Washington State Department of HEALTH

ARTIFICIAL TURF: DOH's perspective

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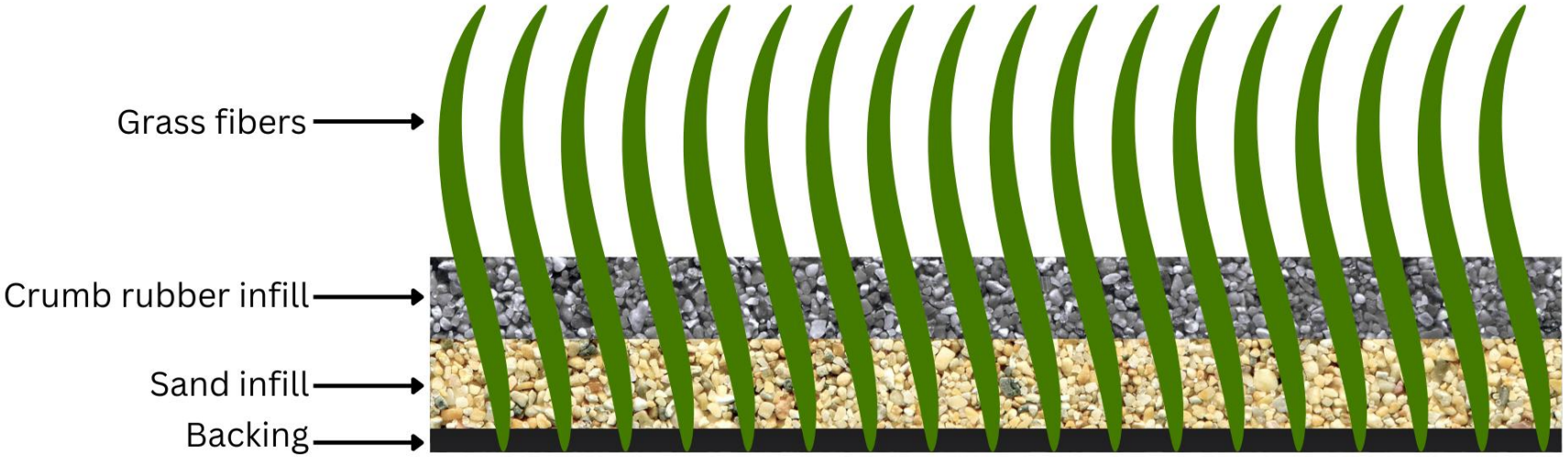
AGENDA

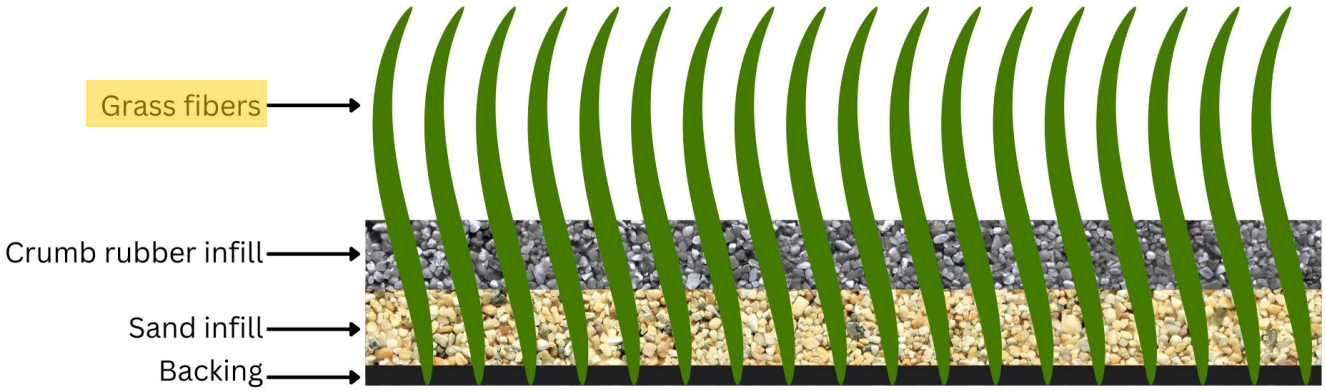
- Artificial Turf Components
- Health & Safety Concerns
- Recent Studies
- Actions & Recommendations
- Safer Alternatives

What is artificial turf made of?

