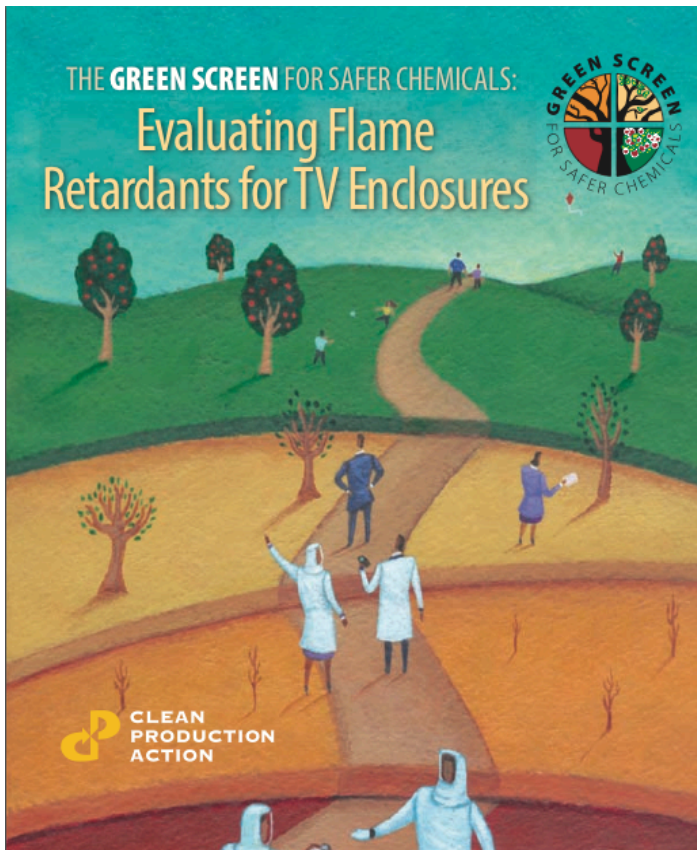


All supporting resources at: <http://www.cleanproduction.org/Greenscreen.v1-2.php>

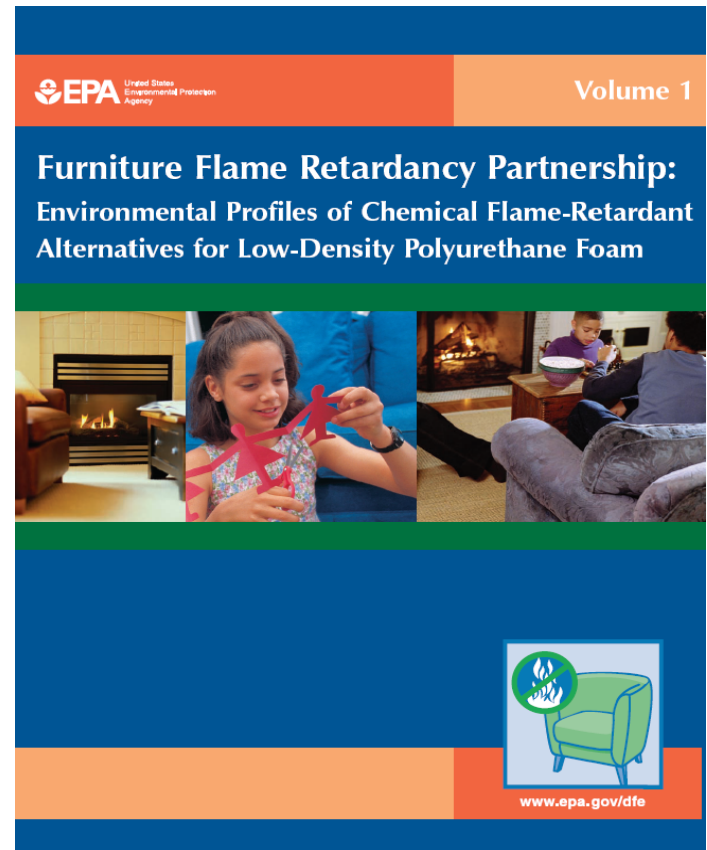


# Origins of the GreenScreen™

State governments seek to identify safer, functional alternatives



USEPA DFE chemical alternatives assessment partnerships





# Builds on the USEPA Design for the Environment Approach: Hallmark of CHA

## But how do I know which one is better?

*USEPA DfE cannot judge or recommend chemicals - GreenScreen provides decision logic*



