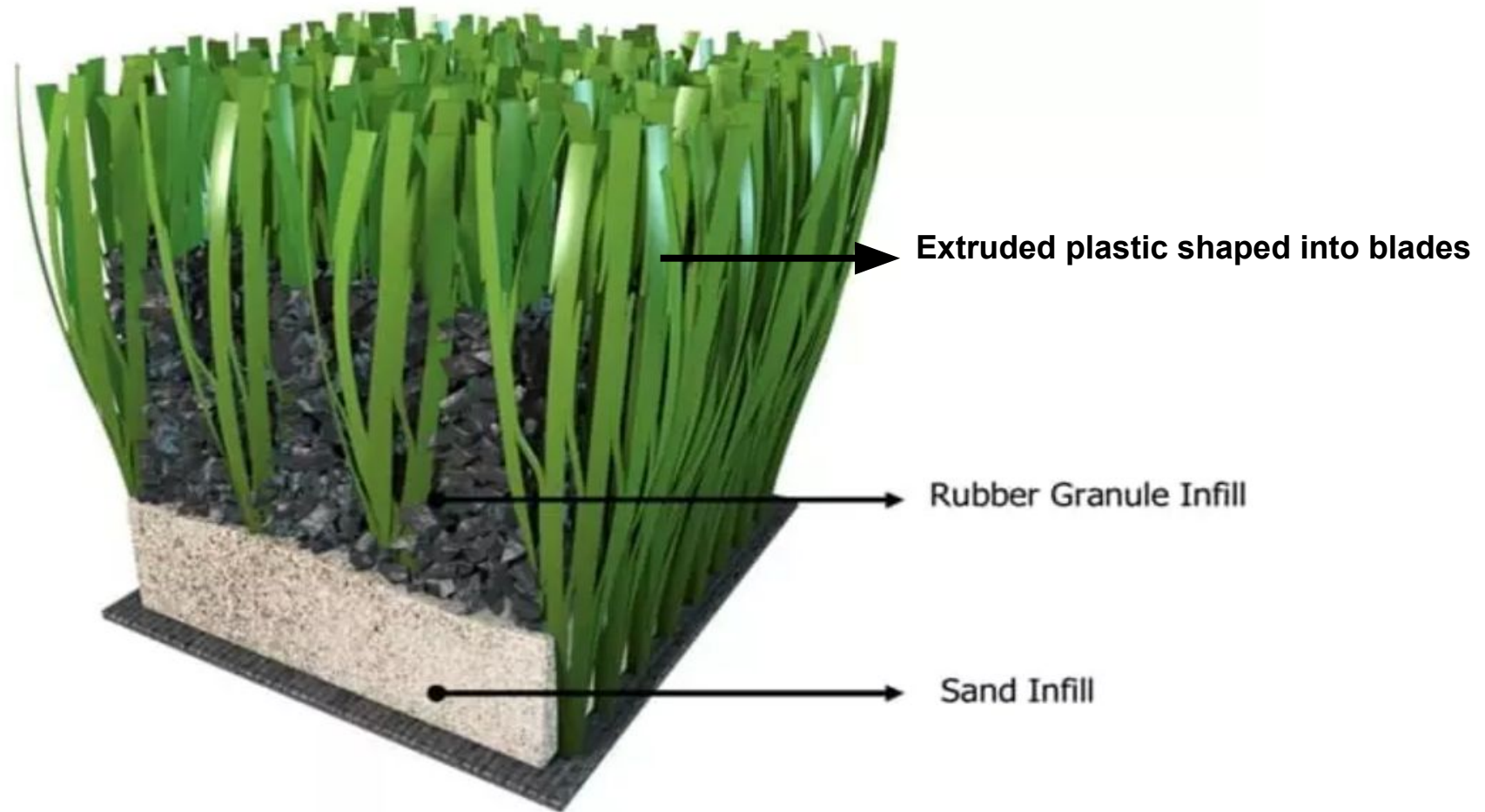


A close-up photograph showing a person's hand, wearing a light grey long-sleeved shirt, touching a piece of artificial turf. The turf is green with a black backing and is being laid out on a wooden border. The background is a blurred green lawn.

The Health and Environmental Impacts of Artificial Turf

Three necessary layers of plastic turf



Artificial Turf Plastics and Chemical Composition



Plastic grass blades contain “plasticizers”, biphenyl A (BPA), and phthalates, which make plastics flexible, PFAS from the manufacturing process.



Close up of plastic blades



Crumb Rubber Infill

No infill has been shown to be free of toxic chemicals. Lead and PAHs most common.



US Women's Nat'l Team sues over Artificial Turf



Icahn School of Medicine at Mount Sinai

Position Statement on the Use of Artificial Turf Surfaces

The Mount Sinai Children's Environmental Health Center at the Institute for Climate Change, Environmental Health, and Exposomics recommends against the installation of artificial turf playing surfaces and fields due to the uncertainties surrounding the safety of these products and the potential for dangerous heat and chemical exposures.