Artificial Turf Components

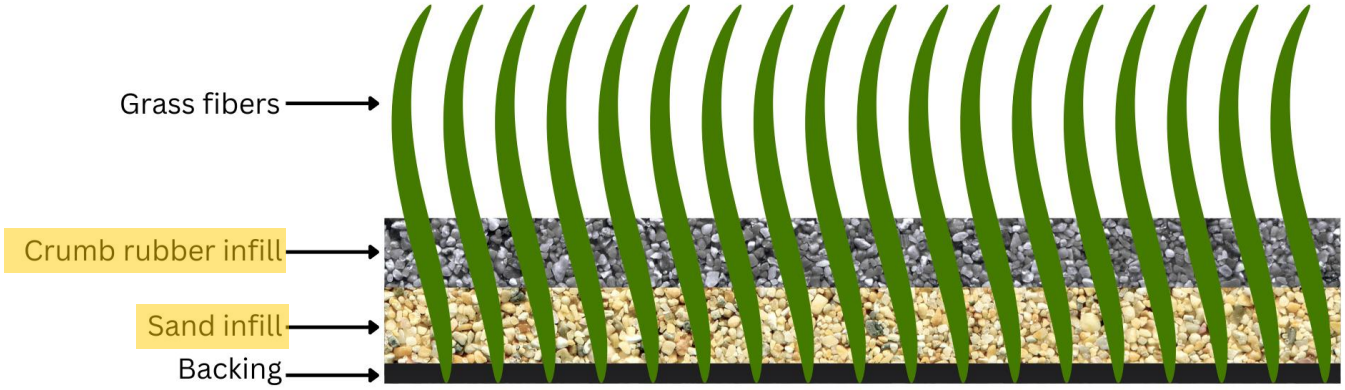


Artificial Turf Components



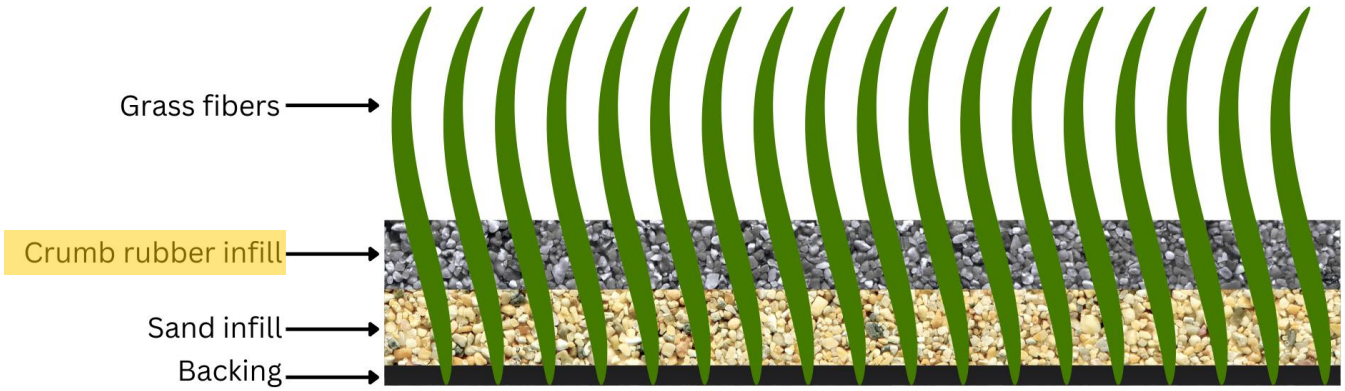
- Artificial Grass fibers:
  - Common materials: polyethylene, polypropylene, and nylon
  - PFAS and fluoropolymers can be used as processing aids or coating treatments

