Soak it for Schools!

a stormwater education compilation for primary schools

Let it Rain
Stormwater Program

Soak it for Schools!

acknowledgements

Soak it for Schools! is a stormwater education compilation of a variety of existing and new materials.

Compiled by: Winooski Natural Resources Conservation District & Lamoille County Natural Resources Conservation District. 2015.
Project Leaders: Sophie Sauvé (WNRCD) and Kimberly Komer (LCNRCD)

Soak it for Schools! was funded by an agreement awarded to the Winooski Natural Resources Conservation District (WNRCD) by the Great Lakes Fishery Commission to the New England Interstate Pollution Control Commission (NEIWPCC) in partnership with the Lake Champlain Basin Program (LCBP). NEIWPCC manages LCBP's personnel, contract, grand, and budget tasks and provides input on the program's activities through a partnership with the LCBP Steering Committee.

The viewpoints expressed here do not necessarily represent those of NEIWPCC, the LCBP Steering Committee, or GLFC, nor does mention of trade names, commercial products, or causes constitute endorsement or recommendation for use.

Let it Rain is a program managed by the Winooski Natural Resources Conservation District and the University of Vermont's Sea Grant. **Soak it for Schools!** was developed by and is managed by the Winooski Natural Resources Conservation District (WNRCD). The Lamoille County Natural Resources Conservation District was a partner in identifying, organizing and vetting the content of the work compiled here and in testing out the materials in schools.

Lake Champlain Basin Program

NEIWPCC
New England Interstate Water Pollution Control Commission

The Winooski NRCD would like to thank all the students and their respective teachers willing to vet this compilation, try out the suggested activities and offer us feedback!

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Soak it for Schools!

dear educators

Current news addressing the health of Lake Champlain from the press, to the Statehouse, from the lake, to the 'field', have seen several key figures in Vermont get excited about a plan to 'clean up the lake'. As individuals who live and work in the Lake Champlain Basin, who enjoy the opportunity to recreate in both the lake and its contributing tributaries, having healthy water is imperative.

While the state of the lake is complicated by several detrimental inputs, what is simple is that one of the key contributing factors is non-point source pollution in the form of stormwater. Soak it for Schools! is an educational resource that aims to connect students and their schools to the surrounding community and watershed by providing lessons on how we all fit into the clean-up puzzle when it comes to stormwater.

At the Winooski Natural Resources Conservation District (WNRCD), we have been working with landowners, agricultural producers, foresters and individuals since 1940 on protecting soil and water through various programs that we develop from grant funding. We are excited to bring our knowledge, experience and passion for conservation to schools through the *Let it Rain* **Soak it for Schools!** program. **Soak it for Schools!** is a compilation of activities that orient students to stormwater and their connection to it. Lessons range from the water cycle to how stormwater is mitigated and how we can all get involved on soaking the storm. Given the opportunity, students will have the chance to demonstrate environmental stewardship through engaging activities and bringing their knowledge home.

