DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Safer Consumer Products Program at Age 10:

A Decade of Progress

SAFER CONSUMER PRODUCTS

DTSC Department of Toxic Substances Control

CalEPA California Environmental Protection Agency

DIRECTOR'S MESSAGE

As the Safer Consumer Products (SCP) Program enters its second decade, I'm proud of what this small, passionate team has managed to accomplish to date. Since DTSC adopted the SCP Regulations[1] on October 1, 2013, the SCP Program has helped advance green chemistry and prevent hundreds of tons of hazardous chemicals from reaching California's homes, workplaces, and environment each year. It is one of the few state-level regulatory programs in the nation based on a precautionary approach to chemicals management.

It all started with a vision, back in the early 2000's, that California could "adopt a chemicals policy that greatly improves chemical information, regulatory oversight, and support for green chemistry research, development, technical assistance, and education."[2] This vision led to the California Green Chemistry Law,[3] signed by Gov. Schwarzenegger in 2008. The Green Chemistry Law directed the Office of Environmental Health Hazard Assessment (OEHHA) to assemble a list of green chemistry hazard traits and toxicological endpoints, which OEHHA adopted into regulation in 2012.[4] The Law also directed the Department of Toxic Substances Control (DTSC) to develop in regulation a process for prioritizing product-chemical combinations of concern to human health or the environment and for identifying safer, green chemistry alternatives.

Reliable information, rigorous research, and robust dialogue form the cornerstones of the SCP Program's mission: to advance the design, development, and use of products that are chemically safer for people and the environment. By considering the wide breadth of the green chemistry hazard traits the program can address, SCP's unique authority allows it to consider chemical hazards beyond toxicity, such as environmental persistence, bioaccumulation, and lactational and transplacental transfer. This enables SCP staff to take a holistic look at the properties of a chemical that may lead to significant or widespread adverse impacts and then take action to prevent harm to people and our environment. The SCP framework is also specifically designed to help avoid

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[1] *California Code of Regulations, Title 22, Division 4.5, Chapter 55*
[2] *Wilson et al. 2006*
[3] *California Health and Safety Code, Division 20, Chapter 6.5, Article 14*
[4] *California Code of Regulations, Title 22, Division 4.5, Chapter 54*

regrettable substitutes, where one harmful chemical is replaced with another that is just as harmful or worse. By incentivizing innovation and placing the responsibility on manufacturers to thoroughly analyze the tradeoffs of available alternatives, the SCP Program has already started moving the consumer products market toward safer chemistries.

The first decade of the SCP Program stands testament to the power of a transparent, science-based, precautionary approach to regulating chemicals of concern in consumer products to protect California's people and environment. There is much to celebrate after SCP's first decade. The SCP Program has helped improve the availability of chemical information by leveraging its authority to request data from manufacturers and by developing its information management system, CalSAFER. SCP has also taken advantage of the explosion of data science tools by partnering with data-based organizations such as Clearya. It has enhanced regulatory oversight for chemicals of concern in consumer products in California and helped prevent hundreds of tons of hazardous chemicals from reaching the state's homes, workplaces, and environment. And by signaling to the marketplace and fostering collaborations, SCP has helped advance the green chemistry field.

The massive scale of the problem associated with hazardous chemical exposures requires that we continue to seek innovative ways to address these issues. The SCP Program has demonstrated it is able to achieve what most other regulatory programs cannot: reduce hazardous chemicals at the source and promote a transition to safer alternatives. Given the need for stronger chemicals management, I look forward to seeing the SCP Program continue to expand its impact in its second decade and beyond.

Sincerely,

Meredith Williams, Ph.D.

Director

Department of Toxic Substances Control

In the decade since the landmark Safer Consumer Products (SCP) Regulations went into effect in October 2013, the Department of Toxic Substances Control's (DTSC's) SCP Program has become internationally recognized for its pioneering efforts to reduce the use of hazardous chemicals in consumer products. Our work has served to change the paradigm for addressing hazardous chemicals by focusing on prevention in addition to cleanup and responsible management of hazardous waste. We take a precautionary approach to protecting California's environment and people – including our most vulnerable and historically marginalized populations. We continue to innovate and lead the way toward advancing safer products and chemistries to lay the groundwork for a circular economy. Our small but mighty team works to change the world so consumer products are chemically safer for people and the planet.

As we complete our first decade, this report summarizes our key accomplishments to date. We discuss these accomplishments in four categories:

- **Implementing the SCP Regulations and our legislative mandates.** This section summarizes the work we have done specifically to implement the SCP Regulations and our other legislative mandates, such as the California Brake Pads Law.
- **Going above and beyond.** This section highlights the ways in which we have informed the dialogue on safer products and chemistries at the national and international level, beyond the day-to-day implementation of the SCP Regulations.
- **Building capacity for the future.** This section showcases our efforts to develop a strong regulatory program that is well-resourced, agile, and able to meet the challenges ahead.
- **Looking ahead.** This section provides an overview of our ongoing activities and expected contributions over the next few years.

1. IMPLEMENTING THE SCP REGULATIONS AND OUR LEGISLATIVE MANDATES

1.1. We have developed a thriving regulatory program from scratch

A law or regulation is only as effective as its implementation. We have developed deliberative, transparent, science-based processes to implement the SCP Regulations.

We compiled a list of more than 3,000 Candidate Chemicals – essentially the menu of chemicals SCP can potentially regulate – as an online database that is easily searchable by chemical name or Chemical Abstract Services (CAS) number. We maintain and update this database quarterly.

Underscoring our commitment to transparency, this database of Candidate Chemicals is publicly available in our information management system CalSAFER, developed in partnership with DTSC's Office of Environmental Information Management. CalSAFER also allows stakeholders to submit public comments and responsible entities to submit the documentation required to comply with Priority Product regulations. This portal is designed to securely accept confidential business information. We have created a series of training videos that explain how to use the platform. We continue to maintain and enhance CalSAFER's capabilities to better serve our regulated communities.