Artificial Turf Components



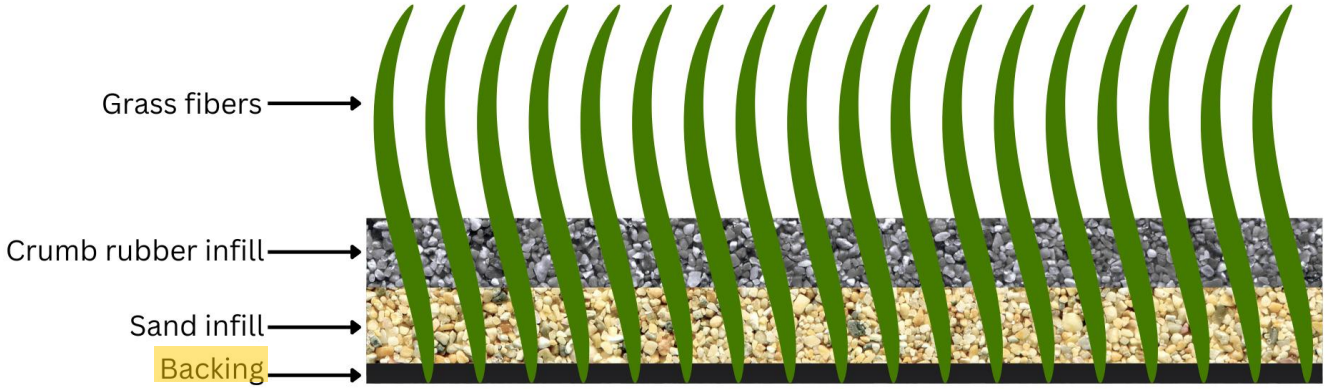
- Infill
  - Function: weigh down turf, keep grass blades upright, improve drainage, enhance durability, and cushioning
  - Commonly used materials:
    - Sand or coated sand
    - Recycled tires (crumb rubber)
    - Cork + coconut fiber blend

Artificial Turf Components



- Crumb rubber infill
  - Can contain metals (i.e. lead and zinc), phthalates, polyaromatic hydrocarbons (PAHs), volatile and semi-volatile organic compounds (VOCs & SVOCs).
  - Historical use of 6PPD in tires → 6PPD and 6PPD-Q detection in crumb rubber
    - 6PPD and 6PPDQ | Washington State Department of Health

Artificial Turf Components



- Backing
  - Function: Holding the grass blades in place, stability, & durability
  - Primary backing
    - Woven or non-woven polyester or polypropylene fabric that holds up the grass blades and keep the infill material in place
  - Secondary backing
    - Polyurethane or latex coating on the back of the turf to enhance weather durability