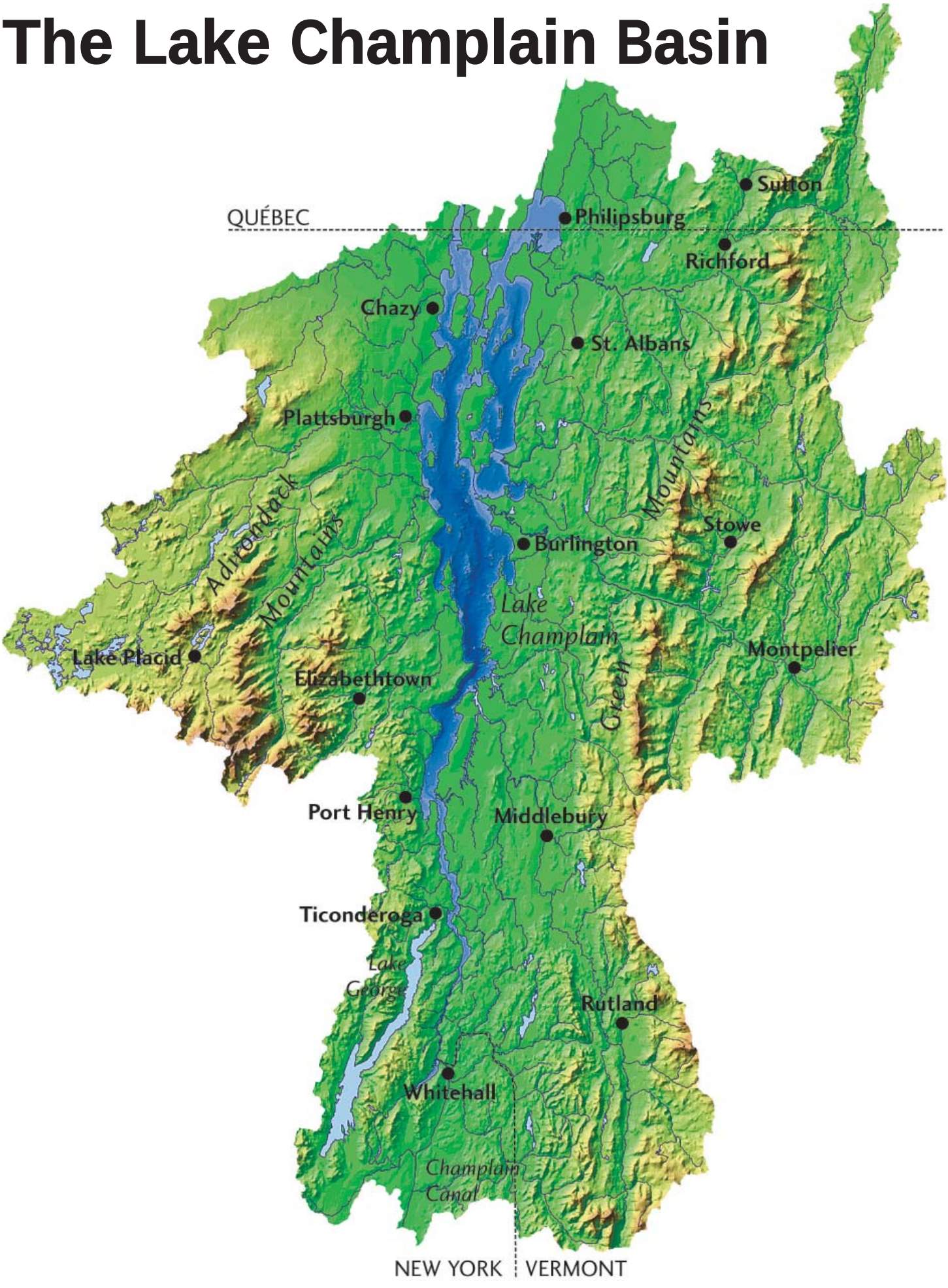
The **Soak it for Schools!** program is a compilation of resources that we have assembled from throughout the United States and beyond. The lessons were selected for their creative approaches to bringing the issue of stormwater to school-aged children. We focused on six lessons that range from basic information on the water cycle to how stormwater can be mitigated by school groups. They are by no means exhaustive of the resources that exist 'out there' and we are eager to build upon/ modify/ substitute our suggestions with your feedback. At this stage, the examples are diverse, that is, they have not been amended to be Vermont-specific, but are general enough to be adapted as needed. We are eager to hear how these lessons are implemented and received and want to underline that we want to hear from you! We are also available to help deliver the information to your classrooms.

Please join us in engaging your students in the activities and lessons we have selected and involving them in reducing our contribution to stormwater. If you would like more information about stormwater, **Soak it for Schools!** or any of our other soil and water conservation programs, please get in touch. We are always eager to hear about how we can help you conserve our natural resources.

