



Preserving Our Lifeline

*working together to nurture, renew and protect
the waters of the bow river basin*

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Low Impact Development and Flooding:

A drop in the bucket?

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Conventional stormwater management relies on large-scale facilities such as dry ponds, wet ponds, constructed and natural wetlands to detain flows from large storm events.

These facilities mitigate the impact of downstream flooding. However, these types of facilities are only part of the picture in protecting our watersheds and managing stormwater. Creating an environmentally and hydrologically functional landscape requires consideration of volume, frequency, evapotranspiration,

recharge and discharge. Detention facilities only address discharge. What about these other characteristics of a hydrologically functional landscape and how do they relate to flood mitigation?

Low Impact Development (LID) refers to a desired outcome: land development that causes so little harm that it can be sustained. An LID approach integrates micro-scale nature-mimicking features



The Sunnyside community in Calgary during the 2013 floods. Photo: The City of Calgary.

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Infiltration trench and swale, Canada Lands Company's Currie Barracks redevelopment in Calgary. A gravel chamber overlain by a thin layer of absorptive soil and conventional sod replaces the storm sewer. Photo: Alberta Low Impact Development Partnership

and processes across the landscape. Rather than a prescription, LID offers a toolbox of practices to supplement conventional stormwater management in order to achieve more goals than merely discharge-rate control.

One of the simplest things that can be done to attenuate flooding is to give urban soils more attention. In urban development, soil has tended to be treated - at best - as a veneer rather than a vital, living component of a hydrologically functioning landscape. Combined with deep-rooted vegetation (read: NOT Kentucky Bluegrass), our yards and open spaces have immense potential to work for us to deliver water quantity and quality benefits. The City of Calgary has recently implemented a 300-mm topsoil depth guideline for new

development and redevelopment throughout the city, in accordance with the recommendations of the Bow Basin Watershed Management Plan. Has your jurisdiction?

Deeper topsoil is seen as one of the most cost-effective ways to achieve multiple objectives, including flood attenuation. Topsoil holds water in its void spaces, thereby delaying the onset of runoff and the severity of flooding. More topsoil has more void space - a simple case of “more is more.” While organic amendments enhance the absorptive capacity of soil, organics shrink as they break down, and are better used in planting beds where settling will not be noticeable (as opposed to lawns). Ultimately, the magnitude of infiltration is dominated by soil structure and soil thickness, not

by the presence of organics. However, organics provide the glue to help with the establishment of soil structure, so a truly organic-depleted soil may benefit from amendment.

Along with the characteristics of the soil itself, vegetation, especially woody vegetation, assists with the creation of macropores, which enhance infiltration and infiltration depth (as do underground creature passages - but these infiltration ‘enhancements’ are usually not counted). How significant is void space in soil for flood mitigation? With 300-mm-thick topsoil, rough estimates are that it can handle all precipitation from a 1-in-25-year storm with a 24-hour duration, or all precipitation from a 1-in-100-year storm with a 12-hour duration.

Green roofs, rain barrels and cisterns, downspout dispersion, reduced lot grading, reduced hard surfaces, microdepressions (rain gardens), underground storage, bioretention, bioswales, increased amounts of soil and vegetation – the storage adds up in proportion to the extent of implementation.

What about the flooding in 2013? How would the implementation of these practices have made a difference? The presence of these practices would, at first glance, have had little impact during the 2013 flood, since rainfall was occurring in the foothills and mountains, well outside of our urban areas. Even if the rainfall had happened within urban areas, the amount of precipitation would have overwhelmed these features since, once saturated,

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absorptive surfaces behave as if they are impervious surfaces. However, nuisance flooding from overland areas could have been reduced. In fact, this is where LID for flood attenuation shines. More frequent storm events, the kind that can deposit 20 to 50 mm of rain in a couple of hours - which are usually associated with summer thunder storms - result in most of the nuisance flooding in our urban areas. At least some of these impacts would have been reduced in the 2013 flood, if LID features had been implemented.

Even though the presence of LID features in our urban areas would not have reduced the magnitude of the flow coming into our cities and towns in 2013, they could have reduced the second instance of flooding that occurred in the Sunnyside community in Calgary in early July 2013. This event occurred when about 20 to 25 mm of rain hit the Sunnyside catchment and the gates at the outfalls of the storm sewer system into the Bow River were still partially closed following the June flood. The absence of LID measures in the catchment above Sunnyside has contributed to the need to make a multi-million dollar investment in automated gates and pump stations to protect this community from future flooding events.