Health & Safety Concerns

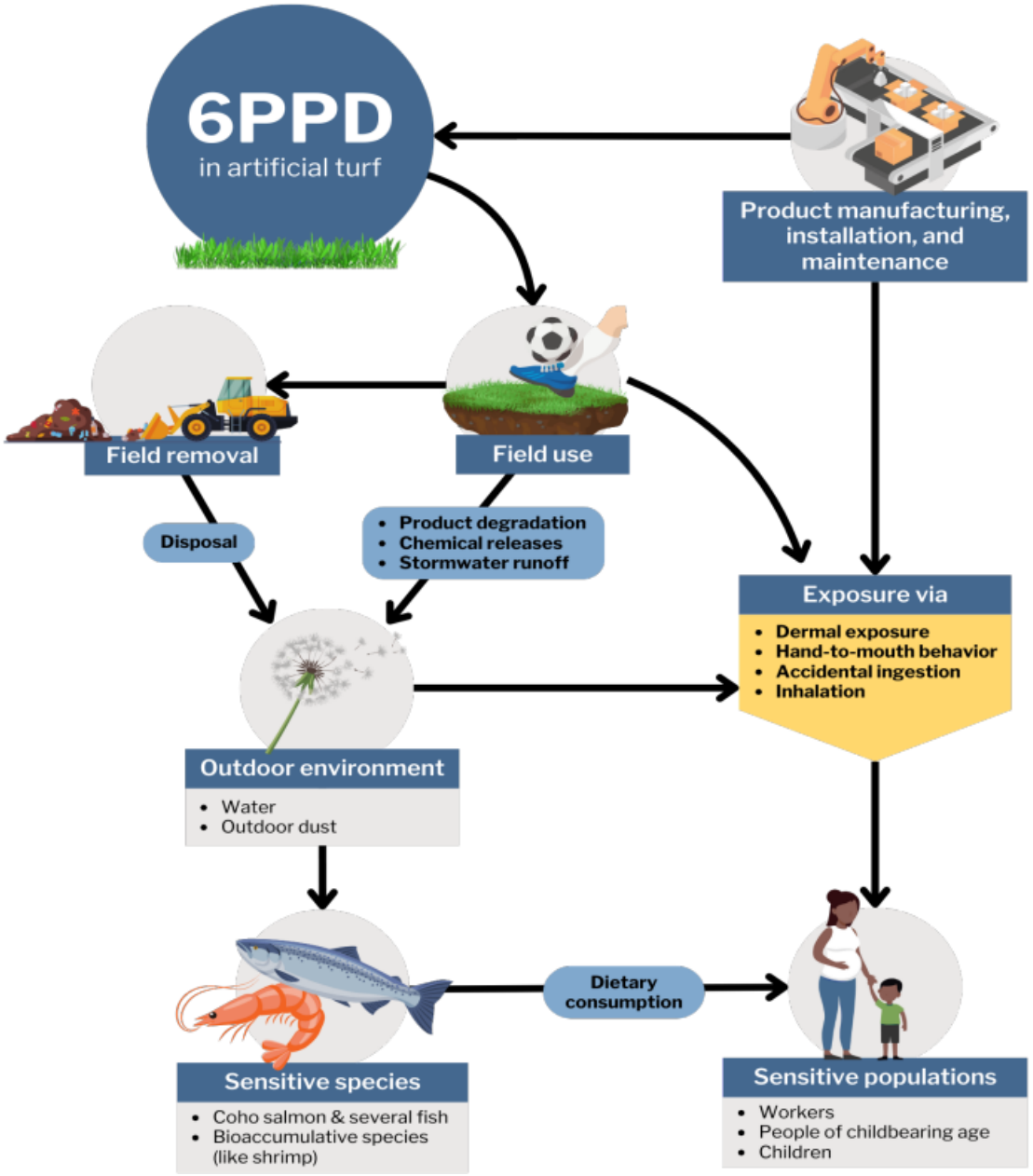
Health Concerns

- Artificial turf components can contain toxic chemicals:
  - Heavy metals (e.g. lead, zinc, cobalt)
  - Phthalates
  - Polyaromatic hydrocarbons (PAHs)
  - Volatile organic carbons (VOCs)
  - Semi-volatile organic carbons (SVOCs)
  - Per- or Polyfluoroalkyl Substances (PFAS)

- Parent, athletes, schools, and communities have raised concerns about possible health risks from exposure to chemicals in artificial turf

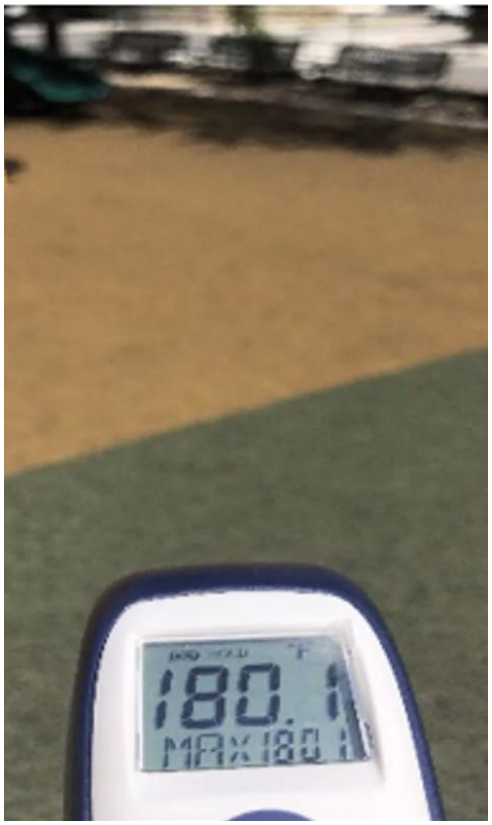
Potential Exposure Pathways

SOURCE: WA ECY SPWA Cycle 2 Phase 2 Technical Supporting Documentation



Non-Chemical Safety Concerns

- **Heat**
  - Heat stress concerns for athletes
  - Artificial Turf can be 35 to 86 degrees F hotter than natural grass
  - Brigham Young University measurements
    - Hottest surface temp measure → 200 F on a 98 F day
  - Heat can amplify chemical emissions
- **Burns**
  - Skin abrasions (AKA turf burns)
  - OEHHA study
    - 2 to 3-fold increase in skin abrasions per player hour in artificial grass vs natural grass turf



Recent Studies

WA DOH: Investigation of Reported Cancer Among Soccer Players in Washington State (2017)

- Epidemiological study
- **Objective**:
  - Determine if cancer diagnoses among Coach Griffin's soccer players had higher cancer rates than cancer rates among all Washington residents of the same ages
  - Explore whether the information from Coach Griffin's list warranted further public health response
- **Results**:
  - This investigation found less cancer among the soccer players, select and premier players, and goalkeepers on the coach's list than expected based on rates of cancer among Washington residents of the same ages

WA DOH: Investigation of Reported Cancer Among Soccer Players in Washington State (2017)

- **Limitations**:
  - Investigation was not designed to determine if increased risk of cancer was due to exposures in artificial turf
  - Observed number of people who met the study's case definition was likely fewer than the true number
  - Investigation didn't apply focus to specific soccer positions that may have higher exposures to turf chemicals (i.e. goalkeepers)