Sincerely,

Sophie Sauvé
District Manager
Winooski Natural Resources Conservation District (WNRCD)

The Lake Champlain Basin



Soak it for Schools!

table of contents

Soak it for Schools!

introduction

Two common requests we receive at Natural Resources Conservation Districts (NRCDs) across Vermont is to speak to schools about stormwater and to provide ideas for student projects that spark their passion for land stewardship. These appeals are timely. Vermonters who live and work in the Lake Champlain Basin have increasing pressure to reduce non-point source pollutants in the form of phosphorus entering the lake either directly or via streams. Since these phosphorus contributions continue to aggravate a history of inputs triggering algal blooms, each Vermonter needs to take the state of the lake seriously and act for change. Vermonters outside the Lake Champlain Basin are equally affected by nearby waterbodies that are listed as impaired, and by the overall effect impaired waterbodies can make on individuals enjoying water either through recreation or tourism, providing food or a source of fresh water.

Students, sponges for knowledge, are potential stormwater revolutionaries in need of tools to act. Let it Rain's Soak it for Schools! was developed as the catalyst needed for students to dig deep to identify their roles in water quality and water health when it comes to stormwater.

School campuses are traditionally large impervious surfaces that contribute to stormwater runoff. Whether located adjacent, near or some length away from a body of water, most campuses impact upon runoff based solely on their large roofs, hard compact parking lots and sidewalks, and often, spans of turf. What better 'laboratory' for studying stormwater than in their own school yards! In addition, Vermonters have both snow melt and water runoff that lead to stormwater fluctuations that impact upon storm systems, including increasing flows and 'flushings' and causing strain on stormwater systems, culverts and rivers.

Soak it for Schools! seeks to address non-point source pollution and ultimately, stormwater issues on school campuses where students can identify, design and develop solutions and installations accessible as demonstrations to the larger community. By empowering a few, we can reach many.
The Winooski Natural Resources Conservation District (WNRCD), which encompasses the Winooski River Watershed and parts of the Lake Champlain Basin and other smaller watersheds, has been working with individual landowners for several years to address stormwater issues. In the last few years, through a project called Let it Rain, WNRCD provides technical and, when funding is available, financial assistance to homeowners who wish to reduce their contribution to non-point source pollution. Through Let it Rain, the WNRCD has led the effort to increase people's role to minimize the effects of stormwater through simple, accessible solutions. Soak it for Schools! was developed based on our experience working with the public over the years and identifying the gap in local information on stormwater aimed at youth.
Soak it for Schools! is a toolkit, as well as a warehouse of existing resources that teachers can access to address the issue of stormwater at an age-appropriate level, and is an evolution of local-specific resources being adapted to relate to Vermont.

Soak it for Schools! is funded by an agreement awarded by the Great Lakes Fishery Commission to the New England Interstate Pollution Control Commission (NEIWPCC) in partnership with the Lake Champlain Basin Program (LCBP). NEIWPCC manages LCBP's personnel, contract, grand, and budget tasks and provides input on the program's activities through a partnership with the LCBP Steering Committee.

Introductory Video:
Water Conservation Design. Watch Central Texas Gardener.
Demonstrates a classroom's experience with stormwater dynamics and water quality protection.

http://video.klru.tv/video/2365161146/
starts at 4:26 relating directly to the watershed and water

Soak it for Schools!

choosing lessons

Soak it for Schools! is designed to help teachers identify resources that can guide students to understand the ripple effects of stormwater in their watersheds. It is also meant to connect students to the implications that can and do affect everyone's enjoyment of Vermont's water resources in some way. We have collected numerous examples of stormwater activities across the nation and from other parts of the world to assemble a collection of lessons that are easily replicated in the Vermont context, and that in the future we hope to acquire funding to adapt to be Vermont-specific. This is not meant to be an exhaustive compilation of resources, just the opposite. It a foundation of resources and we encourage everyone to send us other tools they have found, used, or created and enjoyed so that others may benefit.