LID measures would have helped in two other ways during the June 2013 flood. First, in urban catchments, the repeated erosive forces exerted on the bed and banks of receiving streams during frequent, small storms is such that vegetation along the stream does not have adequate time to repair itself and restore the capability of its roots to hold the bank together when the next erosive event hits. The banks lose



Memorial Drive in Calgary, July 2013. Photo: The City of Calgary

their capacity to resist the much larger erosive forces of the magnitude that occurred in June 2013. The resulting erosion subsequently threatened adjacent public infrastructure including pathways, roadways, water mains, sanitary trunk sewers, etc, as well as private property. Some erosion would have occurred naturally, and we do not have supporting studies to indicate to what extent this small-storm erosive phenomenon occurs in larger streams. However, this phenomenon is well-known for our smaller creeks and streams like Nose Creek and Pine Creek that are, to a large extent, impacted by the increased runoff from urban areas draining into them. The adoption of runoff volume targets in, for example, the Nose Creek Watershed Water Management Plan was done to minimize the erosive effects of the increased runoff from urban areas.

These runoff volume targets require the wholesale implementation of LID in the headwaters.

Second, one of the original messages of the Alberta Low Impact Development Partnership (ALIDP) is that LID is much more than the implementation of an array of features commonly referred to as "source control." The first principle of LID is to conserve natural features. Development should stay outside of any environmentally sensitive or hazard areas, or in the case of flood issues, avoid riparian areas that would be inundated during flood events. Staying outside of the meander belt of a stream equates to giving it the necessary room to naturally move,

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that is, truly “Room for the River.” This then minimizes the risk to adjacent infrastructure and property, and removes the need for extensive river training works. The ALIDP is glad to see that the “Room for the River” concept, which the ALIDP has been advocating since its inception, is now getting due attention as one avenue to minimize the impacts of future floods. Even with Room for the River, runoff volume control is still needed if land development continues, since increased flows will increase stream power and increase the width of the meander belt.

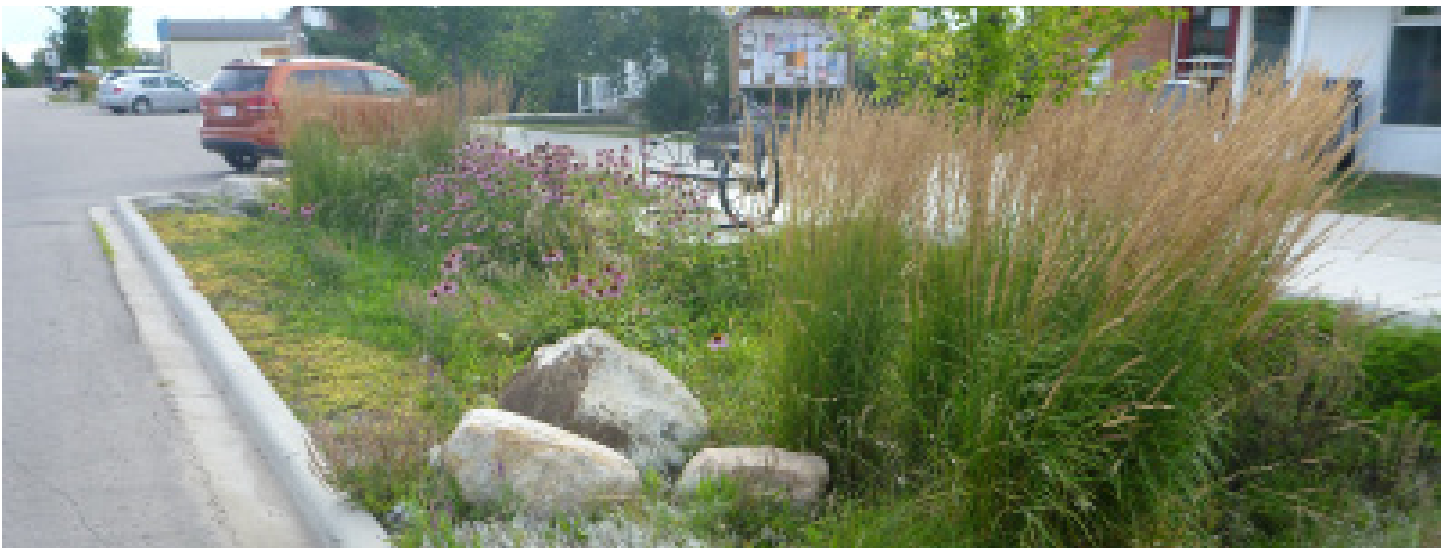
A frequent question is why attention should be given to these sorts of measures for urban areas when they account for only a small fraction of the watershed. The insurance industry tells us that the greatest flood losses are incurred in urban areas because that is where the most people and property are. To illustrate the insurance industry’s

acknowledgement of this, you only have to look as far as the ALIDP’s March 2015 training course in Calgary. The Insurance Bureau of Canada has sponsored us to heavily subsidize AUMA-member municipalities to attend a full-day session on financing municipal stormwater, including a review of LID incentive programs.