Table 4-1 Screening Level Toxicology and Exposure Summary

L = Low hazard concern      N = No  
 M<sup>1</sup> = Moderate hazard concern      Y = Yes  
 H = High hazard concern      P = Yes for pure chemical  
 L, M<sup>1</sup>, or H = Endpoint assigned using estimated values and professional judgment (Structure Activity Relationships)

\*Ongoing studies may result in a change in this endpoint  
 ^Persistent degradation products expected<sup>2</sup>

Company	Chemical <sup>1</sup>	% in Formulation <sup>3</sup>	Human Health Effects							Ecotoxicity		Environmental		Potential Routes of Exposure										
			Cancer Hazard	Skin Sensitizer	Reproductive	Developmental	Neurological	Systemic	Genotoxicity	Acute	Chronic	Persistence	Bioaccumulation	Worker			General Population			Aquatic				
														Inhalation	Dermal	Ingestion	Inhalation	Dermal	Ingestion					
Albemarle	ANTIPLAZE 180 and ANTIPLAZE 195																							
Albemarle	Tris(1,3-dichloro-2-propyl)Phosphate CAS # 13674-87-8	95%	M	L	M	M	L	M	M	M	M	M	L	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Albemarle	ANTIPLAZE 182 and ANTIPLAZE 205																							
Albemarle	Proprietary A Chloroalkyl phosphate (1)		M	L	M	M	L	M	M	M	M	M	L	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
	Proprietary B Aryl phosphate		L	L	M*	M*	M	M*	L	H	H	L	M	N	Y	Y	N	Y	N	N	N	N	N	N
	Triphenyl Phosphate CAS # 115-86-6		L	L	L	L	L	M	L	H	H	L	L	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Albemarle	ANTIPLAZE V500																							
Albemarle	Proprietary C Chloroalkyl phosphate (2)		M	M	M*	M*	L	M	L	M	M	M	L	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
	Proprietary B Aryl phosphate		L	L	M*	M*	M	M*	L	H	H	L	M	N	Y	Y	N	Y	N	N	N	N	N	N
	Triphenyl Phosphate CAS # 115-86-6		L	L	L	L	L	M	L	H	H	L	L	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Albemarle	SAYTEX RX-9500																							
Albemarle	Proprietary D Reactive brominated flame retardant		L	M	L	L	M	M	L	M	M	L <sup>^</sup>	L	N	Y	Y	N	N	Y	Y	Y	Y	Y	Y
	Proprietary B Aryl phosphate		L	L	M*	M*	M	M*	L	H	H	L	M	N	Y	Y	N	Y	N	N	N	N	N	N
	Triphenyl Phosphate CAS # 115-86-6		L	L	L	L	L	M	L	H	H	L	L	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y





# How to do a GreenScreen™ Assessment

- 1. Assess and classify hazards**
2. Apply the Benchmarks
3. Make informed decisions