The lessons are suitable for a range of students, but we focused on the fifth grade Natural Resources Standards since it applies to impacts of human activities. The information and activities guide six core themes or chapters with several options for lessons. Every theme includes a guiding question, a series of suggested lessons, reflective questions and extra resources. Recognizing that everyone learns differently, we hope that a presentation introducing the lesson coupled with both written or technological exercises and/or a hands-on activity might help everyone absorb the information in their own way.

how to use the toolbox

The objective of our work thus far is to test the lessons out, identify those lessons that have the most positive feedback and impact and then where needed, and if funding permits, make them Vermont-specific. We know there is not a desert in Vermont, but where those in Arizona worry about washes, we worry about flooding. Hopefully this will help children connect to others in other places that face both different stormwater challenges and similar concerns to their implications for water quality

The Lt it Rain - Soak it for Schools! Toolbox is a work in progress. We welcome feedback and urge you to complete our evaluation as you field-test its components so that the resources can be fine-tuned for widespread use and distribution.

After receiving feedback, we hope to adapt the lessons into what is useable and practical. We also plan to develop the information and lessons in a unt. We are cognizant that time commitments for this subject may be limited in the classroom so lessons can be completed separately. We have also compiled a quick reference of key concepts.

Infographics:
The Water We Eat
Great infographic that explores our larger impact on water
http://www.angelamorelli.com/water/

Soak it for Schools!

dear parents/ guardians

The recent rumblings about the health of Lake Champlain from the press, to the Statehouse to the 'field' have seen several key figures in Vermont get excited about a plan to clean up the Lake. While the state of the lake is complicated by several detrimental inputs reaching it through our rivers and streams that make up the great basin from Cabot to Charlotte, what is simple is that one of the key contributing factors is non-point source pollution in the form of stormwater. Soak it for Schools! is an educational resource that aims to connect students and their school to the surrounding community and watershed by providing lessons on how we all fit in the clean-up puzzle when it comes to stormwater.

At the Winooski Natural Resources Conservation District (WNRCD), we have been working with landowners, agricultural producers, foresters and individuals since 1940 on protecting soil and water and are excited to bring our knowledge, experience and passion for conservation to schools through the Soak it for Schools! program. Soak it for Schools! is a compilation of activities that orient students to stormwater and their connection to it. Lessons range from the water cycle to how stormwater is mitigated and how we can all get involved on soaking the storm. Given the opportunity, students will have the chance to demonstrate environmental stewardship through engaging activities and bringing this knowledge home.

Please join us in engaging your child/ren in the activities they will undertake and asking them about stormwater. If you would like more information about stormwater, Soak it for Schools! or any of our other soil and water conservation programs, please get in touch. We are always eager to hear about how we can help you conserve our natural resources.

Sincerely,

Sophie Sauvé, District Manager

Winooski Conservation District

"Connecting people to a sustainable landscape"

www.winooskinrcd.org

For more information about the Lake Champlain Basin, please see the State of the Lake report 2012:

http://sol.lcbp.org

A

Suggested Lessons
Classroom Activities

A1. Remembering the Rain (Stormwater in the Desert)

A2. Water Cycle in a Bag (Stormwater in the Desert)

A3. Measuring Rainfall (Stormwater in the Desert)
Water Audits

A4. How much water do you use? (PartSelect: http://www.eduplace.com/science/hmxs/es/pdf/5rs_3_4-4.pdf)

A5. School Water Audit (Barwon RWC Learn it! Live it!)
Classroom Reflection
Saving Water at School (http://www.coolaustralia.org/using-and-saving-water-at-school/)

Web Activities
Interactive Poster:
USGS Water Science for Schools. USGS. http://water.usgs.gov/edu/watercycle.html Interactive Diagrams of Water Cycle. Websites contain informational pages on Surface Water Quality Impervious surfaces; Runoff; Sediment fences reduce runoff; Sediment ponds to trap sediment.

Let it Rain
Stormwater Program

Water, Water, Everywhere!

Exploring the water cycle, observing and identifying rain and snow.

In this lesson, students explore the water cycle, observe rain and/or snowmelt, and note the quantities of precipitation that are part of the water cycle. They will be guided to note regular occurrences such as storms and their impact on their surroundings, as well as the other parts of the water cycle that are affected by an event (evaporation, transpiration, etc.).

Guiding Question:
What does the water cycle mean for the surrounding watershed?

Reflective Question:
Where do we fit in with the water cycle?

