



Jennifer Webb at UMD for student interns on animations

Winter Story (Dec-Jan-Feb)

Season	Date	Weather	Priority	Topic	Water message	Contact	Images/Video	Links
Winter		cold	1	Lake Superior Freezing Over/Ice Caves	Impact of cold winters/ice cover on Lake Superior water levels, lake effect snow, evapotranspiration and water cycle. Warmer temperatures in the Great Lakes region have been accompanied by declines in annual mean lake ice cover since 1973. On average, each year during this period has had 520 fewer square miles of ice cover than the year before. Overall, annual-mean lake ice cover loss for the Great Lakes has declined by 71 percent over this period.	Jay Austin Bob Krunemaker		http://www.earthgauge.net/2012/climate-trivia-lake-effect-snowfall-3 http://www.earthgauge.net/2012/climate-number-520-square-miles-per-year http://www.lakesuperiorstreams.org/understanding/ice.html
Winter	Feb	snow	1	Snow disposal	Where does it go, and then what happens? From Amity headwaters to slip in lower St. Louis River/Duluth Harbor. What about UMD, Mall area?	Chris Kleist-COD Diane Nelson-COS		http://www.duluthmn.gov/winterwatch/ MNDOT/UMD
Winter	Dec	ice snow	1	Salt and Ice	How to use it effectively, UMD and City's new technology. State-wide training (Fortin Consulting)	Chris Kleist Connie Fortin Erik Larson		http://www.lakesuperiorstreams.org/understanding/impact_salt.html http://www.fortinconsulting.com/our-work/road-salt/ http://www.earthgauge.net/2013/smart-about-salt_pca link, http://www.lakesuperiorstreams.org/understanding/impact_salt_2.html
Winter		any	1	Snow Pack and stream ice impacts on fish and other organisms; do they affect the spring runoff and summer baseflow?	How do fish and other aquatic organisms (bugs, crayfish, amphibians, etc) deal with low flows and cold water? What do they do if the stream freezes to the bottom?	Deserae Hendrickson Don Schreiner Valerie Brady Josh Dumke		LSS understanding/organisms and understanding/flow
Winter	Feb	any	1	World Wetlands Day (Feb 2nd)	No matter where you live, chances are there is a wetland nearby. Urban and agricultural development that occurs on or nearby wetlands usually leads to habitat loss, changes in water flow, polluted runoff, and other impacts.	Jennifer Olker Ryan Hueffmeier Valerie Brady Cindy Hagley Jesse Schomberg BWSR		http://www.earthgauge.net/2012/world-wetlands-day Public-Oriented MN website about wetlands
Winter		any	1	Arctic Oscillation, ENSO (El Nino-Southern Oscillation), and your winter weather; What drives the jet stream winds and how does it affect our weather, Lake Superior,	What do these patterns suggest for our winter weather? Will we be seeing a return of the polar vortex or another winter of >100 inches of snow?	Carol Christenson		http://www.earthgauge.net/2012/ao-ens0-and-your-winter-weather
Winter		cold	1	Frozen storm sewers and water mains	How does the weather impact the stormwater infrastructure? How does the city deal with it?	Todd Carlson		
Winter	Any	Wind	1	What effects does wind speed and direction have on Lake Superior, the lower St. Louis River (Duluth-Superior Harbor), and inland lakes?	Wind drives lake currents (horizontal movements across the lake/gyres) and also the degree to which water from near the surface is turbulently mixed downward. These cause large differences in the chemical, physical, and biological (e.g.habitats) properties of large regions of the lake and its watercolumn. Lakes are NOT the equivalent of well stirred bathtubs of water.	Jay Austin Cindy Hagley Rich Axler Branstrator	Donn	
Winter	Dec	any	2	Thin Ice, aerated Lakes	Stay safe on the ice, Ecological need for aeration, Wind movement of ice on Lake Superior	DNR		http://www.lakesuperiorstreams.org/understanding/thin_ice.html http://news.dnr.state.mn.us/2013/12/02/dnr-issues-ice-warning-for-aerated-lakes-7/
Winter	Dec	any	2	Audubon's Christmas Bird Count, climate trends in bird data	winter ranges shifting, population increases and declines, food web disruption and change, Warmer temp prompt species to expand towards the poles.	Jerry Neimi Annie Bracey Ed Zlonis		Learn more and find a count near you. http://www.epa.gov/climatechange/impacts-adaptation/ecosystems.html birds.audubon.org/christmas-bird-count
Winter	Jan	any	2	John Beargrease/ Birkebeiner	An almanac of weather conditions, changing race date, what was the landscape like when Beargrease was running dogs/rowboats?	Mark Seeley Carol Christenson		http://beargrease.com/ http://climate.umn.edu/ http://beargrease.com/follow-the-race/history-of-john-beargrease/ http://www.ssec.wisc.edu/~scottb/ski.html
Winter		any	2	Faunal Forecasters	Which of these organisms can predict the weather?	Larry Weber		http://www.earthgauge.net/2013/four-faunal-forecasters
Winter		cold	2	Cold winter may limit Emerald Ash Borer	will this also affect native species, tent caterpillar, food web links	MDNR-Forestry		http://www.npr.org/2014/01/10/261435111/the-uptside-of-the-bitter-cold-it-kills-bugs-that-kill-trees