EPA: Synthetic Turf Field Recycled Tire Crumb Rubber Research Under the Federal Research Action Plan (FRAP)

- Collaborative research (EPA, CDC, ATSDR, and CPSC)
- **PART 1: Tire Crumb Rubber Characterization (July 2019)**
  - Research objectives, methods, results, and findings of tire crumb rubber characterization research
    - Sampled 40 synthetic turf fields and 9 recycling plants in US
- **PART 2: Exposure Characterization (April 2024)**
  - Characterizes potential human exposures to the chemicals found in the tire crumb rubber material while using synthetic turf fields
    - Collected human activity data using video and questionnaires
    - Pilot study collection of air, dermal wipe, and biomarker samples from people using artificial turf fields
    - Conducted an exposure modelling assessment

EPA: Synthetic Turf Field Recycled Tire Crumb Rubber Research Under the Federal Research Action Plan (FRAP)

Study Conclusions

- **Although chemicals are present in the tire crumb rubber and exposures can occur, they are likely limited**
  - Small amount of organic chemicals are released into the air via emissions
  - Small fractions are released from tire crumb rubber into simulated biological fluids
    - ~3% for gastric fluid
    - <1% for saliva and sweat + sebum
  - In biomonitoring pilot study, concentrations for metals measured in blood were similar to general population
  - No differences in PAH metabolites in urine between study participants using natural grass fields and those using artificial turf fields with crumb rubber

EPA: Synthetic Turf Field Recycled Tire Crumb Rubber Research Under the Federal Research Action Plan (FRAP)

Study Limitations

- This research is not intended to be a risk assessment, but can advance understanding of exposure to inform risk assessment process
- Exclusively aimed at turf fields with crumb rubber infill
- Only 6 chemical substances associated with synthetic turf fields and tire crumb rubber were selected for exposure pathway modeling
- Bioaccessibility measurements and quantitative analyses were not feasible for SVOCs
- PFAS, 6PPD, and 6PPDQ were not included in any of the targeted analyses
- Exposure monitoring was limited to 3 fields with 25 people (14 biomonitored)

OEHHA Draft Synthetic Turf Study

- Draft study released March 2025
- Objective: to characterize the exposures and health risks from crumb rubber infill on synthetic turf fields, considering
  - Multiple age groups of athletes, coaches, referees and spectators
  - Fields of various ages and in different climate zones across California
  - Multiple exposure routes (inhalation, dermal, oral)

OEHHA Draft Synthetic Turf Study

Field Characterization:

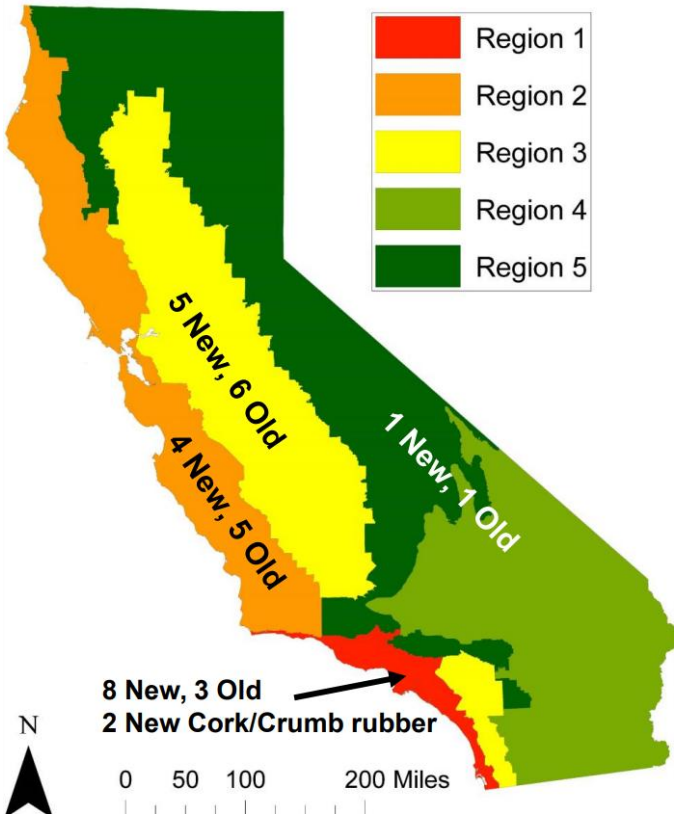
- Air and particle samples on active fields
- NTA to identify unknown chemicals for analyses of field samples