Video:
Critters in the water and what they tell us and/ or Macroinvertebrates: Understanding water quality through the creatures that live in waterways

Introduces the role of macroinvertebrates and their role in the aquatic ecosystem and indicator of water health (http://floridaswater.com/education/lessonplans/)

Soak it for Schools!

B

Suggested Lessons
Classroom Activities

B1. Know Your Watershed (Stormwater in the Desert, p.9-10)

B2. Crumpled Watershed Model (University of Nebraska – Storm-water Activity Sheet)
or
(B2b. How to Build a Model Watershed (Much more elaborate exploration of a watershed) (A New Outdoor America)

Outdoor and Off-Site Activity (field trip)

B3. Discovering Waterways. (Barwon RWC Learn it! Live it!)

Reflective Activities

B4. What is your Watershed Address? (Watershed Connec-tions. Virginia Association of Soli & Water Conservation Districts)

B5. How Big is the River Really? (Watershed Education Lesson Plans, Thomas Jefferson Soil & Water Conservation District)

Let it Rain
Stormwater Program

Watershed Walkabout

Discover our connection to a larger context when it comes to stormwater.

In this lesson, students will discover the reaches of a watershed, their connection to it from a larger and smaller scale, and how the path of water runs through a watershed. Students will identify the watershed in which their school is located and see mapping as a tool for identifying the connections between water sources.

Guiding Question:
Why and how does the health of our local streams impact our watershed?

Reflective Question:
How does our behavior affect our watershed?

Web:
Watershed Game:
http://bellmuseum.umn.du/games/watershed/

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C

Suggested Lessons
Classroom Activities

Overview Video
Ever wondered where the rain goes? Sustainable drainage animation (Susdrain) https://www.youtube.com/watch?v=LMq6FYiF1mo

Classroom Discussion
C1. When Water Comes to Town – Where does it go? (Stormwater in the Desert, p. 14-16)

Classroom Activities
C2. Raindrop Races (Stormwater in the Desert, p.17-19)
C3. Color me a Watershed (Thomas Jefferson Soil & Water Conservation District)

Outdoor Activity
C4. How Much Water Runs Off? (University of Nebraska at Lincoln Extension)

Let it Rain
Stormwater Program

Wading in the (Dirty) Storm

Explore the relationship between different ground surfaces and stormwater.

In this lesson, the difference between impervious and pervious land surfaces, the effects of development on the watershed and pollution to stormwater will be examined in active lessons.

Guiding Question:
How can land use impact water quality?

Reflective Question:
What kind of human behaviors affect stormwater?

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D

Suggested Lessons

Classroom Discussion

D1. Discovering the Ground Water (Barwon RWC Learn it! Live it!)

Classroom Activities

D2. Fertile Green (Thomas Jefferson Soil & Water Conservation District)

D3. Invisible Passengers (Thomas Jefferson Soil & Water Conservation District)

D4. Rubbing the Earth the Wrong Way (Thomas Jefferson Soil & Water Conservation District)

Outdoor Activity

D5. Does it Soak Right In? (Thomas Jefferson Soil & Water Conservation District.)

Let it Rain
Stormwater Program

The Delicate Soil and Water Dance

The relationship between soil and water is a tricky one!

In this lesson, students learn how water can 'rub the earth the wrong way' and how the components of soil, including sediment, nutrients and pollutants affect water and its health. Water's powerful and changing characteristics (steam, water, snow, ice) are touched upon and how their different ways of acting impact upon soil differently.

Guiding Question:
Is there such a thing as 'good soil' when it comes to water health?

Reflective Question:
What are some everyday ways we can positively impact water and soil health

Video: Introduction to Water Pollution: The Dirty Details (7mins)
(http://floridaswater.com/education/lessonplans/)

Highlights the difference between point-source and non-point source pollution

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E

Suggested Lessons
Classroom Activities

Point-Source Pollution:
E1. To Drink or Not to Drink (University of Nebraska Lincoln Extension)

(or much more elaborate: E2. Mini Water Treatment Simulation (Thomas Jefferson Soil & Water Conservation District)

Non-Point Source Pollution:
E3. Discover Rainwater Harvesting (Stormwater in the Desert, p.28-31)

Green Infrastructure/ Low Impact Development/ Green Stormwater Infrastructure
http://www.vtwaterquality.org/stormwater/htm/sw_green_infrastructure.htm

Let it Rain
Stormwater Program

Catch & Release = Reduce & Clean

Investigating the difference between point-source and non-point source pollution and their solutions.