Health impacts of turf chemicals

Carcinogens

- Benzene
- PAHs
- Styrene
- Cadmium
- Arsenic
- PFAS
- VOCs

Neurotoxicants

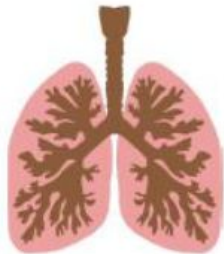
- Lead
- Zinc
- Phthalates
- VOCs

Reproductive Toxicants

- Phthalates
- Plasticizers

Respiratory Irritants

- VOCs
- Particulate matter
- Silica



Inhalation of chemicals and particles



Dermal contact and absorption through the skin or open wounds



Ingestion of turf infill particles

Chronic diseases are on the rise

Your lifetime risk has doubled or tripled for many common diseases in the past 20 years




1 in 10

Alzheimer's Disease



1 in 12

Asthma



1 in 36

Autism



1 in 3 / 2

Cancer in Women/Men



1 in 12

Cardiovascular Disease



1 in 6

Developmental Disabilities



1 in 10

Diabetes



1 in 10

Food Allergy



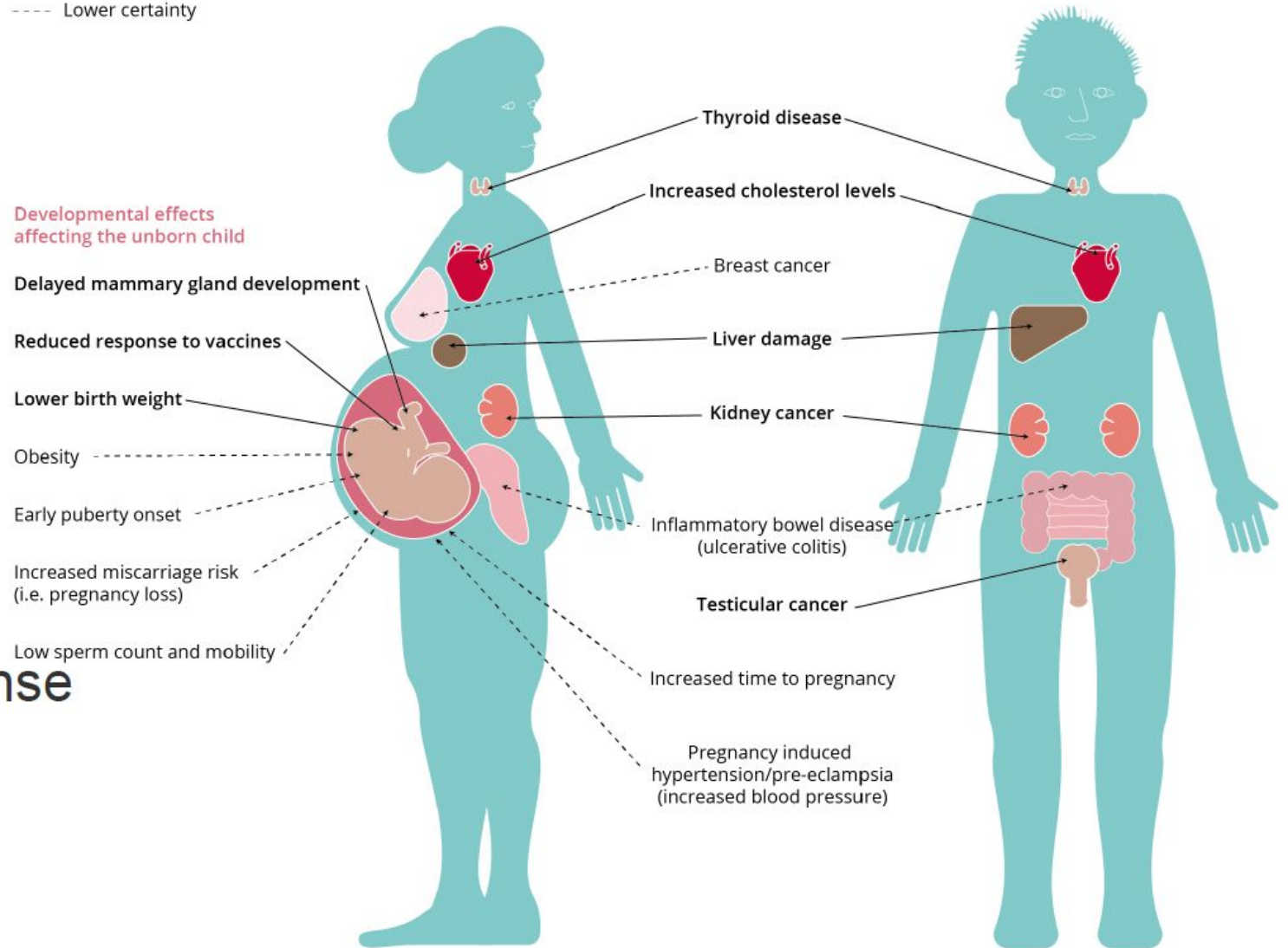
1 in 10

Infertility in Couples

Non-infill exposures: PFAS

- High cholesterol
- Thyroid disease
- Ulcerative colitis
- Cancer
 - Kidney
 - Testicular
- COVID-19 severity
- Immune dysfunction
 - Decreased vaccine response
- Impaired neurodevelopment
- Infertility
- Pregnancy outcomes