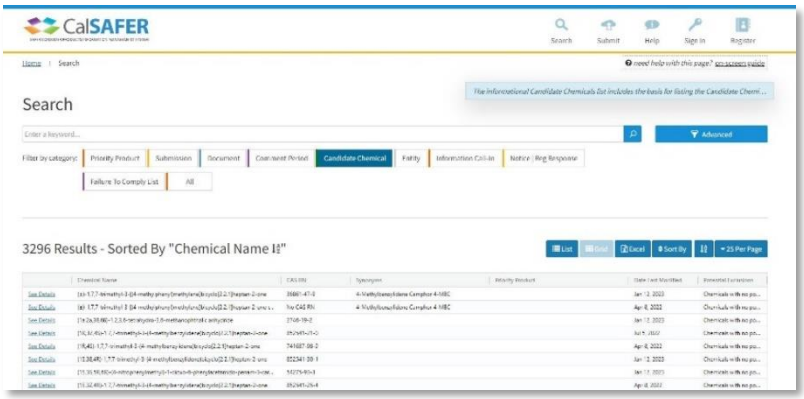


Figure 1: CalSAFER website home page

We have prepared three Priority Product Work Plans (PPWPs), which outline the menu of products we may research during each three-year period, and have researched more than 80 chemicals and chemical classes in 10 large product categories. Informed by our research, we have adopted seven Priority Product regulations to date, with four more in process.

Nail products containing toluene was our first Priority Product to include an Alternatives Analysis Threshold (AAT),[5] allowing us to focus on nail products that contain intentionally added toluene at

[5] *DTSC may set an AAT when a Chemical of Concern is present in a Priority Product solely as a contaminant or if DTSC determines an AAT is appropriate for a Chemical of Concern that is an intentionally added ingredient. If the concentration of a Chemical of Concern in a Priority Product does not exceed the AAT, a manufacturer may submit an AAT Notification in lieu of an Alternatives Analysis, in accordance with section 69505.3 of the SCP Regulations.*

concentrations that may be harmful to nail salon workers and their customers. We drafted method performance criteria to ensure manufacturers can demonstrate whether the concentration of the chemical in their products is at or below this threshold.

We have developed a robust and rigorous Alternatives Analysis review process that aligns with regulatory requirements and provides accountability and transparency. We have diligently reviewed in a timely manner all Alternatives Analysis Reports submitted by our regulated entities, while maintaining scientific rigor and legal defensibility.

We have prepared an extensive Alternatives Analysis Guide that serves as a comprehensive resource for practitioners and stakeholders. Our Guide has played a pivotal role in shaping best practices within the alternatives assessment community and industry. We have also assembled various other resources to help manufacturers select safer alternatives to chemicals of concern, including case study evaluations, practical examples, best practices, and lessons learned. Our efforts have contributed to establishing a robust resource repository, which has become an asset for practitioners in the field of alternatives assessment.

We have provided technical support and guidance to 75 stakeholders (including individual companies, consortiums, and consulting technicians), helping them achieve successful compliance with the SCP Regulations. Our training sessions have equipped stakeholders with the necessary skills and knowledge to conduct Alternatives Analyses effectively. We have also produced training materials to clarify who needs to comply with our regulations and how.

We have worked with DTSC's Environmental Chemistry Laboratory (ECL) to develop analytical approaches in order to test consumer products for compliance with the SCP Regulations. The results of these tests inform our compliance and enforcement efforts.

We are developing our first regulatory response proposal for the manufacturers of spray polyurethane foam systems, who have determined that there are currently no safer alternatives to methylene diphenyl diisocyanates. (Access their Alternatives Analysis reports on our CalSAFER system.)

We have developed a process for receiving public petitions and have granted a petition to adopt motor vehicle tires containing zinc as a Priority Product.

We have convened and worked with the Green Ribbon Science Panel (GRSP) to receive input on the program's implementation. The GRSP consists of experts with a broad array of expertise and diverse perspectives on the use and evaluation of chemicals in consumer products. We have synthesized issues for GRSP members to consider, developed charge questions for their input, and leveraged their expertise to inform our work. For example, we followed GRSP's recommendations to publish more peer-reviewed papers that showcase our staff's expertise. Additionally, the GRSP

supported adding microplastics to our Candidate Chemicals List to give us the ability to regulate consumer products containing microplastics in the future.

