



# Puddle-jump, fun? No.

Here's why.

After a rain spell, puddles in parking lots and on sidewalks are magnets for children. These tiny-want-to-be pools are tempting for foot-stomping fun, but, as Grace Academy students discovered, puddles are full of toxins and should be avoided.

FIRST Lego League participants, from around the world, were challenged during the 2017-2018 season with identifying a problem in the human water cycle that affects the way people find, transport, use, or dispose of water. Grace Academy's

Eaglebots decided to focus on reducing storm water run-off.

Students were tasked to walk around their homes, neighborhoods and around town to identify standing water. They found it everywhere. They reported that a lot came from roofs without gutters. "Rain fell to the ground and pooled in front yards at low spots.", shared Lilian Lee, a Grace Academy fourth-grader. "There was also rain that fell into downspouts that emptied onto sidewalks and parking lots creating puddles."

Students conducted online research and learned that rain that falls on roofs becomes polluted as it collects toxins from roofing materials, algae and moss. When rain hits ground surfaces, such as sidewalks, lawns, parking lots, footpaths, and driveways, it mixes with fluids from vehicles, fertilizers, soil, and/or cleaning compounds—and road-kill if present.



Additionally, students learned that dog waste is an environmental pollutant. In 1991, dog feces was labeled a non-point source pollutant by the Environmental Protection Agency (EPA), placing it in the same category as herbicides and insecticides; oil, grease and toxic chemicals; and acid drainage from abandoned mines. (<http://www.doodycalls.com/resources-toxic-dog-waste/>)

Puddles become polluted and can become breeding grounds for toxic microorganisms which have the potential of developing into infectious diseases and viruses.

All stormwater in the city of Marysville is discharged directly into local streams, lakes and eventually in up in Puget Sound. The City has a Municipally Separate Storm Sewer System in which rain water and waste water are conveyed in separate pipe systems to different endpoints. Through this process, stormwater goes directly to the stream, while waste water goes directly to the treatment plant.

Cities like Seattle and Everett have combined systems where rain water and waste water go into the same pipe system and both go to the treatment plant. However, during heavy storms, the treatment plant cannot handle the high capacity of water and the system will overflow into surface water – dumping both stormwater and untreated waste water into the creek. To help avoid this, these Cities offer rebate programs to reduce stormwater inputs and prevent overflows. The City of Marysville does not need to do this because our systems are separate.



Students determined that storm water run-off could be reduce by adding gutters to outbuildings. They identified two residential properties to work on specifically. One homeowner experienced a small pond from rain falling off a roof of a large utility shed that had no gutters—actually, none of the outbuildings on property had gutters. The students educated the homeowners about collecting rain using barrels. Student advised the homeowners to use the harvested rainwater for irrigation purposes, washing vehicles, and pressure washing applications. Both homeowners install rain barrels. One reported that the system was slightly helpful, but since there was no water pressure, the water drizzled out from the hose.

The students regrouped and contemplated what could be done. After more research and considering the homeowner’s budget, they designed a portable water filtering system that she could afford and was easy to set up and use. Additionally, because the system was portable, she could use it to access water from all the rain barrels at each outbuilding.

The homeowner was pleased with the results.

The students quantitative research included an online survey to ascertain the level of awareness and engagement in rainwater harvesting practices. Flyers, promoting the survey, were sent home weekly for two months. Parents and coaches also promoted a link to the survey on their Face Book pages. The survey results provided a better sense of how much participants knew about polluted water and harvesting. The survey consisted of seven questions. Seventy-seven people completed the survey. The survey had a 100 percent completion rate and on average, took two minutes and 14 seconds to complete. Highlights include:

- 30% of respondents were not aware that storm water was polluted or contaminated.
- 70% of respondents did not know about harvesting rainwater and wanted to learn more.
- 50% of respondents would install a catchment system to take advantage of a cash-back rebate if offered.

Students shared their research with Brooke Ensor, National Pollutant Discharge Elimination System (NPDES) Coordinator and Mayor Nehring, City of Marysville, to ask if they can work together to help educate city residents. They agreed to expanding the City’s website to include the students’ research and



adding links to water conservation pages published by the Snohomish County Water Conservation District and the Surface Water Management department.

Additionally, Grace's FLL coaches will work with City personnel discuss hands-on field educational opportunities and in-class instruction by City staff to complement Grace's science education curriculum.

Students learned by sharing their project with others was the greatest benefit. They had no idea where the season would take them. Opened doors have inspired them academically and peaked their interest for future engagement in science and city government careers. Mr. Timmermans, said, "We are thankful we have found resources in our own backyards and individuals who are open to helping us grow our programs for our students and the community."