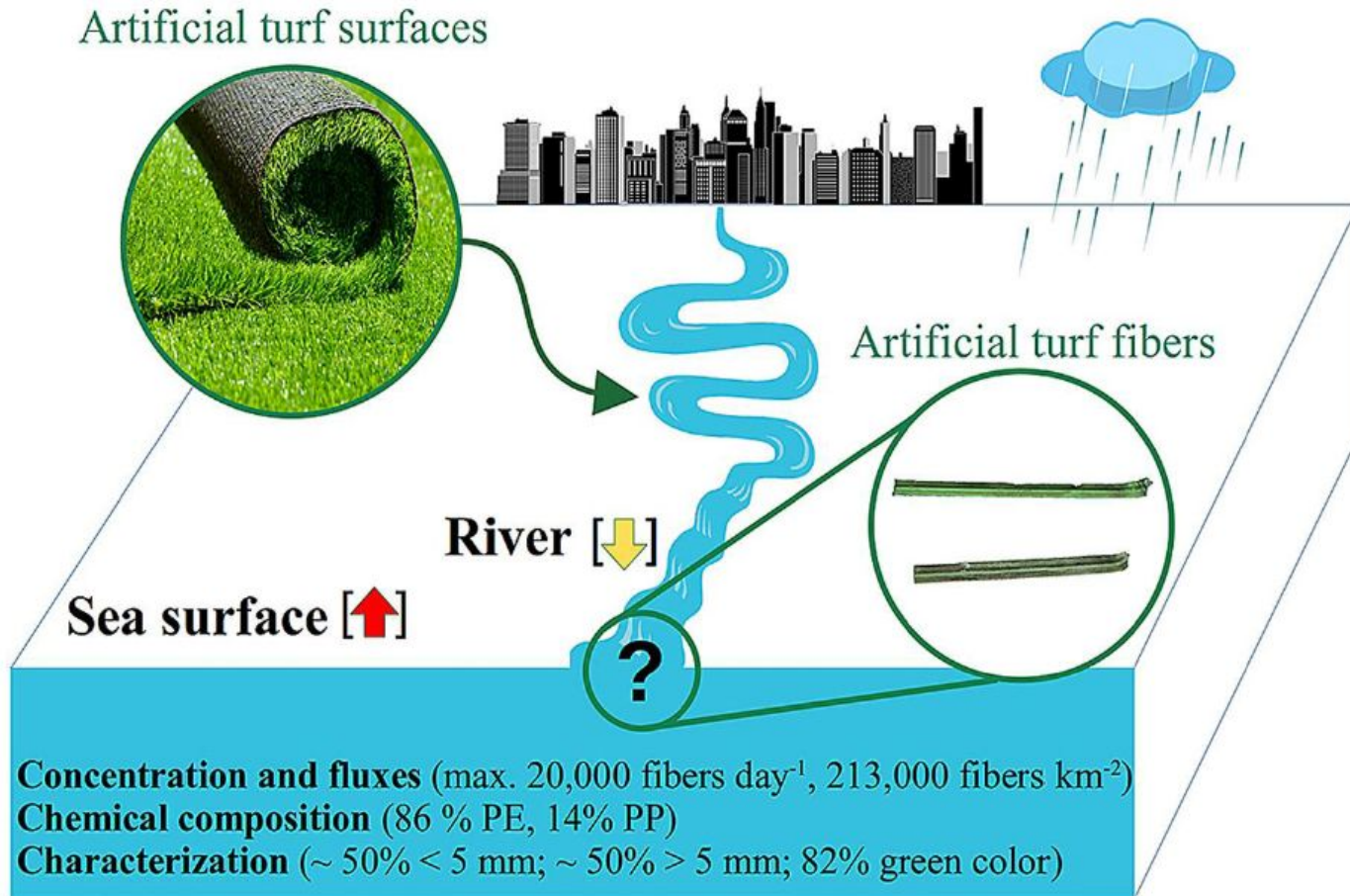
— High certainty
- - - Lower certainty





With use, blades break down into plastic micro-particles that are released to the environment.

Emerging Concern: Microplastics



- Indoor & outdoor air
- Tap and bottled water
- Seafood
- Inhale and ingest 5g/week
- Lung, blood, placenta
- Health effects may include:
 - Inflammation
 - GI problems
 - Obesity/metabolic disorders
 - Respiratory problems
 - Immune dysruption
 - Endocrine disruption
- EU Ban on microplastics includes artificial turf