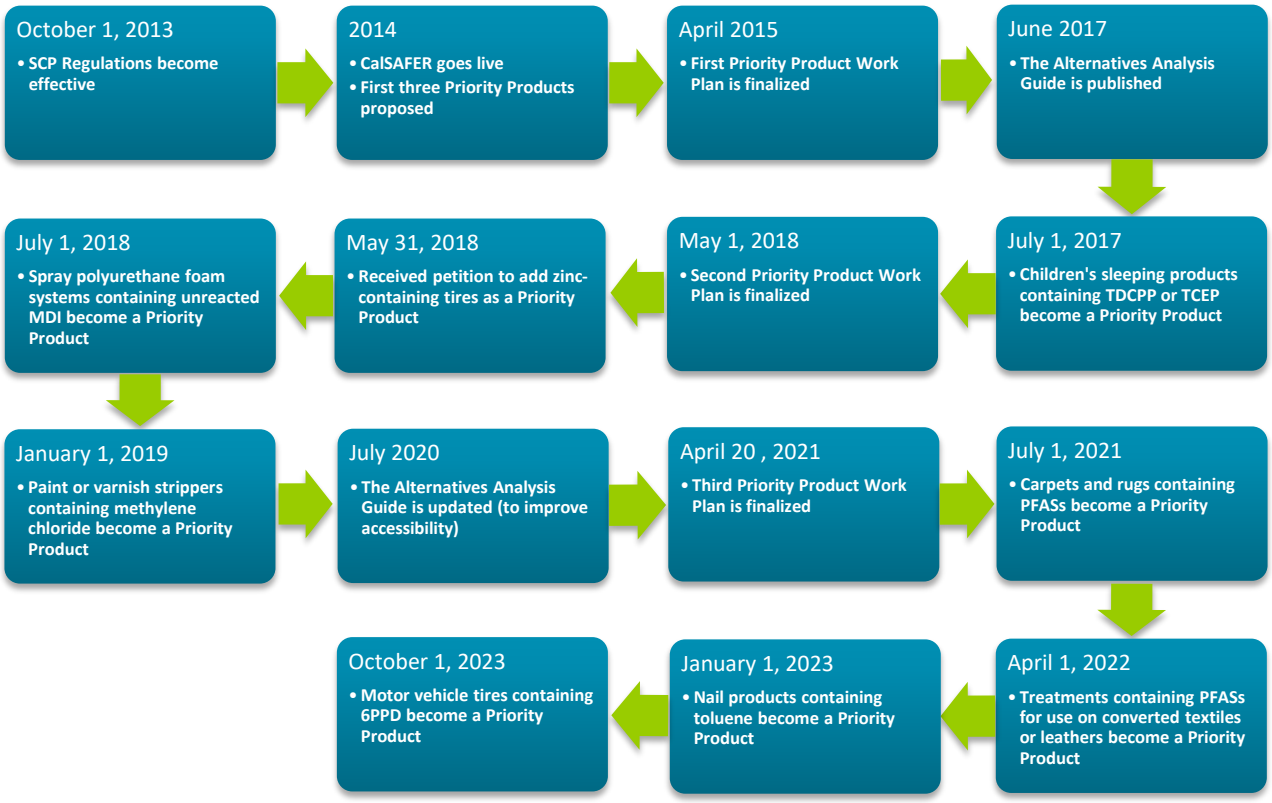


Figure 2: Timeline of key SCP accomplishments

1.2. We have taken bold action to protect California's people and environment

In contrast to most other chemical regulatory frameworks, such as the federal Toxic Substances Control Act, which require a complex risk assessment prior to restricting chemicals of concern, the SCP Regulations take a precautionary approach, requiring only that we find potential for exposure and harm in order to take action on a product-chemical combination. This allows us to be innovative and forward thinking.

For example, we regulate classes of chemicals rather than individual chemicals whenever possible. We were the first government entity in the world to regulate the entire class of per- and polyfluoroalkyl substances (PFASs) in consumer products based solely on their high environmental persistence as a hazard trait shared among all class members. This approach allows us to meet an important goal of the California Green Chemistry Law by avoiding chemical whack-a-mole, i.e., the replacement of one chemical of concern with another.

We were also the first to regulate motor vehicle tires containing N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine (6PPD), an environmental contaminant linked to the deaths of endangered coho salmon. Our regulation, effective October 1, 2023, compels tire manufacturers to seek safer alternatives to 6PPD. The SCP Program has thus become a global leader in the quest to phase out 6PPD in favor of safer antidegradants.

A major focus of our regulatory action and research is protecting children's health. For example, our work on regulating carpets and rugs containing PFASs as well as our research into hair straightening products and artificial turf were featured in the Children's Environmental Health Center's 2023 Report to the California Legislature and Governor.

1.3. Our adopted Priority Products are preventing the use of tons of hazardous chemicals each year

Our listing of paint or varnish strippers containing methylene chloride as a Priority Product has helped prevent the use of an estimated 400 to 600 metric tons of toxic methylene chloride in California each year. Methylene chloride was responsible for multiple deaths among construction workers and DIYers and has also been associated with adverse health effects such as cancer of the brain, liver, and biliary tract.

Our listing of carpets and rugs with PFASs as a Priority Product has contributed to all U.S. carpet manufacturers switching to safer, PFAS-free alternatives. Additionally, as a result of our listing of PFAS-containing aftermarket treatments for textiles and leathers as a Priority Product, all 28 manufacturers of these products stopped selling PFAS-containing treatments in California. Eight of these manufacturers (29%) reformulated their products with safer chemistries, thus extending these benefits beyond California. Taken together, our two PFAS-related regulations have helped prevent up to 100 metric tons of PFASs from reaching California homes and workplaces each year. PFASs are a class of thousands of chemicals containing carbon-fluorine bonds. Certain PFASs take so long to degrade in the environment that scientists have nicknamed them "forever chemicals." Exposure to the most thoroughly studied PFASs has been linked to several adverse impacts, including increased incidence of thyroid disease, immunotoxicity (e.g., reduced response to routine vaccination), carcinogenicity (kidney and testicular), elevated cholesterol, and reproductive and developmental toxicity.

1.4. We have innovated ways to collect information and use data science for decision-making

SCP's first information call-in aimed at nail product manufacturers produced valuable data that will help our ongoing efforts to make these products safer for salon workers and their customers. We presented our results in 2023 at a public webinar and in a report. We learned that 97 (11%) of the chemical ingredients reported by the 31 manufacturers that responded to our call-in are on our

Candidate Chemicals List and include carcinogens, neurotoxicants, reproductive toxicants, developmental toxicants, endocrine toxicants, respiratory toxicants, and dermatotoxicants.

Additionally, we partnered with ECL to determine the presence and concentration of Candidate Chemicals in nail products and have published our results in a technical report. This study, combined with the information call-in, revealed the presence of Candidate Chemicals in nail products not only as intentionally added ingredients but also as contaminants or residuals. These insights led to our proposed Alternatives Analysis Thresholds for nail products containing toluene or methyl methacrylate, allowing us to focus on promoting safer alternatives for products containing these chemicals at levels of concern.

Also in partnership with ECL, we measured the concentration of 1,4-dioxane, a chemical recognized as a carcinogen by most authoritative bodies, in more than 150 frequently used personal care and cleaning products. In addition, we facilitated a community science project with high school students from a vulnerable community in Los Angeles to further our understanding of 1,4-dioxane concentrations in consumer products targeted to different cultures within the state.