# 18 Hazard Endpoints

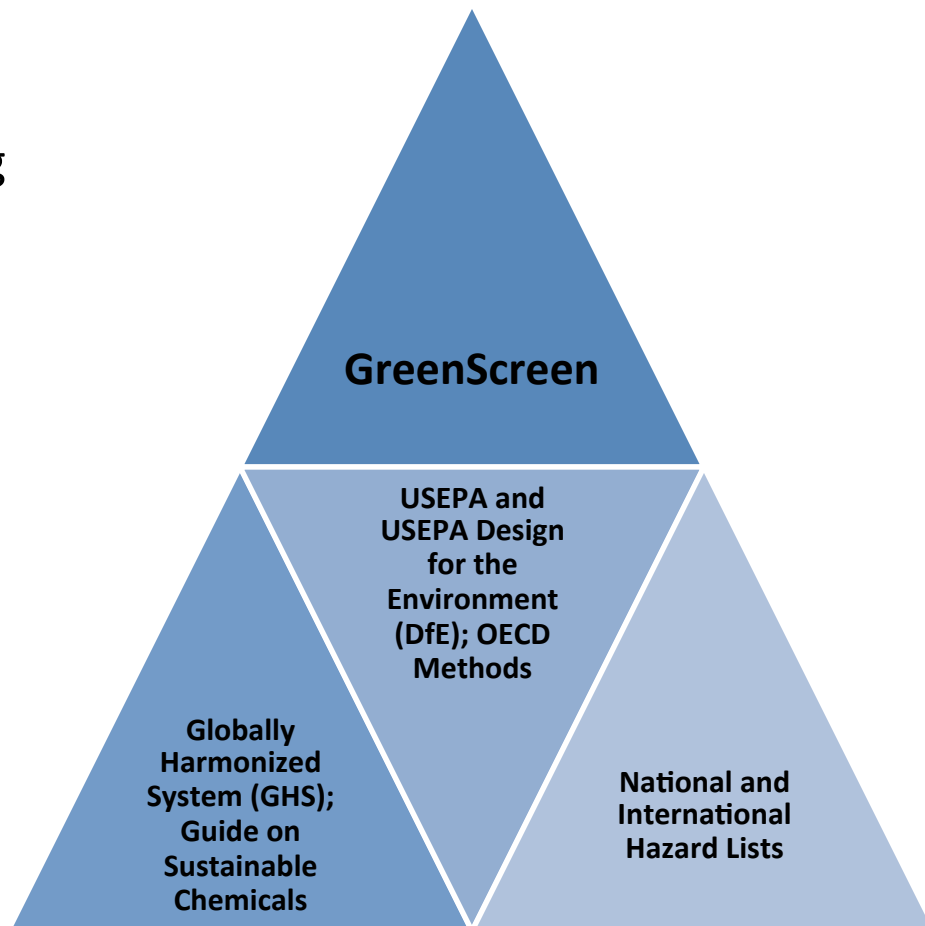
Human Health Group I	Human Health Group II and II*	Environmental Toxicity & Fate	Physical Hazards
Carcinogenicity	Acute Toxicity	Acute Aquatic Toxicity	Reactivity
Mutagenicity & Genotoxicity	Systemic Toxicity & Organ Effects	Chronic Aquatic Toxicity	Flammability
Reproductive Toxicity	Neurotoxicity	Other Ecotoxicity studies when available	
Developmental Toxicity	Skin Sensitization	Persistence	
	Respiratory Sensitization		
Endocrine Activity	Skin Irritation	Bioaccumulation	
	Eye Irritation		



# Where Do the Hazard Endpoints and Criteria Come From?

## Source of GreenScreen Hazard Endpoints:

- GHS/CLP – Globally Harmonized System of Classification and Labeling of Chemicals (United Nations)
- OECD Screening Information Data Sets (SIDS) and test methods
- USEPA Design for the Environment Program Alternatives Assessment Criteria for Hazard Evaluation
- USEPA New Chemicals Program and test methods
- Guide on Sustainable Chemicals (Federal Environment Agency)







