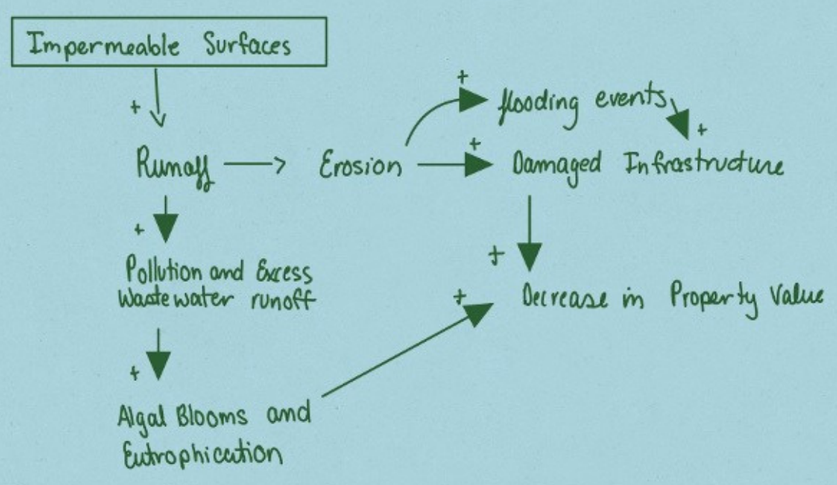
PERMEABLE SURFACES

Development in urban environments, like Burlington, have a high percentage of impermeable surfaces, which results in increased runoff carrying pollutants from the city into Lake Champlain. Ecological and economic systems are strongly influenced by water quality which is seen in the nutrient loading and non point runoff into the Lake Champlain watershed and subsequent toxic algae blooms and reduction in water quality. By implementing permeable surface solutions like community gardens, green roofs and improved riparian buffers, pollution can be reduced, which in turn would improve the state of ecological and economic systems.

WHY DO WE NEED PERMEABLE SURFACES?

Permeable surfaces allow water to be filtered through layers of organic matter and soil, removing toxins while replenishing the surrounding area with life sustaining resources. However, when water is inhibited from doing this by the built environment it retains those pollutants and picks up more as it travels. Thus, simultaneously polluting the surrounding area and severely reducing groundwater infiltration.

A lack of permeable surfaces in a community can influence water quality and availability, which are both necessary for an area to be habitable for humans and other organisms. Additionally, trying to control the flow of water with impermeable surfaces can lead to erosion, and damaged infrastructure, costing far more money and time in the long run than the implementation of impermeable surfaces.



Socio-Economical:

- permeable surfaces → green infrastructure available for all in the community, improves quality of life for everyone

Socio-Ecological:

- permeable surfaces → improved groundwater infiltration, improved water availability, less run-off, waterway stability

Eco-Ecological:

- permeable surfaces → less eutrophication, less flooding events, less infrastructure damage, healthier habitats/ecosystems, soil stability, less erosion and sedimentation, tourism improves

By implementing permeable surfaces, we are creating a SUSTAINABLE FUTURE!

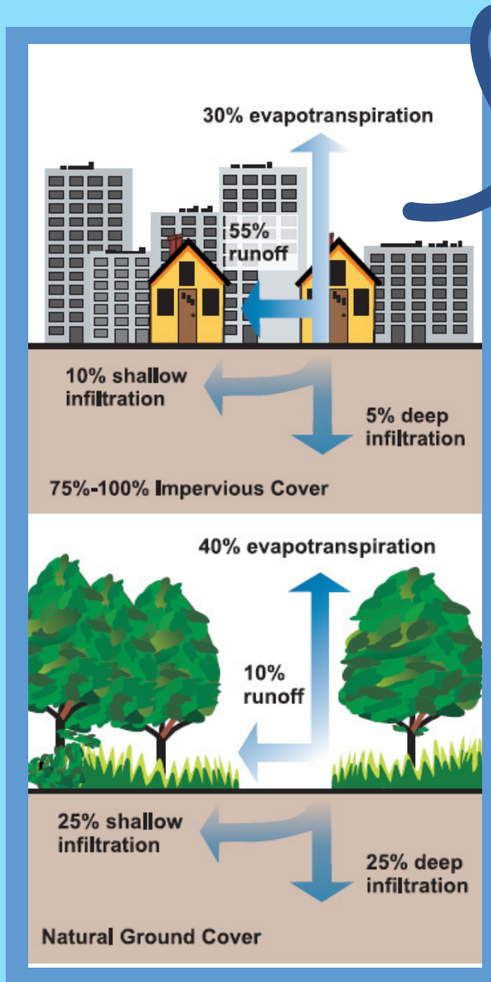


Fig. 1: Destination of Water in Impermeable and Permeable Environments

Moreau1. (2003, February). File : Natural & Impervious Cover Diagrams EPA.jpg. Wikipedia Commons. Retrieved December 11, 2022, from https://commons.wikimedia.org/wiki/File:Natural_%26_impervious_cover_diagrams_EPA.jpg