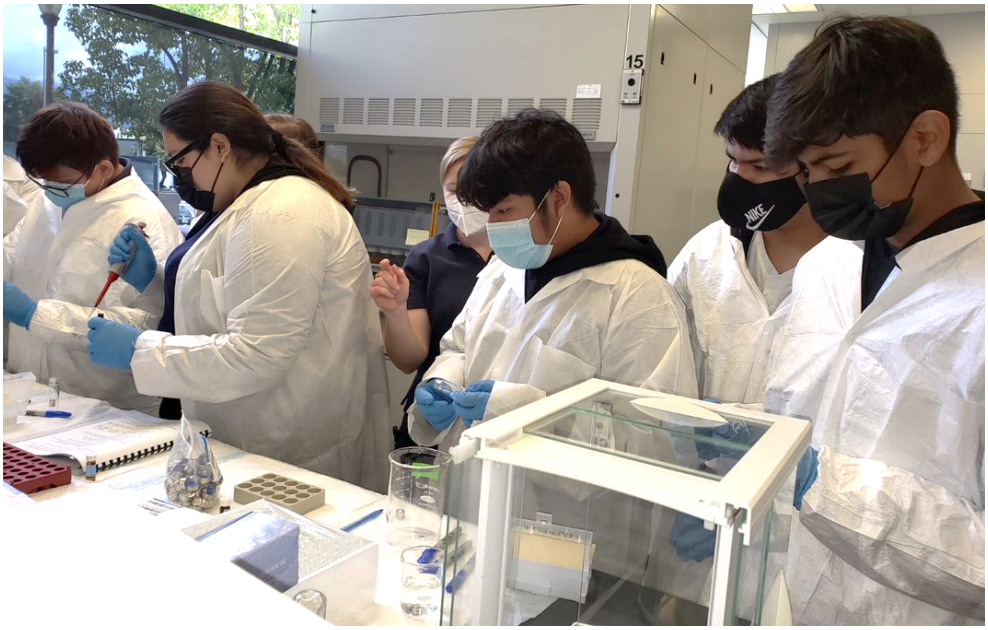


Figure 3: A few of the 23 students from Huntington Park Institute of Applied Medicine who learned about testing for 1,4-dioxane at the Department's Environmental Chemistry Laboratory in Pasadena.

Following the addition of the entire class of quaternary ammonium compounds (QACs) to our Candidate Chemicals List, we undertook a systematic assessment of the use of QACs in personal care and cleaning products in order to fill a significant data gap. This involved developing our own nomenclature approach for this highly varied class.

In partnership with University of Michigan researchers, we are using environmental models to estimate children's exposures to endocrine-disrupting compounds in toys and personal care products.

1.5. We are committed to public engagement and transparency

We strive to engage and learn from all our stakeholders. To date, we have held 53 workshops, webinars, and other public meetings attended by thousands of participants worldwide and 42 public comment periods, during which we received more than 850 public comments. We also produced 26 technical documents and worked hard to ensure they meet the most stringent accessibility requirements so everyone can access them.

We have created a series of short videos that highlight our work for a broader audience. We also have duty officers who respond to public inquiries received via email.

Our website is full of helpful information and resources, including lists of existing alternatives to the Chemicals of Concern identified in our Priority Product regulations, as well as the SCP Timeline, which underscores our commitment to transparency and accountability by showing external stakeholders the depth and breadth of our work. The Timeline also helps send signals to the market about the direction of SCP's work and possible upcoming regulatory actions.

Because we believe ingredient transparency is critical to human and environmental health, we participated in developing the Principles for Chemical Ingredient Disclosure and have endorsed these principles alongside multiple businesses, investors, NGOs, universities, health care organizations, and other government entities.

SCP Accomplishments by the Numbers

3	Priority Product Workplans issued
7	Priority Product regulations adopted
10	Product categories researched
80	Chemicals and chemical classes researched
26	Technical documents published
42	Public comment periods held
53	Workshops, webinars, and other public meetings hosted
24	Early career scientists and engineered mentored

1.6. We strive to promote environmental justice to prevent harm and protect the most vulnerable

We have made environmental justice a policy priority. We envision a world where consumer products are safe for all people and do not perpetuate inequities.

We have focused our efforts on chemicals in nail products that disproportionately impact vulnerable nail salon workers, many of whom are women of reproductive age and of Vietnamese descent. Our recent adoption of nail products containing toluene as a Priority Product will help move the market to reformulate nail products so they are safer for nail salon workers.

We have evaluated the chemicals present in hair straightening and relaxer products, since women and girls of African descent are more likely to have their hair chemically treated compared to other ethnic groups (we summarized our results in this presentation and background document). Because none of the SCP project staff were of African descent, we found it critical to take the time to understand the cultural context and sensitivities around this product, as well as the experiences of those impacted by the product. We also conducted a hair salon exposure study asking salon workers which hair straightening and relaxer processes they use and how frequently. This research study will help us better understand current hair practices and exposures to workers and clients, a necessary first step in ultimately reducing exposures to chemicals of concern.

Our work on 6PPD, and its exceptionally toxic transformation product, 6PPD-quinone, was partly informed by conversations and consultations with California Native American Tribes. To learn about the concerns and experiences of California Native American Tribes related to 6PPD-quinone and its impact on coho, DTSC held government-to-government consultations with several Tribes, as well as informal meetings with Tribal technical staff. We heard concerns about the loss of coho and other salmonids that are culturally significant to many of the Tribes in the state and have been since time immemorial, as well as concern for the effects of 6PPD-quinone on the people and other organisms who eat exposed salmon. These consultations have contributed to our decision to regulate motor vehicle tires containing 6PPD as a Priority Product, which requires manufacturers to work toward salmon-safe tires.

