Pervious Pavements and the Toxicity of Urban Stormwater

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Permeable paving is a range of sustainable materials and techniques with a base and subbase that allow the movement of stormwater through the surface. In addition to reducing runoff, this effectively traps suspended solids and filters pollutants from the water.
Permeable pavements - a great idea but there are problems

• Do not have the tensile and compressive strength of regular pavements

• Can clog over time if not maintained properly
Boeing Carbon Fiber Product

Received grant from Boeing to evaluate a carbon fiber product that they developed for aircraft wings as a potential means to increase the durability of permeable pavements.
The WSU engineering team developed the process to incorporate carbon fiber into permeable asphalt and concrete.

WSU Puyallup developed the toxicity data.
Toxicity studies

• Exposed *Ceriodaphnia dubia* to lab water and lab water run through traditional permeable asphalt and concrete and carbon-fiber modified permeable pavements

• Exposed *C. dubia* to urban stormwater run through traditional permeable asphalt and concrete and carbon-fiber modified permeable pavements
Concrete Columns
Flocculate in lab leach water from concrete cores
Asphalt columns
Addition of Boeing’s carbon fiber to both pervious concrete and porous asphalt increased tensile and compressive strength.
Seattle Freeway runoff
Conclusions

• Addition of Boeing’s carbon fiber to pervious concrete and porous asphalt resulted in increased tensile and compressive properties and improved infiltration

• Addition of carbon fiber to porous asphalt reduced toxicity to *C. dubia*.
Next steps

• Evaluate toxicity to salmon and other fish species
• Evaluate stormwater from a series of rain events
• Evaluate leachate toxicity over time – multiple water samples run through the columns