de Haan et al 2023 Env. Poll. Vol 334, 122094



Artificial Turf as a Heat Island



Heat effects of turf



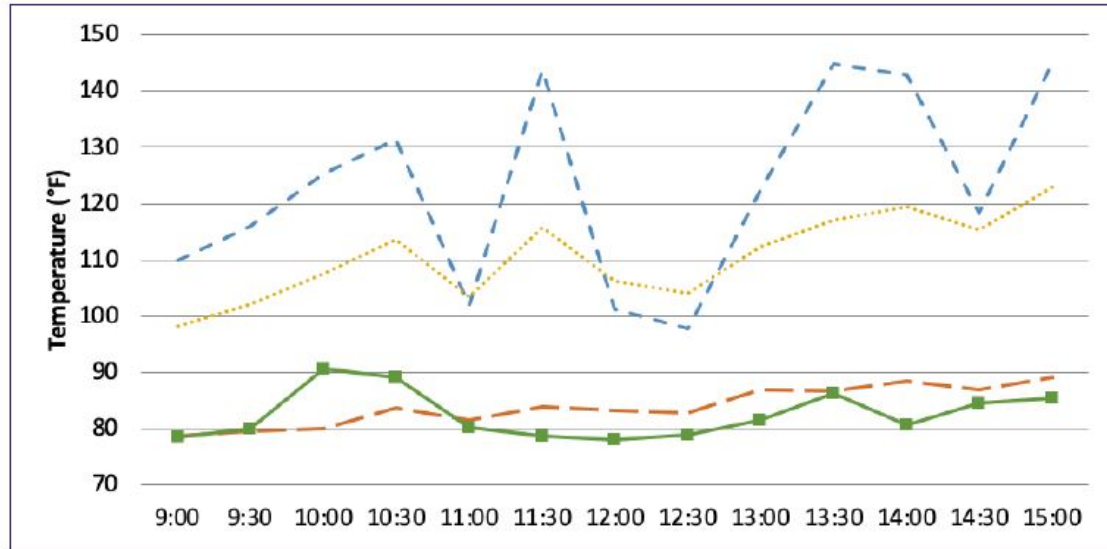
Thermal effect. An image taken 14 August 2002 by NASA's Landsat satellite (left) shows surface temperatures in upper Manhattan (red indicates warm temperatures, and blue indicates cool temperatures). A large synthetic turf field created high temperatures similar to those on a large black roof (see Google Earth image, right). Cool spots almost always correspond to urban vegetation, such as parks, street trees, and water bodies.

- Surface temperatures up to 200°F
- 50°F higher than natural grass
- 70°F hotter than air temp
- Increased air temperature at head height
- Watering provides limited cooling



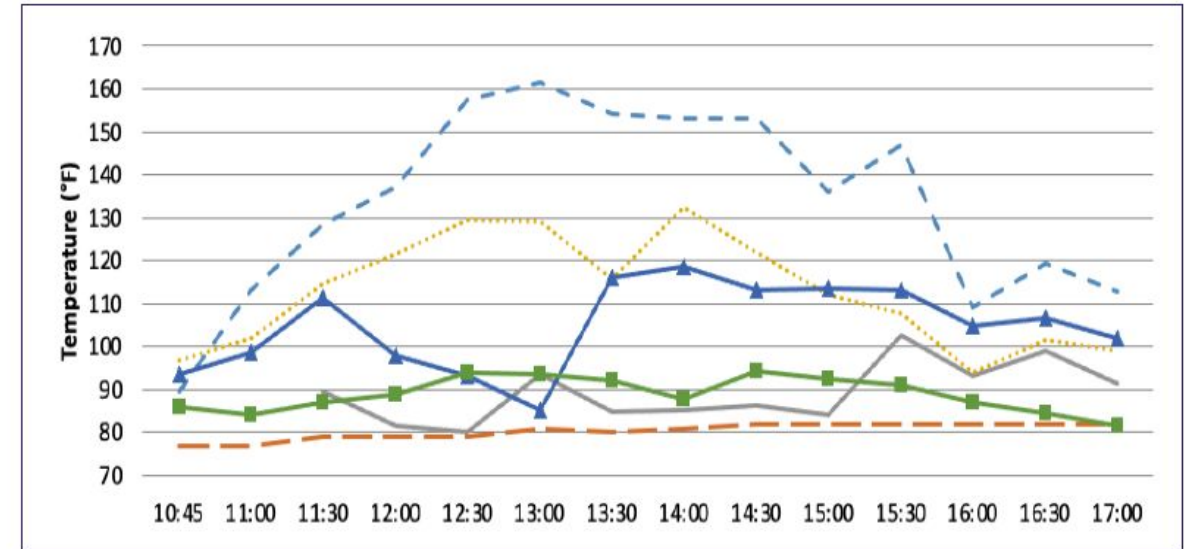
Dangerous surface temperatures on artificial fields and playgrounds, NYC

Crumb rubber turf field



--- Rubber surface
— Sand
—▲ Wood Mulch

PIP Playground



--- Ambient Temperature
... Asphalt
—■ Grass

Courtesy: Dr. Homero Harari, Mount Sinai

Health effects of hot turf

- Heat illness

- #1 cause of death and disability in high school athletes
- Football players most impacted
- Marching bands also at risk

- Skin burns

- 1st degree: 118°F
- 2nd degree: 131°F

- Game & practice cancellations/restrictions

- No play when surface temp >120°F
- Precautions and restrictions when air temp >82°F



<https://www.montgomeryschoolsmd.org/departments/athletics/programs/default/542923/>