When verifying compliance with our Priority Product regulation for carpets and rugs, we used demographic and geospatial data to ensure that we sampled products from stores in environmental justice communities.

Combining data from multiple databases, we created the first interactive map of consumer product manufacturing activities in California to help inform our future PPWPs. By understanding what types of consumer products are manufactured in California and where, we can better target our efforts to protect vulnerable and disadvantaged communities from exposures to Candidate Chemicals.

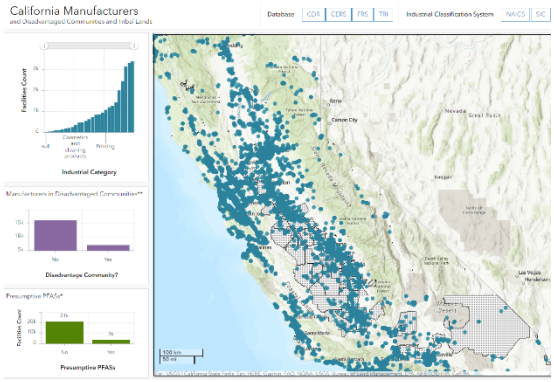


Figure 4: Interactive map of consumer product manufacturing activities.

1.7. We're leading the way to safer chemistry

Shining a light on problematic chemicals in our PPWPs has inspired some companies to switch to safer chemistries. For instance, members of the Resilient Floor Covering Institute switched away from orthophthalates in vinyl flooring due to their mention in the 2015-2017 PPWP.

We developed guidance and resources for participants in the Healthy Nail Salon Recognition (HNSR) Program. Nail salon workers experience higher adverse impacts from unsafe chemical use due to frequent exposure for longer periods. DTSC's HNSR program was established to reduce salon worker exposure, and it complements our mission to stimulate innovation toward safer products.

We are helping protect aquatic organisms in California rivers and streams by overseeing the implementation of California's law limiting copper in brake pads. Copper is toxic to many aquatic organisms, and vehicle brake pads are a major source of copper pollution in urban runoff. In collaboration with the State Water Board, we prepared a report to the Legislature assessing progress toward reducing copper in brake pads and waterways. We found that more than 60% of brake pads are now copper-free, which corresponds to an estimated 28% decrease in copper entering urban runoff.

We have also conducted extensive research in the field of Alternatives Analysis, exploring innovative approaches, emerging tools, and best practices for incorporating exposure, life cycle thinking, economic impacts, and environmental justice.

2. GOING ABOVE AND BEYOND

2.1. We have published widely read peer-reviewed articles and book chapters

SCP is engaged in the global dialogue on the issues that inform our work. To date, our staff have authored or co-authored 14 peer-reviewed articles and book chapters, with more than 150,000 views and 1,177 citations combined. SCP's contribution to academic research and dialogue helps advance scientific knowledge and decision making by manufacturers, researchers, government entities, and consumers working toward safe and sustainable chemistries and products.

Our paper highlighting our approach to regulating PFASs as a class was selected as one of ten most impactful papers of 2021 in the journal Environmental Health Perspectives. According to the journal, our publication is extremely highly cited, having received approximately 11 times more citations than average.

SCP staff also co-authored a groundbreaking review of QACs as a chemical class of emerging concern that highlighted the known hazards of these chemicals and important data gaps. The

authors proposed a research and policy agenda to expand our understanding of QACs to protect human and ecological health.

We collaborated with eleven other scientists on a paper describing how to optimize chemicals management in the United States and Canada through the essential-use approach. By identifying and eliminating non-essential uses of hazardous chemicals, government and business leaders can help safeguard our health and environment. We also developed a brief video explaining our approach.

We published the first study on the contribution of household and personal care products to 1,4-dioxane contamination of drinking water. Another of our papers showcased a new method for the analysis of 1,4-dioxane in consumer products, developed in partnership with ECL.

We also published a paper evaluating which practices from existing studies meet the rigor of the SCP Alternatives Analysis process and highlighting some of the challenges and opportunities in this emerging field of assessing alternatives. Our paper helped advance the understanding of alternatives analysis methodologies. One of the authors was interviewed on the IEAM podcast, a podcast "devoted to bridging the gap between scientific research and the use of science in decision making, regulation, and environmental management," about our research in pursuit of safer alternatives.

2.2. We have fostered collaborations to advance green chemistry science and policy

Advancing the design, development, and use of products that are chemically safer for people and the environment takes a village. As such, we have worked to develop close-knit partnerships and collaborations with multiple non-governmental organizations (NGOs), academic institutions, industry representatives, federal agencies, and Tribal, state, and local governments.

For example, we have a memorandum of understanding (MOU) with U.S. EPA to collaborate, coordinate, and communicate on issues of mutual interest toward supporting safe and sustainable chemistry. This has allowed us to leverage U.S. EPA's knowledge and resources, for instance to research the environmental fate and toxicity of the more than 250 QACs found in personal care and cleaning products, many of which have little to no publicly available data. We also leveraged U.S. EPA's chemical databases and modeling expertise to better understand and define the chemical class of PPD derivatives and shared our research findings on triphenyl phosphate with U.S. EPA staff to support their risk evaluation under the Toxic Substances Control Act (TSCA).

We signed a data sharing agreement with the U.S. Food and Drug Administration (FDA) that allows the FDA to share non-public, non-trade secret data and information with DTSC. This information is helping support our ongoing research into beauty and personal care products.

We have initiated a partnership with U.S. Customs and Border Protection (CBP) and U.S. EPA for targeted product sampling to ensure compliance with the SCP Regulations. These efforts will complement an established collaboration in which CBP sends alerts to importers when new SCP regulations go live.