In this lesson, students gain an understanding of possible solutions to stormwater pollution. By first learning about water treatment from a point-source perspective, they will then be introduced to water harvesting techniques and other overviews of solutions that are adaptable in scale, for individual to town.

Guiding Question:
What is the difference between point and non-point source pollution?

Reflective Question:
What can individuals do to address stormwater?

Video:
Water Conservation Design – An Interview with Landscape Architect from Surroundings Studio about how to design for stormwater
http://video.klru.tv/video/2365161146/

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F

Suggested Lessons
Class Action Options

F1. Noting Notable Features. Rain Garden Curricular Sampler. (Earth Partnership for Schools)

F2. B**ecome a Clean Water Ranger!** http://www.lcbp.org/wp-content/uploads/2012/08/Ranger_Checklist.pdf

F3. Build Your Own Rain Barrel (University of Nebraska Lincoln Extension)

Stormdrain Stenciling: www.stormdrainease.com

Rain Gardens (Rain Garden Manual and Start-to-Finish Rain Garden Design – workbook for homeowner)

Let it Rain
Stormwater Program

Digging Deeper for the Storm

How can students lead stormwater mitigation?

In this lesson, students are exposed to different approaches to contributing to stormwater mitigation. Ranging from outreach to implementation, prospects are varied and tested!

Guiding Question:
What role do we have in reducing the impact of stormwater in our watershed?

Reflective Question:
How far can we take the information gained on stormwater and apply it to our everday?

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Soak it for Schools!

student evaluation

Thank you for taking the time to provide us with valuable feedback so we can modify the contents of Soak it for Schools! to make it more enjoyable by all!

General Information
Grade: _____
Chapter: _____
Is this the first time you hear about Stormwater? Yes/No
If not, what other information about Stormwater have you heard? _____
_____

Chapter
1) What part of the chapter did you enjoy?

2) What did you learn about stormwater?

3) What can you do to help reduce the impacts of stormwater?

Follow Up:
Are you interested in becoming a stormwater champion? Please circle all that interests you:
a. Doing a stormater audit at home?
b. Creating solutions to stormwater at my school?
c. Learning about stormwater solutions in Vermont?
d. Visiting stormwater solutions in Vermont?
e. Spreading the word about stormwater?
f. Something else? Tell us!

thank you!
Please return to the Winooski Natural Resources Conservation District (WNRCD) at 617 Comstock Road, Berlin, VT 05602 or via email: info@winooskinrcd.org

Soak it for Schools!

teacher evaluation

Thank you for taking the time to provide us with valuable feedback so we can modify the contents of Soak it for Schools! as needed to be able to create a tool that is useable and enjoyed by all.

General Information

Age Group / Grade: _____

Size of Group: _____

First Introduction to Stormwater? Yes/No

If not, what other work on Stormwater has been undertaken? _____

Toolbox

1) What part of the toolbox did you use:

a. Water, Water, Everywhere!

b. Watershed Walk-About

c. Wading in the (Dirty) Storm

d. The Delicate Soil and Water Dance

e. Catch and Release = Reduce and Clean

f. Digging Deeper for the Storm

2) Did the pre-presentation materials provide you enough information to introduce the issue to your students? If not, what was missing?

Chapters:

1) Were the instructions relatively easy to understand?

2) What can be done differently?

3) Will you look further into the topic of study?