Exposure Characterization:

- Soccer player sport activity data
- Soccer exposure data by decoding video recordings of soccer events

Human Health Risk Assessment:

- Compiled and derived toxicity criteria of selected tire related chemicals
- Exposure assessment and risk characterization for athletes (2+ years old), coaches (16+ years old), referees (16+ years old), spectators (0+ years old)



OEHHA Draft Synthetic Turf Study

Study Conclusions

- Overall, this study found no significant health risks to players, coaches, referees and spectators from on-field or off-field exposure to field-related chemicals in crumb rubber infill from synthetic turf fields

- There were few small exceedances based on maximal values from individual fields, but they were concluded to be of low probability and of low concern:
  - DART for athletes aged 11 to 70 years
  - Chronic toxicity in on-field infant spectators
  - Excess cancer risk in on-field infant spectators and athletes 16 to 30 years

OEHHA Draft Synthetic Turf Study

Study Limitations

- Evaluation limited to crumb rubber infill and not backing materials or grass blade components
- No analysis for metals in fine particulate matter from the air on the fields
- PFAS and 6PPDQ were not included in any of the targeted analyses but were not detected in the non-targeted analysis
- Study design and chemical identification was based on literature review conducted in 2015
- Some chemicals may have outdated toxicity criterions (i.e. 6PPD)
- Hazard indices for DART and cancer are underestimated due to the omission of some chemicals that have established DART or cancer effects (e.g., phthalates, nickel).
- Many public comments expressed concerns of cumulative exposures and heat effects not being considered

DOH Conclusions & Recommendations

- Available research on artificial turf does not suggest it poses a significant public health risk
- People should be aware that there are toxic chemicals in artificial turf, but research suggests exposure is low and will not cause significant health risk in frequent users
- DOH recommends people to continue playing on athletic fields regardless of field surface type
- While we cannot rule out the possibility that there are health effects from artificial turf that we have not been able to detect, we have overwhelming research that physical activity is beneficial for people's physical and mental health

DOH Recommendations

- **How can I limit chemical exposure?**
  - Always wash hands after playing on the field and before eating.
  - Avoid eating and drinking on turf surfaces.
  - Take off any shoes, clothes, or equipment outside or in the garage to prevent tracking crumb rubber into the house.
  - Shower after field use and quickly clean any cuts or scrapes to help prevent infection.
  - Any crumb rubber in mouths should be spit out; don't swallow it.
  - To avoid heat stress, turf managers should regularly monitor surface level temperatures and set guidelines for alerting users
  - Sports coaches should exercise caution when practicing on artificial turf in hot weather

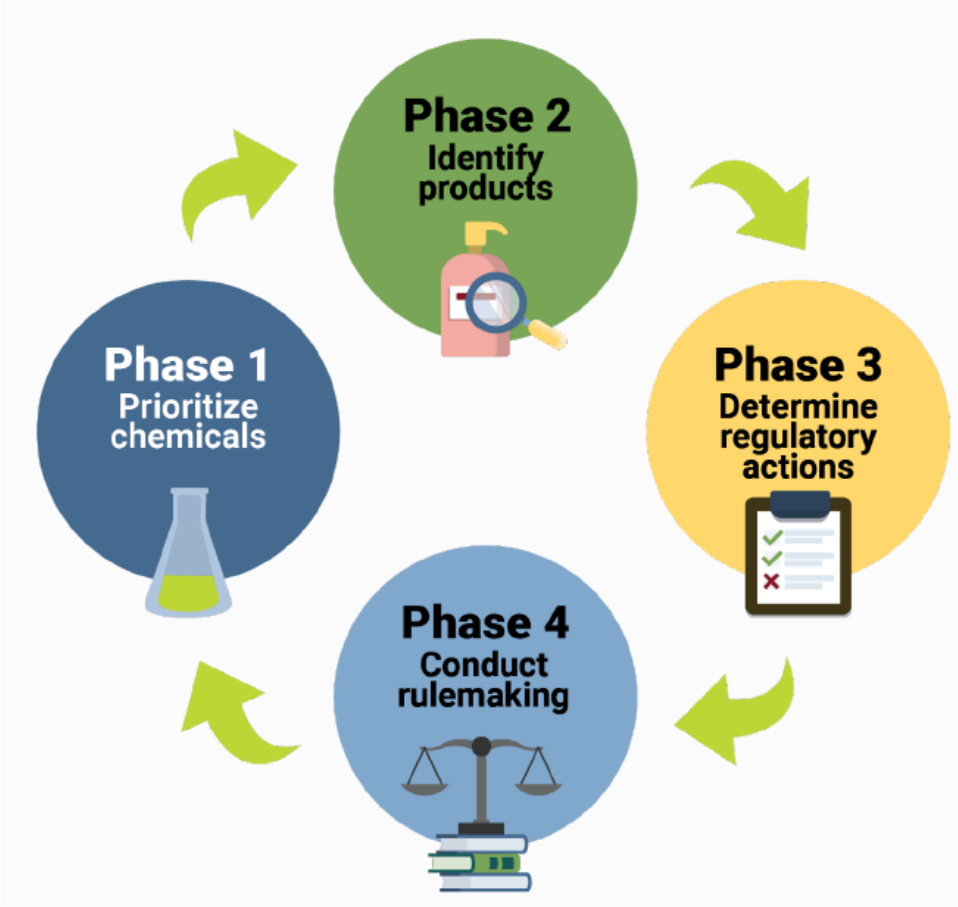
Safer alternatives?