This year we signed an updated MOU with Washington's Department of Ecology and Oregon's Department of Environmental Quality to exchange information and resources regarding the three states' green chemistry initiatives. The previous MOU, in effect from 2018 to 2021, helped facilitate communication and coordination on a number of issues of mutual interest, including the adverse impacts on salmon and other fish related to 6PPD in automotive tires and potential alternatives and mitigation measures; the use of PFASs in food packaging and Chemicals of Concern in personal care products; and the findings of our respective research on hazardous chemicals in children's products. We expect to expand our consultation and collaboration under the updated MOU.

In partnership with the state of Washington and the Massachusetts Toxics Use Reduction Institute (TURI), we organized the first ever Collaborative Innovation Forum on Functional Substitutes to 6PPD in Tires, which brought together experts thinking outside the box to find alternatives to this highly toxic rubber antiozonant. This work will be valuable as the tire industry moves to conduct its Alternatives Analysis work in compliance with the SCP Regulations.

We have worked closely with staff from New York's Department of Environmental Conservation as both our governments pursue action on 1,4-dioxane. We coordinated on a large lab study to assess the concentration of 1,4-dioxane in more than 300 consumer products. Additionally, we have maintained open lines of communication with New York Department of Environmental Conservation staff to share our evolving understanding of efforts and challenges associated with the removal of 1,4-dioxane from personal care and cleaning products.

In collaboration with OEHHA and the California Department of Public Health, we advise on the implementation of the California Environmental Contaminant Biomonitoring Program (also known as Biomonitoring California). Biomonitoring refers to measuring chemicals (or their metabolites) in people's blood, urine, or other fluids or tissues. The data generated by Biomonitoring California help inform SCP's work by showing which chemicals of concern are present in Californians' bodies.

Our partnership with the tech platform Clearya provides us data-driven insights regarding toxic chemicals in personal care and other products used by millions of Californians every day.

We are co-leading an Interstate Technology and Regulatory Council (ITRC) project on 6PPD and have co-led or participated on ITRC project teams focused on microplastics, 1,4-dioxane, and PFASs.

Some of the organizations SCP has collaborated with include:	
Association for the Advancement of Alternatives Assessment	Oregon Department of Environmental Quality
Breast Cancer Prevention Partners	Organization for Economic Cooperation and Development
California Healthy Nail Salon Collaborative	Regional Monitoring Program for Water Quality in San Francisco Bay
Clearya	San Francisco Estuary Institute
Environmental Working Group	State of Washington
Green Science Policy Institute	U.C. Berkeley / Berkeley Center for Green Chemistry
Interstate Chemicals Clearinghouse	U.S. Customs and Border Protection
Interstate Technology and Regulatory Council	U.S. Environmental Protection Agency
Massachusetts Toxics Use Reduction Institute	U.S. Food and Drug Administration
Natural Resources Defense Council	Washington Department of Ecology
New York Department of Environmental Conservation	Women's Voices for the Earth

We are founding members of the Interstate Clearinghouse (IC2) and the Association for the Advancement of Alternatives Assessment (A4). We remain actively connected with the alternatives assessment practitioner and policymaker communities to foster knowledge exchange and collaboration. We have also reviewed and provided input to other agencies' Alternatives Analysis Guides (e.g., the IC2 and the Organization for Economic Cooperation and Development (OECD)) and to their alternatives assessment reports (e.g., Washington state's report on alternatives to PFASs in food packaging). Participation in national organizations such as the IC2, A4, and ITRC ensures that the SCP Program can both learn from and help lead the community of practice in alternatives assessment and chemicals policy. DTSC often hears from regulated industries about the challenges associated with complying with the multitude of regulations and laws across the U.S. and the world. Staying engaged in these organizations allows SCP to stay abreast of the myriad of issues and to, whenever possible, be consistent with regulatory efforts worldwide.

Our staff sit on various BizNGO committees and on the California Healthy Nail Salon Collaborative's Scientific Advisory Committee on nail and hair salon products. We also provide input to the San Francisco Estuary Institute (SFEI) and the Regional Monitoring Program for Water Quality in San Francisco Bay on their work on microplastics, PFASs, and other contaminants of emerging concern.

We have leveraged information on the hazards of chemicals and products from several NGOs such as Black Women for Wellness, Breast Cancer Prevention Partners (BCPP), Environmental Defense Fund (EDF), Environmental Working Group (EWG), Green Science Policy Institute, Natural Resources Defense Council (NRDC), and Women's Voices for the Earth (WVE). We also collaborated with staff from the Green Science Policy Institute and other NGOs on scientific publications regarding quaternary ammonium compounds and the essential use approach to chemical regulation.

We have partnered with the Berkeley Center for Green Chemistry (BCGC) at the University of California, Berkeley, in several efforts, including providing mentorship for teams of students researching safer alternatives to product-chemical combinations of concern. BCGC showcases the importance of training future scientists, engineers, and decision-makers in the principles of green chemistry, sustainability, and life cycle analysis.

2.3. Our shadow is bigger than our shape

Our work has created ripples beyond California and continues to inspire others. National and international organizations are leveraging our work in their own efforts to promote safer chemistries. Examples abound:

- Our efforts in the SCP Program informed the implementation of other states' laws, such as Safer Products for Washington.
- Our research and regulatory action on methylene chloride not only protected Californians but added to the national dialogue and was a precursor to U.S. EPA's action to address methylene chloride under TSCA.
- Our PFAS-related Priority Products have contributed significantly to shifting industry away from using PFASs in carpets, rugs, and aftermarket treatments for textiles and leathers, and likely even influenced some major manufacturers' decision to stop making these hazardous chemicals altogether.
- Our research into food packaging containing PFASs informed Assembly Bill (AB) 1200 of 2021, which banned all PFAS-containing plant fiber food packaging from being manufactured or sold in California. AB 1200 also requires cookware manufacturers to disclose the presence of all Candidate Chemicals in their products.
- The California Cleaning Products Right to Know Act of 2017 requires disclosure of all chemicals on our Candidate Chemicals List, preventing these ingredients from being protected as confidential business information.