In summary, the implementation of LID features would not have prevented the riverine flooding experienced in June 2013, since it originated from rainfall in the foothills and mountains. However, the implementation of LID will mitigate the impacts of severe storm events - especially summer thunderstorms - when they hit our urban centres, by attenuating peak flows, reducing runoff volumes and maintaining the resiliency of receiving streams. Developing outside of environmentally sensitive and hazard areas such as riparian areas would have greatly reduced the damage incurred in 2013.

Besides flood resilience, LID can play a key role in objectives such as biodiversity, carbon sequestration, water quality, water security and water conservation. Taking a holistic approach to choosing cost-effective solutions through a lens of multiple considerations is something we expect to see more of. But it doesn’t happen on the back of a napkin or in a few stakeholder engagement sessions. Work such as the Cooperative Stormwater Management Initiative demonstrates the complexity of grappling with even a subset of these objectives. We need to better understand the performance of LID features in our climate in order to validate assumptions and make design decisions that will succeed. Along with education and training, the ALIDP is working through its partners to establish a research program to investigate practices that will assist with achieving water quality objectives. But that’s another story...

Visit the ALIDP website at:
<https://alidp.org/>



Rain gardens installed as part of the Village of Alix’s main street revitalization project.
Photo: Alberta Low Impact Development Partnership

Students Explore Land-use Issues in the Bow River Basin with the NEW Alberta Tomorrow

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Following the 2013 flood, managing land use within the Bow River Basin was very much on the minds of many residents...

Teachers were looking for resources that would help students understand that many factors came together to result in the flood, and also that our activities on the land contribute to the watershed's resilience to events such as flooding.

With help from the BRBC, hundreds of students within the Bow River Basin have been exploring land-use issues with Alberta Tomorrow, a free, online land-use simulator that helps to explain the complexities of land-use planning in balance with economic and environmental needs.

Through a series of videos and simulations, students are able to understand the relationships between what we do on the land and environmental and socio-economic indicators. By investigating satellite imagery, students are able to see multiple land uses within the watershed that are not always visible from the ground.

With the ability to travel into the past to see what the landscape was like over 100 years ago, and



Student using the simulator. Photo: Alberta Tomorrow Foundation

peer into the future to see what our future may hold if we continue as we have been, students are able to make connections between our own activities and the state of our economy and environment. With an optional field trip, teachers can bring students to explore the state of the Bow River watershed through water and invertebrate sampling.

Most importantly, students are challenged to create a future they would like to see on the satellite imagery, run the simulator, and see if their future will allow them to reach goals they have set for both the environment and the economy. They create land-use plans that balance the environment with the economy.

Students come away with an understanding that balancing our land uses is no easy task, yet making a plan for our future is essential. They realize that they may have to accept some trade-offs, even with the positive impacts that best practices can have on reaching our future goals.

The newest version of Alberta Tomorrow is now available for tablets and smartphones, allowing students to enter and record water quality and land-use data while they are out in the field. Free lesson plans and classroom visits are available to teachers.

Check out this new version at: www.albertatomorrow.ca.

Managing Lakes through Citizen Science

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While they may appear peaceful and serene, there is actually a buzz of activity at many lakes across the province as groups of volunteer citizen scientists work hard to monitor, manage and protect their favourite waterbodies.

In Alberta, where lake management is primarily conducted by volunteers, the Alberta Lake Management Society (ALMS) works with stewards to facilitate data collection and management. Just this past summer, through the LakeWatch program, volunteers with boats at 31 lakes across the province joined ALMS technicians to collect rigorous water quality data. Information on metals, nutrients, cyanobacterial toxins and more are collected from each of the lakes and compiled into LakeWatch Reports made available to the public online. While many volunteers want the data simply to learn more about their lake and establish an ecological benchmark, other volunteers are more deliberate, using the data to help evaluate the impacts of development, to contribute to a State of the Watershed Report, or to help guide the creation of an Integrated Lake Watershed Management Plan.

As many of Alberta's lakes are naturally nutrient rich, water quality concerns in the province are typically



LakeWatch Technicians, 2013. Photo: Alberta Lake Management Society

in response to the unsightly symptoms of eutrophication: harmful blooms of cyanobacteria, reduced water clarity or even fish kills. Though the symptoms may be dramatic, volunteers often find the solution to nutrient enrichment rather dull: managing the watershed to limit point and non-point source nutrient pollution. Fortunately for them, there is nothing dull about the newest threat to our lakes: invasive species.