# Summarize Hazard Classifications in a Comparative Table

Chemical Name	Group I Human					Group II Human							Ecotox		Fate		Physical	
	C	M	R	D	E	AT	ST	N	SnS	SnR	IrS	IrE	AA	CA	P	B	Rx	F
Chemical 1	<b>M</b>	<i>L</i>	<b>L</b>	<b>M</b>	<i>M</i>	<b>L</b>	<b>L</b>	<i>M</i>	<b>L</b>	<b>DG</b>	<b>L</b>	<b>H</b>	<b>L</b>	<b>L</b>	<b>vH</b>	<b>M</b>	<b>L</b>	<b>L</b>
Chemical 2	<i>L</i>	<b>L</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>L</b>	<b>H</b>	<b>M</b>	<b>L</b>	<b>L</b>	<b>M</b>	<i>M</i>	<b>H</b>	<b>H</b>	<b>vH</b>	<b>vH</b>	<b>L</b>	<b>L</b>
Chemical 3	<b>L</b>	<b>L</b>	<b>M</b>	<i>H</i>	<b>DG</b>	<b>L</b>	<b>H</b>	<b>DG</b>	<b>L</b>	<b>DG</b>	<b>L</b>	<b>L</b>	<b>L</b>	<b>DG</b>	<i>M</i>	<i>M</i>	<b>L</b>	<b>M</b>

**Bold H, M, or L = measured data**

*Italic H, M, or L = estimated data (analog or model)*

**DG= data gap**



# How to do a GreenScreen™ Assessment

1. Assess and classify hazards

**2. Apply the Benchmarks**

3. Make informed decisions





# Step 2: Apply the Benchmarks to the Hazard Classifications

**ABBREVIATIONS**

**P** Persistence  
**B** Bioaccumulation  
**T** Human Toxicity and Ecotoxicity

This chemical passes all of the criteria.

**BENCHMARK 4**

Low P\* + Low B + Low T (Ecotoxicity, Group I, II and II\* Human) + Low Physical Hazards (Flammability and Reactivity) + Low (additional ecotoxicity endpoints when available)

**Prefer—Safer Chemical**

**BENCHMARK 3**

- Moderate P or Moderate B
- Moderate Ecotoxicity
- Moderate T (Group II or II\* Human)
- Moderate Flammability or Moderate Reactivity

**Use but Still Opportunity for Improvement**

If this chemical and its breakdown products pass all of these criteria, then move on to Benchmark 4.

**BENCHMARK 2**

- Moderate P + Moderate B + Moderate T (Ecotoxicity or Group I, II, or II\* Human)
- High P + High B
- High P + Moderate T (Ecotoxicity or Group I, II, or II\* Human)
- High B + Moderate T (Ecotoxicity or Group I, II, or II\* Human)
- Moderate T (Group I Human)
- Very High T (Ecotoxicity or Group II Human) or High T (Group II\* Human)
- High Flammability or High Reactivity

**Use but Search for Safer Substitutes**

If this chemical and its breakdown products pass all of these criteria, then move on to Benchmark 3.

**BENCHMARK 1**

- PBT = High P + High B + [very High T (Ecotoxicity or Group II Human) or High T (Group I or II\* Human)]
- vPvB = very High P + very High B
- vPT = very High P + [very High T (Ecotoxicity or Group II Human) or High T (Group I or II\* Human)]
- vBT = very High B + [very High T (Ecotoxicity or Group II Human) or High T (Group I or II\* Human)]
- High T (Group I Human)

**Avoid—Chemical of High Concern**

If this chemical and its breakdown products pass all of these criteria, then move on to Benchmark 2.

**Benchmark U =**  
 Undetermined due to insufficient data

← **Aligned with Regulatory Drivers**



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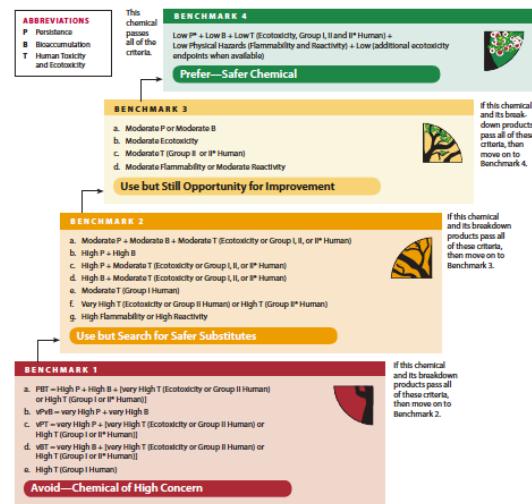




# Value of Benchmark Score

Results can be presented as a simple 1-4 score that supports taking action:

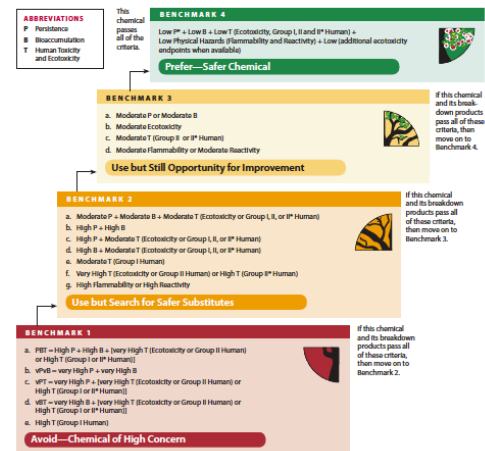
- BM1 – avoid/phase out
- BM2 – manage to use safely
- BM3 – getting there
- BM4 – inherently low hazard





# Value of Benchmark Score

- Scores can be used without toxicology training
- Drives wider adoption of preferred materials
  - Preferred materials/positive list
  - Guide new product development
  - Drives innovation of new materials





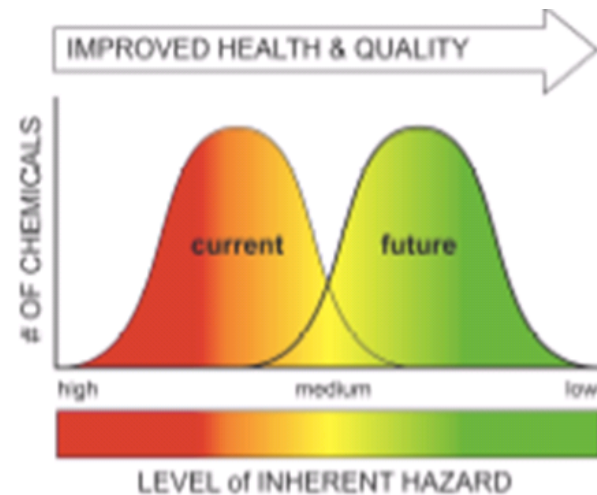
# Applications for GreenScreen/CHA

## 1. Support State Alternatives Assessment Regulations

- Interstate Chemicals Clearinghouse
  - AA guidance
  - Website
- ME Safer Chemicals in Children's products
- WA, CA DTSC....

## 2. Materials Procurement - Identify chemicals of concern and safer alternatives

- E.g. Hewlett Packard approved materials list; mandatory for HP suppliers providing potential replacements