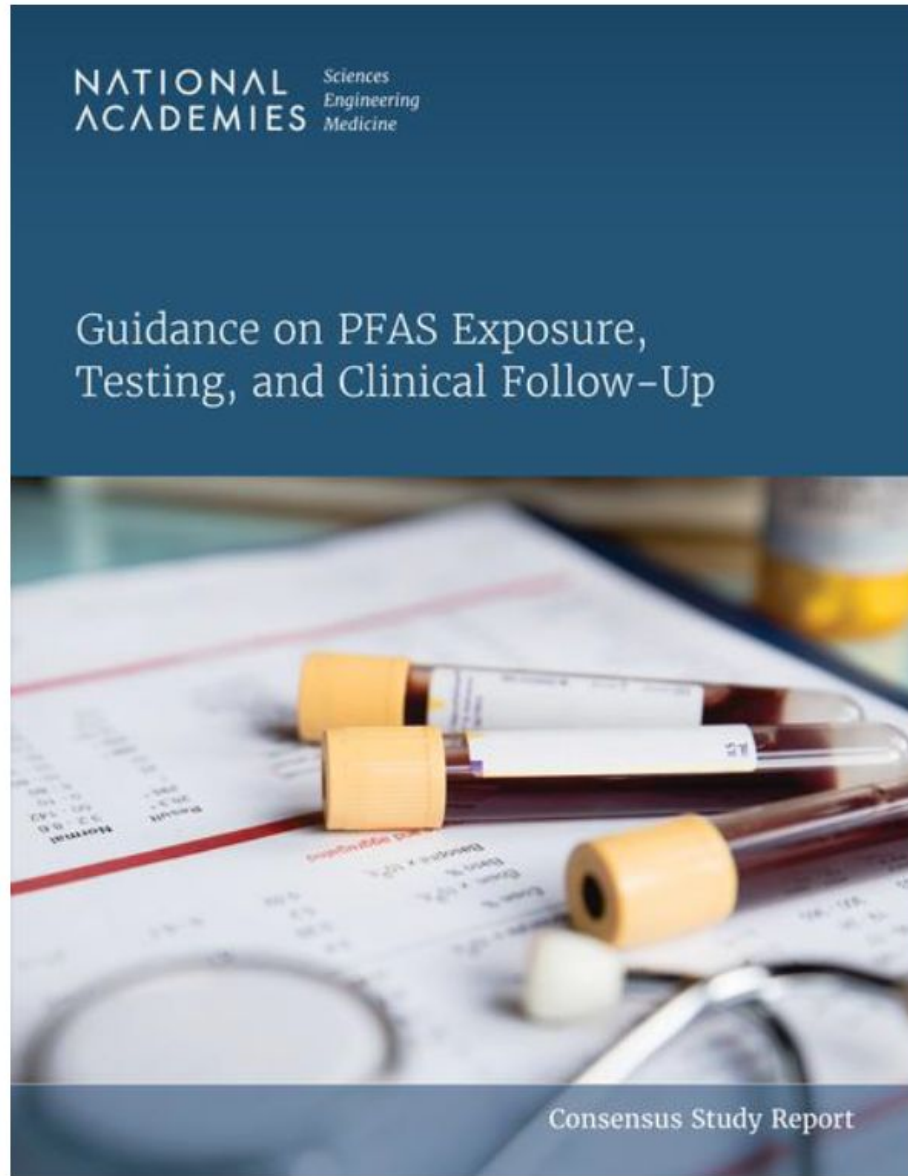
https://www.burlingtonpublicschools.org/district/district_policies/utilizing_artificial_turf_in_the_heat



Artificial Turf as a Children's Health Hazard

Stabilizers, plasticizers, pigments, fillers, and flame retardants may pose a risk for human health.

Clinical Guidance: PFAS testing



PFAS blood level (sum of 7 common PFAS)	Clinical Action
<2ng/mL	<ul style="list-style-type: none">• No follow up
2-<20ng/mL	<ul style="list-style-type: none">• Reduce PFAS exposures• Test cholesterol at 9-11 and 17-21 years• Test hypertension in pregnancy
>20ng/mL	<ul style="list-style-type: none">• Reduce PFAS exposures• Test cholesterol at 9-11 and 17-21 years• Thyroid function test at 18+years• Assess for testicular & kidney cancer and ulcerative colitis at well visits at 15+ years



The High Hidden Costs of Artificial Turf



Typical football sports field turf weighs 200 tons.

The disposal costs are summarized below in Table 9.

Table 9: Disposal Cost Summary*		
	62,625 sf field	85,000 sf field
Removal & disposal (TRC)	\$115,000 - \$148,000	\$149,000 - \$191,000
Disposal & resurfacing (STMA)	\$427,000 - \$512,000	\$553,000 - \$663,000
Transportation & landfill (STMA)	\$130,000	
Total (STMA) [disposal & resurfacing + transportation & landfill]	\$557,000 - \$642,000	\$683,000 - \$793,000
Landfill (Fresenburg) [no field size given]	\$45,000 - \$65,000	

* Rounded to three significant digits.

Sources: Turfgrass Resource Center. (no date.) "Natural Grass and Artificial Turf: Separating Myths and Facts." Available at http://www.nsgao.com/images/Natural-Grass-and-Artificial-Turf_booklet.pdf.

STMA. (no date.) "A guide to Synthetic and Natural Turfgrass for Sports Fields, 3rd edition. Available at http://www.stma.org/sites/stma/files/STMA_Bulletins/STMA%20Syn%20and%20Nat%20Guide%203rd%20edition%20FINAL.pdf.