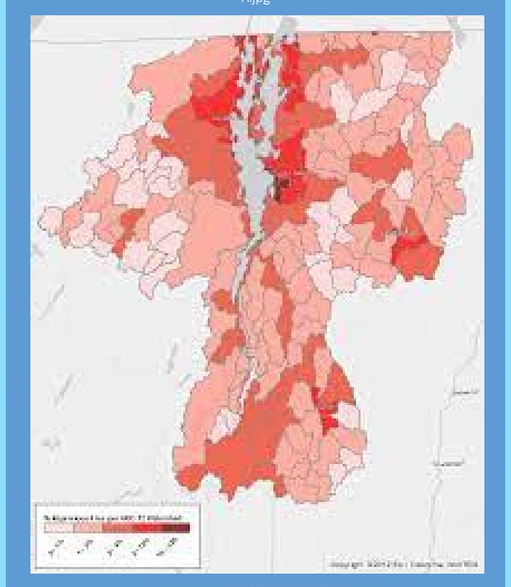


Fig. 2: Impervious Surfaces in the Lake Champlain Watershed (Excluding Canada)

O'Neil-Dunne, J. (2013, October). Mapping Impervious Surfaces in the Lake Champlain Basin. Lake Champlain Basin Program. Retrieved December 11, 2022, from https://www.lcbp.org/wp-content/uploads/2013/11/76_MappingImperviousSurfaces.pdf

Fig. 4: Permeable Pavers

Google. (n.d.). Google image result for https://www.mutualmaterials.com/wp-content/uploads/2016/11/110416-0208-1024x684.jpg. Retrieved December 11, 2022, from https://www.google.com/imgres?imgurl=https%3A%2F%2Fwww.mutualmaterials.com%2Fwp-content%2Fuploads%2F2016%2F11%2F110416-0208-1024x684.jpg&imgrefurl=https%3A%2F%2Fwww.mutualmaterials.com%2Fintroduction-to-permeable-concrete-paving%2F&tbnid=TQmWCK_Mb7UaeM&vet=12ahUKEwi61ZujmfL7AhXKunIEHYGwADMQMygiegUIARDzAg..i&docid=rcf4TQtxAB1f5M&w=1024&h=684&q=permeable+pavers+driveway&ved=2ahUKEwi61ZujmfL7AhXKunIEHYGwADMQMygiegUIARDzAg

We want **less** run off. The contrast in runoff rates between an area with more permeable surfaces (top), and one full of impervious land cover helps to show how natural processes are affected. When we have **improved groundwater infiltration**, we have **improved water quality**, and who doesn't want that?

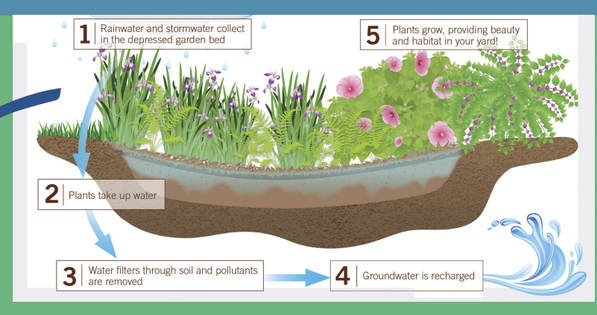


Fig. 3: Diagram of a Rain Garden

McHugh, J. (n.d.). That Rainy-Day Feeling. Edible Columbia. Retrieved December 11, 2022, from https://ediblecolumbia.ediblecommunities.com/food-thought/rain-gardens

IMPERMEABLE V.S. PERMEABLE SURFACES

- Human use in an urban area pollutes road surfaces with oil, grease, tire and brake wear, which then flows into the city's drainage system and surface water as it cannot infiltrate concrete
- 60% reduction in total suspended solids across permeable pavement type, about a 20% reduction in total phosphorus load for PICP and PA with a 43% reduction for PC, and about a 45% reduction in metal concentrations across permeable pavement types
- The cost of permeable pavement types range from $6.50 to $10.00 per square foot for installation compared to $9.50 to $11.50 per square foot for typical pavement and storm systems
- Rain gardens have the ability to detain 90% of rainfall events in garden network basins.
- Of the 10% of events causing an overflow to the Combined Sewer System, the flows were delayed off peak for an average of 5.5 hours
- In rain gardens native plant seeds can be foraged, and existing areas can be improved

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7433195/
https://www.sciencedirect.com/science/article/pii/S0301479719312289

NEXT STEPS:

- **Implementing rain gardens and converting your driveway to permeable pavers**
- **Use your voting power to make a difference → you can make a lasting and profound difference in your community for free!**

Nicholas Farrar, Josslin Muto,
Ava Stackhouse, Mica Vasseur