Safer Products for Washington (SPWA)

- Regulatory program led by WA ECY
- Cyclical process for systematically regulating classes of chemicals in consumer products
  - Statute: Chapter 70A.350 RCW
  - Rule: Chapter 173-337 WAC

- Equitably reduce exposure to toxic chemicals from consumer products
- Prevent releases of toxic chemicals into the environment

Safer Products for Washington Process

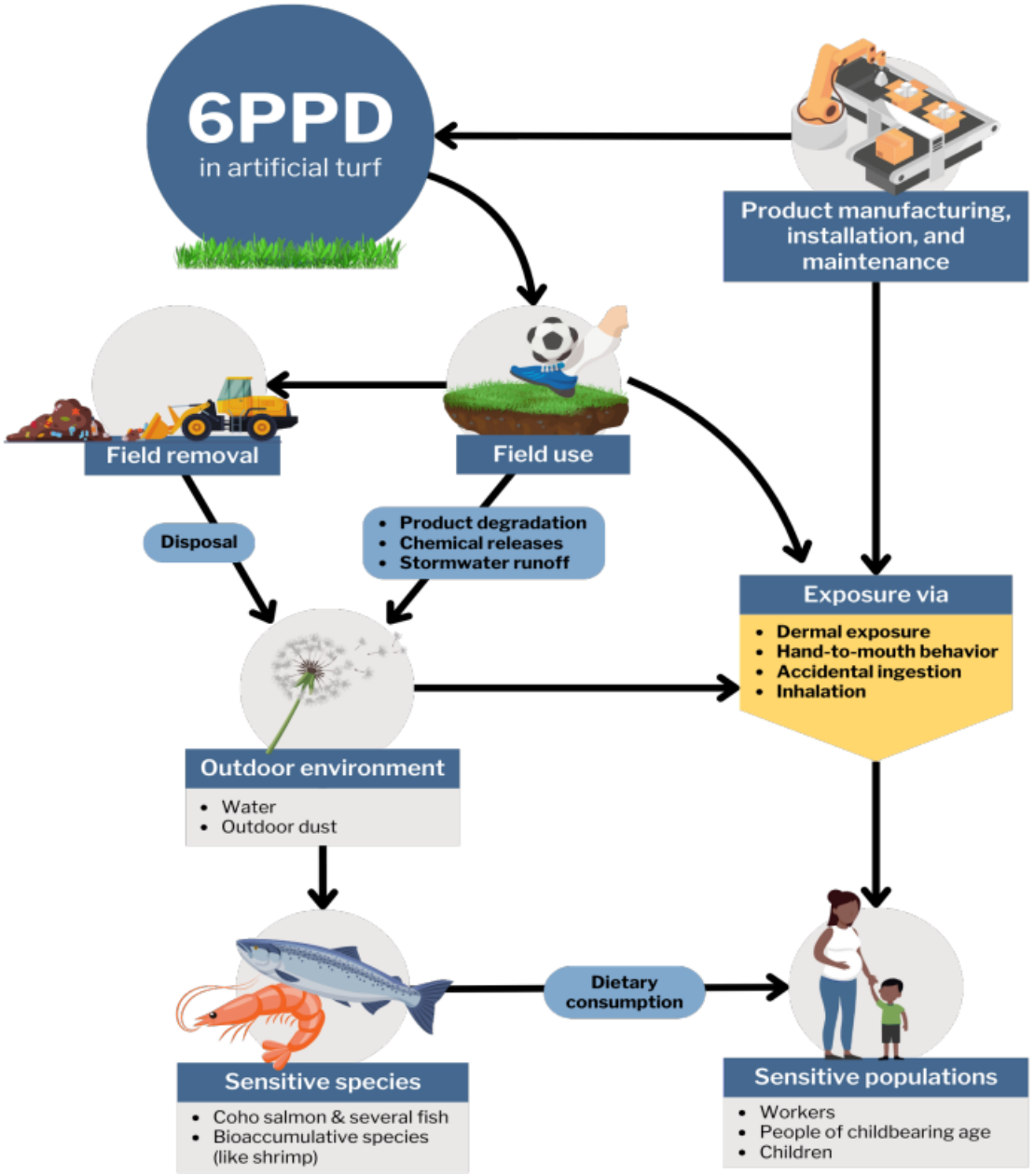


SPWA Cycle 2 Priority Products: Artificial Turf

- Priority Chemical Classes in Artificial Turf
  - PFAS – persistent, bioaccumulative, and toxic
  - 6PPD – reproductive toxicity and aquatic toxicity
- Product Scope
  - Artificial grass blades, infill, and backing materials

Potential Exposure Pathways

SOURCE: WA ECY SPWA Cycle 2 Phase 2 Technical Supporting Documentation



SPWA Cycle 2 Priority Products: Artificial Turf

Potential alternatives to review in phase 3 include (but not limited to):

- Coated rubber infill
- Ethylene propylene diene monomer infill
- Organic infill (cork, coconut shell fibers)
- Sand (silica) infill
- Coated silica sand infill
- Thermoplastic elastomer (TPE) infill

SPWA Cycle 2 Priority Products: Artificial Turf

Other potential decision pathways:

Alternative process

- Is the priority chemical necessary for the product?
  - For example, can PFAS processing aids be avoided in the manufacturing of turf through changing equipment maintenance schedules?

Alternative product

- Are natural grass fields an option?

Toxics Use Reduction Institute (TURI)

- Independent government agency focused on reducing toxic chemical-use at the source
  - Making informed substitutions
  - Changing manufacturing processes
  - Improving efficiencies

TURI
TOXICS USE REDUCTION INSTITUTE

Toxics Use Reduction Institute (TURI)

Athletic Playing Fields: Choosing Safer Options for Health and the Environment (December 2018)

- Factors considered:
  - Chemicals in infill
  - Environmental concerns