Additionally, we continue to regularly speak at a wide variety of conferences, webinars, and professional meetings to discuss our work and approach to chemicals management and safer

products. Our staff have also been invited to contribute book chapters and consult with other California state agencies.

3. BUILDING CAPACITY FOR THE FUTURE

3.1. We continuously improve our processes

Through the Lean Six Sigma approach to process improvement, we have streamlined our processes to reduce the average amount of time needed to research and list a Priority Product. For example, we adopted a regulation listing motor vehicle tires containing 6PPD as a Priority Product less than three years after publication of the study that documented the link between a 6PPD transformation product and coho salmon deaths.

We have developed a strong project management culture that includes capturing and incorporating lessons learned so we can continue to improve.

We have adapted the principles of systematic review to our screening research so we can be both thorough and efficient. As the name implies, systematic reviews involve a systematic evaluation of the scientific literature based on a predetermined, detailed search plan to identify, appraise, and synthesize all relevant studies on a specific topic. Originally developed for evaluating data from clinical interventions, systematic review methods enable greater transparency and reduced bias when researching and synthesizing evidence from scientific literature. However, because traditional systematic review methods can be extremely time-consuming and resource-intensive, we have adapted the methodology to meet the needs and requirements of the SCP Program.

We have developed internal tools, templates, and guidance to systematize our work wherever possible.

3.2. We've made SCP a great place to work

We take pride in the work we do at SCP and have built a culture based on Scientific rigor, Collaboration, Perseverance, Respect, Optimism, Creativity, Knowledge, and Service (SCP ROCKS).

Our internal Diversity, Inclusion, and Anti-Racism team has spearheaded initiatives to improve outreach to and retention of underrepresented groups. For instance, our SCP Ambassadors have developed relationships with campus affinity groups and professional organizations that serve underrepresented groups to help them access rewarding careers in California civil service.

We provide staff with continuous training and opportunities for personal development, including professional licenses, trainings, and certifications relevant to their work. We stay up to date on the latest research through a series of SCP Tech Talks.

We run an early-career mentoring program that trains the next generation of environmental scientists, engineers, and policymakers through temporary work positions. Thus far, 24 early-career scientists and engineers have worked with us as scientific aids, interns, student research assistants, or volunteers. In addition to assisting SCP scientists and engineers with their project, participants in this program have the opportunity to lead and manage their own project on a topic relevant to SCP's mission.

4. LOOKING AHEAD

4.1. We have many new initiatives on the horizon

We are in the process of preparing our fourth Priority Product Work Plan (PPWP), which differs from previous efforts due to Senate Bill (SB) 502 requiring more information on the anticipated timelines and chemicals we plan to evaluate. Over the next three years, we will research the product categories described in the PPWP and adopt Priority Product regulations as needed. We also plan to leverage our expanded data call-in authority granted by SB 502 and explore opportunities to use existing evaluations of alternatives to move directly to regulatory response when feasible.

For the first time, we have begun taking steps to add new chemicals to the Candidate Chemicals List through our own formal rulemaking process – specifically, microplastics and the chemical class of phenylene diamine derivatives (which are related to the rubber antioxidant 6PPD).

We are also gearing up to implement our first regulatory responses for one of our first Priority Products, spray polyurethane foam systems with unreacted methylene diphenyl diisocyanates (MDI). This follows a ruling in DTSC's favor by the Fifth District Court of Appeal after a challenge of DTSC's authority and actions brought by the American Chemistry Council. The court broadly affirmed DTSC's authority under the SCP Regulations to regulate products that pose potential for exposure to and adverse impacts from chemicals of concern and rejected challenges under the Administrative Procedure Act and the California Environmental Quality Act to DTSC's regulatory action. Since the manufacturers of spray foam systems did not identify any safer alternatives during the Alternatives Analysis process, the SCP Regulations require that the manufacturers invest in green chemistry research to develop safer alternatives that reduce or eliminate exposures to MDI at the regulatory response phase.

We have been awarded a U.S. EPA grant to evaluate the existing tools for assessing environmental justice impacts across the various life cycle stages of a product and embed environmental justice principles into our Alternatives Analysis Guide. Our objective is to enable businesses and government decision makers to evaluate environmental justice impacts across the entire life cycle of a product, thereby preventing burden shifts that disproportionately affect vulnerable subpopulations and communities. We also plan to form a stakeholder network committed to integrating environmental justice principles in order to select safer alternatives that benefit all communities.

Our partnerships with the California Green Business Network and California Healthy Nail Salon Collaborative assist small businesses that employ workers from disadvantaged communities to improve worker health and safety, prevent pollution, conserve resources, develop their regions economically, and advance environmental justice. This effort will help nail salons to join DTSC's

Healthy Nail Salon Recognition Program to reduce salon workers' exposure to harmful chemicals statewide.

In the coming years, we also plan to pilot the Partners with Emerging Alternatives Recognition List (PEARL). This initiative will encourage manufacturers of alternatives to Candidate Chemicals in consumer products to publicly disclose detailed information on their chemicals. The aim of recognizing these manufacturers through the PEARL is to promote transparency and enable product manufacturers to select safer ingredients for their products during the Alternatives Analysis process.

Last but not least, we are looking to expand our public outreach efforts beyond the people we regulate. For instance, we are preparing to launch an SCP podcast next year – stay tuned for a fun tour of SCP's work!

4.2. We're doubling in size to increase our impact

All the work highlighted in this report was accomplished with a small team of full-time staff. With the leadership and support of Governor Newsom and the California Legislature, SCP received authorization to hire 37 new positions in 2022/2023. Our program is now doubling in size and getting ready to take on more challenges in the years ahead. These new resources will allow us to grow our impact, increasing our capacity to develop new tools, engage in scientific research and collaboration, and foster innovation related to our mission.