Brad Fresenburg, "More Answers to Questions about Synthetic Fields – Safety and Cost Comparison", Turfgrass Specialist & Extension Associate, University of Missouri. PowerPoint slides obtained via email December 2015.

Sports Turf Managers Association (STMA) 2016

Total Costs \$557,000 to \$793,000 depending on field size

Credit: Toxics Use Reduction Institute, UMass

Artificial Turf Concerns

Infills



- Tire crumb contains chemicals that are known to be hazardous to human health and the environment
- Other infills can also contain chemicals of concern

Other Materials



- Toxic chemicals have been measured in artificial grass fibers
- Shock pads can be made with chemicals of concern
- Maintenance may require application of hazardous antimicrobials

Heat



- On summer days, artificial turf temperatures have been measured over 150 degrees F
- Can burn skin and increase the risk of heat-related illness among athletes

Disposal



- In most cases artificial turf cannot be completely recycled
- Most turf and infill is not recycled
- Most waste artificial turf goes to landfills

Environment



- Synthetic particles migrate into the environment, contributing to microplastic pollution
- Replacing natural grass reduces habitat for small organisms

Environmental Impacts for water and wildlife

A City of Eugene park project seeks to turn a natural area into a regional sports complex featuring artificial turf.

A photograph of a sunset over a body of water. The sun is low on the horizon, casting a bright orange and yellow glow across the sky and reflecting on the water. In the foreground, there are silhouettes of reeds and grasses. The overall scene is peaceful and scenic.

Artificial Turf Proposed for Golden Gardens

Golden Gardens at Sunset

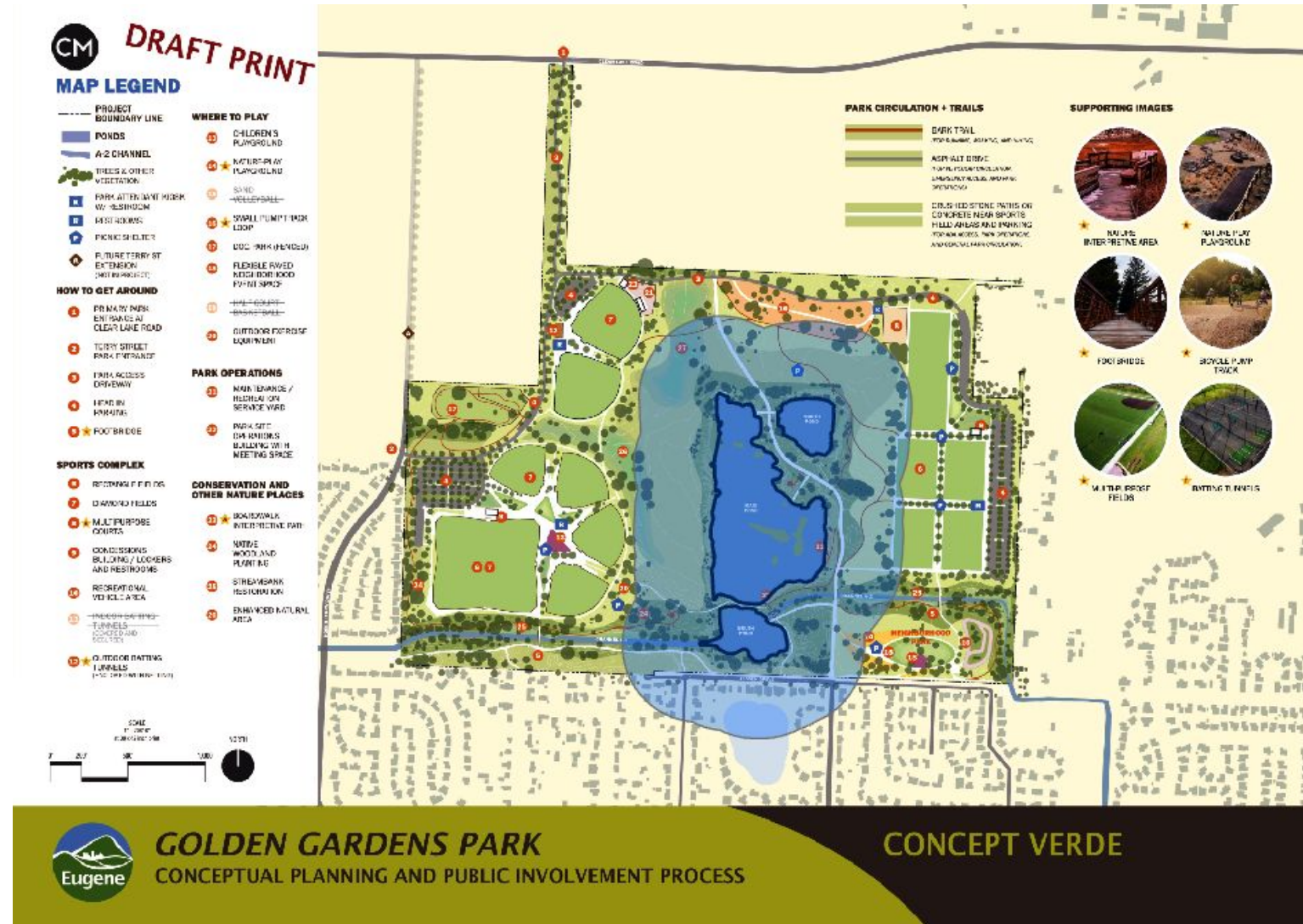
Eugene Has Big Plans for the Site

Current Draft Designs all include at least:

- 9 Baseball and Softball fields
- 6 Soccer Fields
- Artificial Turf for 365-day play

The minimum buffer of 500 ft around turtle habitat recommended by ODFW is shown in Blue.