  - Heat stress
  - Injuries
- Safer alternative → Organically managed grass

Toxics Use Reduction Institute (TURI)

Table 3: Comparing artificial turf with natural grass				
Category	**Subcategory**	**Artificial turf**	**Natural grass – conventional**	**Natural grass – organic**
Chemicals	**Present in surface**	Polymers, additives; respiratory hazards, e.g., zeolite	Ambient environmental exposures only	
	Applied to surface	Cleaners, disinfectants, herbicides	Synthetic pesticides, fertilizers	Soil health built through aeration, proper mowing practices, organic soil amendments, and other approaches
Other health hazards	**Heat**	Higher	Lower	
	Risk of skin abrasions and infections	Higher	Lower	
	Other injuries	Variable injury patterns		
Other environmental considerations	**Ecosystem services**	None	Habitat for a range of organisms; carbon fixation; water/flood control; reduction of heat island effect in urban areas	
	Migration of materials	Particles of infill & artificial grass blades can migrate into environment	Possible fertilizer runoff or pesticide drift	n/a
	Water use	Irrigation may be used to lower temperature	Irrigation may be used to support grass growth	Irrigation may be used to support grass growth; organic management reduces irrigation needs by supporting root development

Questions?

Or contact ev.rasyid@doh.wa.gov

Resource Links

- Synthetic Turf and Crumb Rubber | Washington State Department of Health (Webpage update in progress)
- Federal Research on Recycled Tire Crumb Used on Playing Fields and Playgrounds | US EPA
- Release of the draft report on Synthetic Turf and Scientific Advisory Panel Meeting – OEHHA
- Technical Supporting Documentation for Priority Products: Safer Products for Washington Cycle 2 Implementation Phase 2
- Artificial Turf – TURI
  - turi.org/publications/athletic-playing-fields-choosing-safer-options-for-health-and-the-environment/
- 6PPD and 6PPDQ | Washington State Department of Health