For many citizen scientists, the threat of invasive species has ignited a renewed interest in lake monitoring and management. In 2013, invasive zebra mussels (*Dreissena polymorpha*) made their way into the first

Canadian prairie province, infesting a portion of Lake Winnipeg. In order to combat this ever-encroaching threat, Alberta Environment and Sustainable Resource Development (ESRD) sprang into action, releasing education campaigns such as "Clean, Drain, Dry", implementing inspection stations complete with sniffer dogs at highways entering the province, and adding invasive mussel monitoring into all of its lake monitoring programs. For ALMS, this was an opportunity to put its network of volunteers to work, by facilitating the distribution of zebra mussel

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Volunteers at Mayatan Lake, 2011. Photo: Alberta Lake Management Society

substrates to citizen scientists across the province. Using these substrates, volunteers can record the presence or absence of adult mussels and upload their results to the ALMS website. If mussels do find their way into Alberta, early detection will be key to containing and managing the threat.

While mussels have served as a valuable rallying point, they certainly aren't the only aquatic invasive species threatening our waters. In order to address these additional concerns, ALMS, with the support of ESRD, implemented a pilot program in 2014 for the monitoring of invasive aquatic plants. Citizen scientists met with ALMS technicians throughout the summer to conduct aquatic plant surveys. Sylvan Lake, Chestermere Lake and Wizard Lake received the

most in-depth monitoring, each being visited numerous times throughout the open-water season, and the results have been posted online. While the primary goal of the program was to identify any invasive species, including Eurasian Milfoil (*Myriophyllum spicatum*), Flowering Rush (*Butomus umbellatus*) or Curly-Leaf Pondweed (*Potamogeton crispus*), this was an exciting opportunity to share data on native aquatic plant species with the University of Alberta's research herbarium.

In order to be more effective at monitoring for invasive aquatic plant species, ALMS will be delivering workshops this spring and summer to stewardship groups interested in learning how to sample for and identify these invaders. At these

workshops, citizen scientists can practice plant identification, learn sampling techniques and pick up an invasive aquatic plant sampling package. After the workshops, citizen scientists can travel onto their lakes and conduct the sampling themselves. This is a simple way for stewards to have a potentially huge impact on the fight against invasive species.

Though the above programs are all appropriate for engaging youth in the protection of our environment, ALMS also offers the Alberta Water Quality Awareness Program to facilitate an interest in lakes and the outdoors in general. This summer, nearly 1,000 water quality test kits will be mailed out for free to participants across the province. This is a great way to get kids' feet wet and foster an interest in science. Kits can be ordered from our website and data may be easily uploaded to our provincial database.

Today, opportunities for citizen scientists to become involved in lake monitoring and management seem endless. If the above initiatives don't appeal to you, maybe you'd be more interested in monitoring ice phenology with the IceWatch program, monitoring water clarity with the Secchi Disk Dip-In program, or monitoring loons through the Canadian Loon Survey. If you are interested in getting involved, don't hesitate to ask how you can help – citizen scientists such as yourself are key to ensuring healthy lakes for Alberta's future.

To bring an ALMS program to your lake, or for more information on any of the above-mentioned programs, please contact Bradley Peter at info@alms.ca.

March 11th 9:30 - 15:30
**BRBC Quarterly Educational
and Networking Forum**

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TransAlta Auditorium
110 12th Avenue SW, Calgary

Contact Information

Upcoming Events

BRBC Science Forum
April 15th
Mount Royal University

Forum details to follow in
upcoming BRBC weekly
News & Events bulletins.

Stewards in Motion
March 12th
**Claresholm Community
Center**

Brought to you by the Alberta Stewardship Network, in partnership with the Oldman Watershed Council, and with the support of the Miistakis Institute and Environmental Law Centre, this year's Stewards in Motion theme is "transforming collaboration to advance local stewardship efforts." Participants will not only actively learn, share, and engage in conversations across sectors, they will also be introduced to a new tool that will help move stewardship efforts forward. Learn more, see the agenda and register online today at <http://www.landstewardship.org>.

Presentations

Bert van Duin
The City of Calgary

Lily Mah & Brenda Casella
The City of Calgary

Susan Davis Schuetz
WaterSMART / CSMI

Wendell Koning
Alberta Environment & Sustainable Resource
Development

Stephanie Neufeld
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Melanie Watt
Biosphere Institute of the Bow Valley

For details and to register, visit:
<https://eventbrite.ca/event/15803245934/>

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... the next BRBC newsletter will be released in
June

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