If ODFW's larger recommended buffer of 1700 foot was used, it would cover most of the site.





Northwestern Pond Turtles on Site

Photo credit: Jennifer Eisele 4/9/2024

The Northwest Pond Turtle is listed as sensitive/critical in Oregon.
It is currently proposed for listing as threatened nationwide.



Guidance for Conserving Oregon's Native Turtles including Best Management Practices by ODFW

Golden Garden is great bird habitat

Oregon's Blue Heron



Bald Eagles nesting area



BioHabitats - City of Eugene Hired Ecological Consultant Recommendations

- Design for minimum 492 ft. buffer around existing NWPT habitat
- Seek to extend NWPT to >1300 ft. for native vegetated habitat
- Enhance and/or restore protected turtle habitat areas to create a protection zone.



Figure 19. Buffers of 492 ft. (yellow hatch), 1300 – 1640 ft. around the ponds at Golden Gardens (dotted lines).



DRAFT PRINT

MAP LEGEND

PROJECT BOUNDARY LINE

PONDS

A-2 CHANNEL

TREES & OTHER VEGETATION

PARK ATTENDANT KIOSK W/ HBS ROOM

REST ROOMS

PUBLIC SHELTER

FUTURE TERRY ST EXTENSION (NOT IN PROJECT)

HOW TO GET AROUND

- 1 PRIMARY PARK ENTRANCE AT CLEAR LAKE ROAD
- 2 TERRY STREET PARK ENTRANCE
- 3 PARK ACCESS DRIVEWAY
- 4 LEAD IN PARKING
- 5 FOOTBRIDGE

SPORTS COMPLEX

- 6 RECREABLE FITNESS FACILITY
- 7 DIAMOND FIELDS (10 TOWN)
- 8 MULTIPURPOSE COURTS
- 9 CONCESSION BUILDING / LOCKERS AND RESTROOMS
- 10 RECREATIONAL VEHICLE AREA
- 11 INDOOR RATTING TUNNELS (SOFTBALL AND BASEBALL)
- 12 OUTDOOR RATTING TUNNELS (SOFTBALL AND BASEBALL)

WHERE TO PLAY

- 13 CHILDREN'S PLAYGROUND
- 14 FUTURE PLAY PLAYGROUND
- 15 SAND VOLLEYBALL
- 16 PUMP TRACK LOOP
- 17 DOG PARK (FENCED)
- 18 TLE (TLE-PAVED) W/ BENCHES AND EVENT SPACE
- 19 HALF COURT BASKETBALL
- 20 OUTDOOR EXERCISE EQUIPMENT

PARK OPERATIONS

- 21 MAINTENANCE / REPAIR / IRRIGATION SERVICE YARD
- 22 PARK SITE OFFICES BUILDING WITH MEETING SPACE

CONSERVATION AND OTHER NATURE PLACES

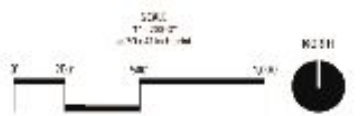
- 23 BOARDWALK INTERPRETIVE PATH
- 24 NATIVE WOODLAND PLANTING
- 25 STREAMBANK RESTORATION
- 26 ENHANCED NATURAL AREA