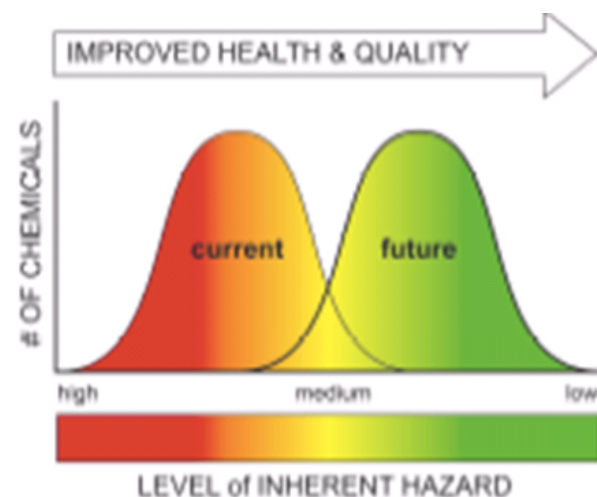
# Applications for GreenScreen/CHA

## 3. Product Development

- New formulations
- New chemicals

## 4. Corporate Policies

- Manage chemical inventories



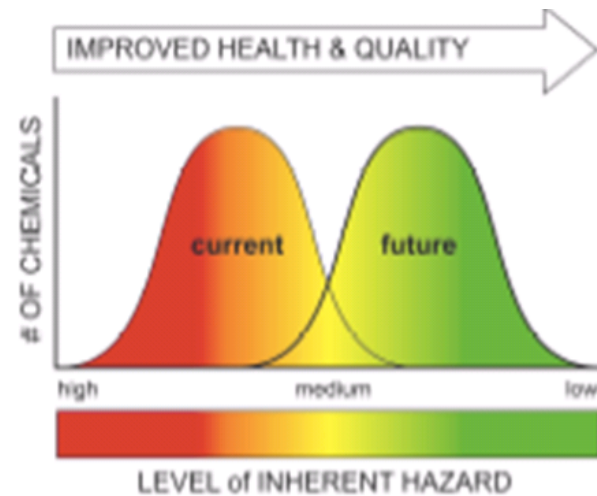




# Applications for GreenScreen/CHA

## 5. Standards, Scorecards and Ecolabels

- USGBC LEED v4 (proposed)
  - Alignment with Cradle to Cradle Certification (proposed)
  - Alignment with the Health Product Declaration
- BizNGO Guide to Safer Chemicals





# New Program Developments

1. GS v1.2 FINAL Guidance – May 2013; clarification:
  1. Inorganics
  2. Mixtures
  3. Polymers
2. Growing number of GS Licensed Profilers
3. GS Verification Program
4. GS Certified Practitioner Program
5. Automation of GS List Translator



# Licensed GreenScreen Profilers Perform GS Assessments as a Service to Clients

Demonstrate expertise, knowledge, competency and capacity

**Margaret H. Whittaker**, Ph.D., M.P.H., E.R.T., D.A.B.T., UK/EU

ToxServices LLC

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**Patricia Beattie**, PhD, DABT

SciVera LLC

[www.scivera.com/services.php](http://www.scivera.com/services.php)





# Verification Program

## Verification:

- Provides additional level of quality control
- Can be applied to fully transparent DRAFT GS assessments performed by Licensed GS Profilers
- Allows for publication of results and use of GS trademark under license agreement
  - Is good for 3 years



# Draft vs. Verified Assessments

CHEMICAL PROFILE

Self assess chemicals using the GS

- OR -

Engage licensed GS Profiler to assess chemicals using the GS

VERIFICATION

Verify DRAFT GS Assessment via GS Verification Program

COMMUNICATION

Generate DRAFT GS assessment; May NOT use GS trademarks for public product claims

May use GS trademarks to claim verified product scores via license agreement

Generate DRAFT GS assessment; May NOT use GS trademarks for public product claims



# Certified Practitioner (CP) Program

- Individuals in organizations may become certified to perform GS assessments for their organization
  - Eligible to submit GS assessments for verification
- Requirements include:
  - One day workshop (i.e. MN Training on Jan 24)
  - Advanced GS Topics (available via webinars)
  - Practicum: perform 2 GS assessments with coaching by a GS Trainer

# GreenScreen is Open and Transparent

AND Only Verified Assessments May Support Product Claims



**NEW**

**CHEMICAL PROFILE**

Self assess chemicals for your organization using the GS as a Certified Practitioner (CP)

- OR -

Engage licensed GS Profiler to assess chemicals using the GS

**VERIFICATION**

**NEW**

Verify DRAFT GS Assessment via GS Verification Program

**COMMUNICATION**

Generate DRAFT GS assessment; May NOT use GS trademarks to make public product claims

**NEW**

May use GS trademarks to claim verified product scores via license agreement

Generate DRAFT GS assessment; May NOT use GS trademarks to make public product claims



# Automation of the GS List Translator

- The GS List Translator is that portion of the GS method based only on hazard classification lists
- Lists are easily automated
- Use of the GS List Translator is a good first step but does NOT give the full picture
  - Full GS assessments trump GS List Translator assessments





# Automation of the GS List Translator

Software partners include:

- Healthy Building Network via Pharos (NGO)
- The Wercs via GreenWERCS (for profit business)



***“The more you know about what you are putting into your products, the more likely you are to make better choices in product development”***

*Jonathan Plisco, PolyOne*



# Contact Info

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