Follow Up:

1) Are you interested in receiving additional support? Please circle all that apply below:

a. Guest Presenter on the topic

b. Topic Resources (articles, bibliography, current findings)

c. Access to kit-materials to use in your classroom

d. Curriculum that includes pre and post lessons

e. Professional Development on the topic

f. Additional time with presenter

g. Other? Please elaborate

thank you! Please return to the Winooski Natural Resources Conservation District (WNRCD) at 617 Comstock Road, Berlin, VT 05602 or via email: info@winooskinrcd.org

Soak it for Schools!

stormwater audit

Undertake an audit of the stormwater at your school; compare the results with your classmates to identify any gaps. Then take the stormwater audit home to identify how residential situations differ (or not!) from institutional settings such as your school in terms contributing to stormwater.

General Questions

Audit Date: _____
Weather at Time of Audit: _____
School Name and Address: _____
Local Watershed: _____
Local water body where stormwater enters: _____

Mapping Activities

1) The School Campus

Use a map of the school campus (or draw one) to identify key areas where water goes on the property. Start with a basic outline of the school building and hard surfaces and add other information as you continue the audit.

2) The Context of the School

Use an aerial map to locate your school in the context of your watershed. Cut and paste or draw it here.

What is the school's proximity to the nearest body of water: _____
(Two resources for mapping are: googlemaps.com and http://anrmaps.vermont.gov/websites/anra/)

About the School

Physical features of the building relevant to stormwater (pitched roof, shingles, etc.):

_____

About the Gutters

Gutter Number Gutter Connection/ Disconnection? Issues Possible Solutions

About the Drains

Drain Number Drain Condition Issues Possible Solutions

About the Impervious Surfaces (Parking Lot, Sidewalks, Compacted Turf, etc.)

Type of Surface Area Issues Possible Solutions

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stormwater audit

About the School Campus

1) Features of the impervious surfaces of the school campus (asphalt pavement, gravel, compaction, etc.):

_____

2) Measure the impervious areas (square feet)

Roofs _____¬¬¬¬¬¬_____+_____¬¬¬¬¬¬_____ +_____¬¬¬¬¬¬_____=___

_____¬¬¬¬¬¬_____ Walkways_____

Driveway surfaces_____ Other_____

3) Are there any significant slopes on the campus?

4) Are there any areas that show evidence of water ponding?

5) Where does the stormwater on the property go?

(runoff – overland; runoff- onto street; piped offsite; into a catch-basin; into a water body)

6) Are there storm drains in close proximity where site water is flowing? Yes No

If yes, indicate location on site map and inspect catch basin for inflow pipes coming from the property.

About the School Campus Vegetation

1) Are there trees or shrubs on site? Yes No (Indicate on the map)

2) What is the estimated canopy cover for the site? _____%

About the Green Stormwater Infrastructure

Are there any stormwater harvesting features on the property? (ie: downspout disconnection, rain barrel, rain garden, cistern, vegetative swale, other) If yes, please list and note on school map: _____

_____

What now?

Based on the information collected so far, can you identify any priority areas that need to be addressed sooner than later for stormwater? If so, list or draw your thoughts here!

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key concepts

Berms: Mounds of soil used to retain stormwater or to direct its flow.

Condensation: The process of a vapor becoming liquid (the formation of clouds).

Evaporation: The process of liquid water becoming a vapor.

Impervious: Not allowing water or other liquids to pass through a surface.

Infiltration: The movement of water through the soil surface into the soil.

Pervious Pavement: Driveways, sidewalks, patios made with gravel, crushed stone, open paving blocks, or special porous concrete to allow great stormwater infiltration.

Pollutant: Any substance in air, water, or soil that may be harmful to the health of humans or other living things or may harm the environment.

Precipitation: Water falling from the atmosphere in the form of rain, snow, sleet or hail.

Soil: Composed of gravel, sand, silt and clay, soil is the growing medium for plants and can be a great place to slow and store captured stormwater.

Stormwater Runoff: Rainwater that hits the ground and flows over the earth's surface or snow that melts to become water that runs off.

Swale: A long, shallow trough between two areas of higher ground in the yard.

Transpiration: The process in which water vapor is released from plants into the atmosphere.

Water Harvesting: Collecting and putting rainwater or stormwater to beneficial use.

Watershed: An area of land that sheds water and directs it downhill to a particular watercourse or point.

What does stormwater impact?