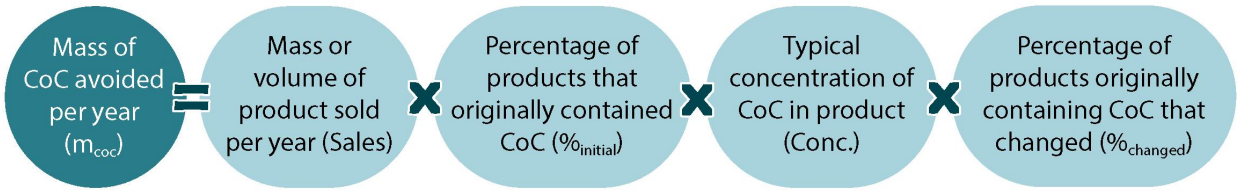
If you are interested in working with us, check out our Career Opportunities.

Small but mighty, SCP will continue to change the world, steadily leading the way toward consumer products that are chemically safer for people and the environment. Will you join us on this quest? Learn how at dtsc.ca.gov/scp/accomplishments.

5. APPENDIX: CHEMICALS OF CONCERN AVOIDED CALCULATIONS

5.1. Scope and approach

To estimate the mass of Chemicals of Concern (CoCs) that SCP's Priority Product regulations have prevented from entering the California market (m_{COC}), we multiplied the total amount of product sold per year (Sales), the percentage of those Sales that initially contained the CoC ($\%_{initial}$), the typical concentration of the CoC in the product (Conc.), and the percentage of those products that initially contained the CoC but changed in response to our regulation ($\%_{changed}$).



5.2. Data sources

This section describes the data sources that were used to assign values to the different parameters.

Paint Strippers Containing Methylene Chloride

- **Sales x $\%_{initial}$:** In response to our Priority Product regulation, several manufacturers provided us their sales data for 2018. We extrapolated these data to the entire market using market share information from "2017 Market Research Report on Global Paint Removal Industry," a report compiled by QYR Chemical and Material Research Center and submitted during the comment period for paint or varnish strippers containing methylene chloride (Dong 2017). Based on this information, we estimated sales of the Priority Product (i.e., Sales x $\%_{initial}$) at 886,719 kg/yr.
- **Conc.**: We reviewed Safety Data Sheets (SDSs) for 20 products that were submitted to us with a Preliminary Alternatives Analysis report. Based on our analysis of these SDSs, we used 46.63% and 69.13% as minimum and maximum concentration values.
- **$\%_{changed}$**: Based on the information we received from manufacturers in response to our Priority Product regulation, we assumed 90% of paint or varnish strippers that initially contained methylene chloride have been removed from the California Market.

Carpets and Rugs Containing PFASs

- **Sales:** The Carpet America Recovery Effort (CARE) is an industry-led product stewardship organization that tracks production and disposal of carpet as part of its efforts to increase carpet recycling. According to CARE's 2021 Annual Report, 67,339,933 square yards of carpet were sold in California in 2020 (CARE 2021).

- **$\%_{initial}$**: In a 2020 paper titled "Flows, stock, and emissions of poly- and perfluoroalkyl substances in California carpet in 2000-2030 under different scenarios," Chen and coauthors estimate that 56% of new carpet had been treated with PFAS stain- and soil-repellents (Chen et al. 2020). At our 2017 public workshop, the president of the Carpet & Rug Institute (CRI) stated that nearly 100% of residential and commercial carpets are treated with PFASs (Yarbrough 2017). Because one major carpet manufacturer, Interface, is not a CRI member and ceased using PFASs prior to 2017 (Davis 2016), 95% is likely a more accurate maximum value. We used 56% and 95% as minimum and maximum values for $\%_{initial}$.
- **Conc.**: According to recent estimates, PFASs are applied to carpets at a concentration of 9,100-108,300 $\mu g/m^2$ (Chen et al. 2020). A 2008 report by the Danish EPA reported that PFASs were applied to carpets at a concentration of 100-2,000,000 $\mu g/m^2$ (Jensen et al. 2008). We used 9,100 $\mu g/m^2$ and 2,000,000 $\mu g/m^2$ as minimum and maximum values for Conc.
- **$\%_{changed}$**: Since we received no Priority Product Notifications from manufacturers following our adoption of carpets and rugs containing PFASs as a Priority Product, we assumed that 100% of the carpets that initially contained PFASs have adopted non-PFAS alternatives (we're in the process of doing our own product testing to verify this assumption).

Treatments for Converted Textiles and Leathers Containing PFASs

- **Sales:** According to available data, 460,384 units of treatment products were sold in brick-and-mortar stores from October 2019 to October 2020 (Nielsen Consumer LLC 2020). We assumed each unit weighs 283 grams, since that seems to be the typical size for these types of products (Amazon 2023).
- **$\%_{initial}$**: A 2008 report by the Danish EPA assumed that 10% of textile and leather treatments contained PFASs (Jensen et al. 2008). A Swiss study published in 2017 detected PFASs in 63% of 60 impregnation products. We used 10% and 63% as minimum and maximum values for $\%_{initial}$ (Favreau et al. 2017).
- **Conc.**: Based on our analysis of treatment product SDSs available on the internet for 17 products, we used 1.82% and 4.28% as minimum and maximum concentration values.
- **$\%_{changed}$**: Based on the information we received from manufacturers in response to our Priority Product regulation, we assumed 100% of treatment products that initially contained PFASs and continue to be sold in California have adopted non-PFAS alternatives.

5.3. Results

Table A1: Estimates of the annual amount of Chemicals of Concern prevented by three of SCP's adopted Priority Products

Priority Product	Estimated mass of Chemicals of Concern prevented, kg/yr
Paint strippers containing methylene chloride	400,000 – 600,000
Carpets and rugs containing PFASs	300 – 100,000*
Treatments for converted textiles and leathers containing PFASs	200 – 4,000

*Note: this range is an underestimate because we were only able to identify data for carpets but not for rugs.

5.4. References

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