Putting It All Together

PARK CIRCULATION + TRAILS

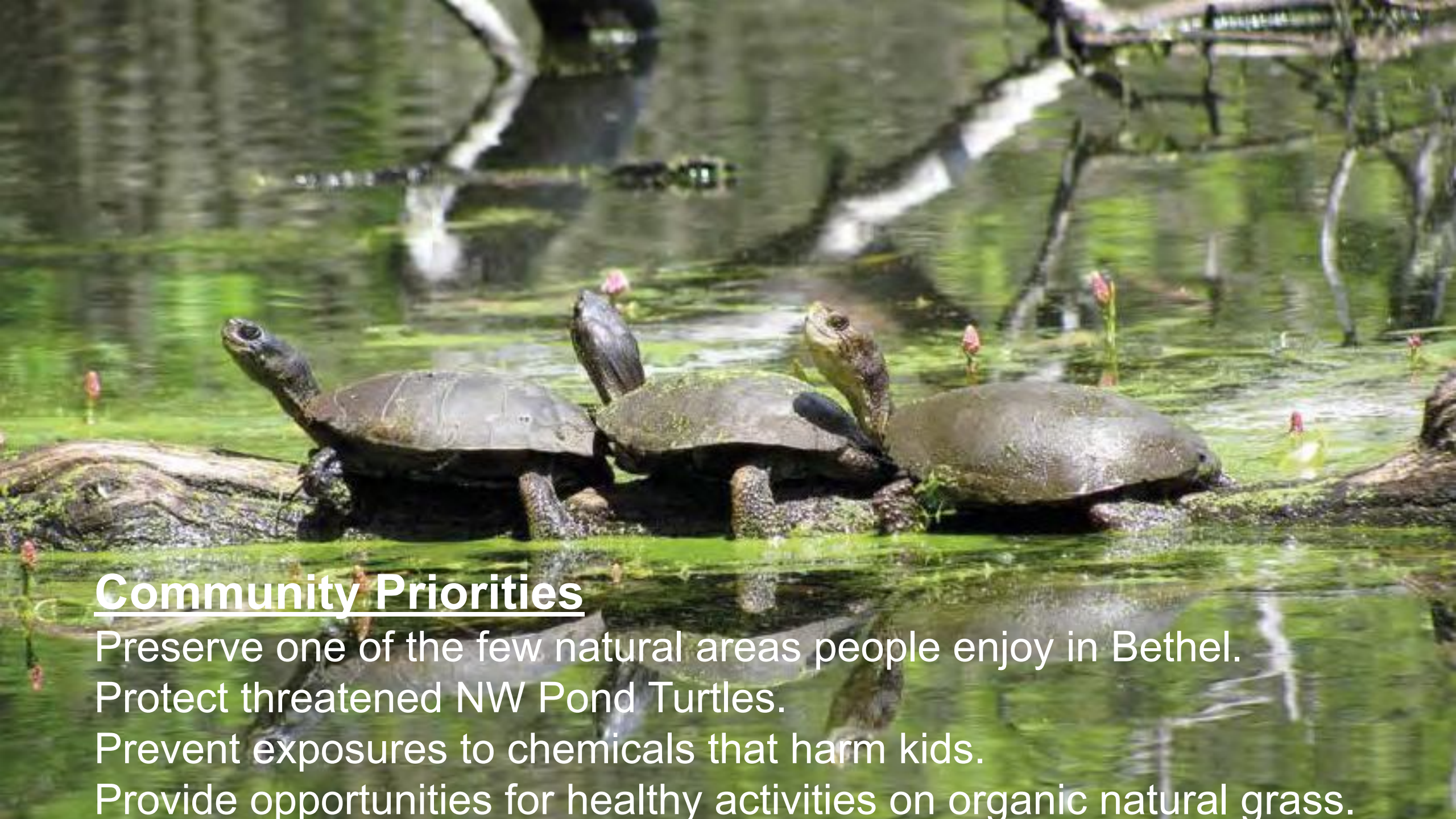
- 27 BUSH TRAIL (W/ PLANTINGS AND LIGHTS)
- 28 ASPHALT DRIVE (W/ STRIPES AND LIGHTS, MULTIPURPOSE USE AND PARKING)
- 29 CRUSHED STONE PATHS OR CONCRETE NEAR SPORTS FIELD AND PARKING (W/ AN ACCESSIBLE SIDEWALK AND GENERAL PARK CIRCULATION)

SUPPORTING IMAGES



GOLDEN GARDENS PARK
CONCEPTUAL PLANNING AND PUBLIC INVOLVEMENT PROCESS

CONCEPT AZUL




Community Priorities

Preserve one of the few natural areas people enjoy in Bethel.

Protect threatened NW Pond Turtles.

Prevent exposures to chemicals that harm kids.

Provide opportunities for healthy activities on organic natural grass.

A close-up photograph of artificial grass. The blades are bright green and appear to be made of a synthetic material. They are growing out of a dark, textured black plastic backing. The lighting is even, highlighting the texture of both the grass and the plastic.

Not safe for kids or wildlife.
Pollutes rivers and oceans.
Fills our world with plastic waste.
Heats our planet.
Not okay for a livable future.

BioHabitats - City of Eugene Hired Ecological Consultant Recommendations

- Realign Channel A-2 for a more sinuous, naturalized form.
- Investigate and reconnect, where possible, historic water relationships as guided by hydric soil types and currently saturated soils. Where drainages co-occur with desirable locations for development, create opportunities for green infrastructure, Low-Impact Development, and/or high-functioning bypasses.
- Restore and extend native riparian zones and wetlands along natural drainages. This supports water quality in addition to habitat diversity.
- Restore native upland prairie, prioritizing NWPT buffer and less common soil types.



Figure 20. Preliminary strategy ideas to restore habitat and landscape diversity at Golden Gardens Park. Understanding that these continuous channels will be difficult with park construction, green infrastructure, low-impact development, and/or bypasses could also be considered.

BioHabitats - City of Eugene Hired Ecological Consultant Recommendations

Figure 21. Combined preliminary strategies of a protected and restored 150-m buffer within NWPT habitat (yellow hatch), reconnected hydrologic connections, realigned channels, and restored native riparian zones and wetlands. Native prairie restoration would occur in the interstitial spaces among channels.



Community Priorities

- Preserve one of the few natural areas people enjoy in Bethel
- Protect NW Pond Turtles that are proposed to be listed as threatened/endangered
- Provide opportunities for healthy activities in Bethel on organic natural grass