Winter	any	2	Anatomy of a pothole water and temp act together on natural and man-made structures	City of Duluth-Roads, MnDOT-Duluth Larry Zanko	http://www.earthgauge.net/2013/anatomy-pothole http://www.earthgauge.net/2011/winter-potholes http://www.reuters.com/article/pressRelease/idUS161904+28-Jan-2008+PRN20080128 http://www.nrri.umn.edu/default/pt.asp?id=1713
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Spring Story (Mar-Apr-May)

Season	Date	Weather	Priority	Topic	Water message	Contact	Images/Video	Links
Spring	Apr	any	1	Is the Frog Population Beginning to Croak?	Importance of vernal ponds, spring rainfall, snowmelt, temp. Hartley Nature Center/ Citizen Science (April 26th, 2014)	Ryan Huffmeier Jennifer Olker Pat Schoff		http://www.earthgauge.net/2013/climate-trivia-how-does-climate-change-affect-wetlands Wetlands Work for Us http://www.lakesuperiorstreams.org/understanding/frogs.html http://www.lakesuperiorstreams.org/general/docs/Hartley_2014_Workshop%20description2.pdf
Spring		any	1	Adopt a Storm drain, Adopt a River	Engage in your local watershed, find out which watershed you live in and be a part of keeping it clean and healthy. Where to bring sand/salt, yard waste	Todd Carlson Wendy Grethen Chris Kleist		http://www.lakesuperiorstreams.org/streams/stream_selector.html http://www.dnr.state.mn.us/adoptriver/index.html http://cfpub.epa.gov/surf/locate/index.cfm
Spring		any	1	Headwater streams, the loss of the origin story	What constitutes a stream? Protecting water in intermittent streams will protect water downstream. Importance of headwater streams to Duluth especially in regard to increased stormwater peak flows from climate change.	Jesse Schomberg Val Brady		www.epa.gov/sciencematters/january2011/little-stream.htm ;
Spring		heat rain	1	Blue Thumb, rain gardens to save our streams, beautify our neighborhoods, workshops offered locally	Lakeside Project (Amity Creek); reduce stormwater peak flows, temperature spikes by slowing down runoff and reducing contact with bare soil and asphalt/concrete surfaces. Kansas City = City of 10,000 rain gardens	Jesse Schomberg Carol Andrews Val Brady Cindy Hagley (Water Quality Impacts) MPCA-Duluth (Water Quality Impacts)		http://www.lakesuperiorstreams.org/citizen/rainbarrel.html http://www.lakesuperiorstreams.org/citizen/wet_garden.html cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=72 Kansas City Rain Garden (LSS LID, Northland Innovative Stormwater Conf)
Spring	Apr	any	1	National Arbor Day: Boulevards, Duluth as "Tree City USA" for over 25 years	Miller Creek, urban forests/watersheds, city tree commission	John Pastor Bob Olen Jesse Schomberg		http://www.arborday.org/programs/treeCityUSA/index.cfm http://www.seagrant.umn.edu/downloads/stormwater10/RandyNeprash-IntegratingStormwaterMgmtUrbanTrees.pdf
Spring	May	any	1	Lawn Care, nutrients	keep lawns productive and water fresh by keeping nutrients on the lawn, (algal blooms, fish kills) wait for dry weather to apply, apply early in day when dew allows it to stick to leaves, step on grass and save (Water) pick up pet waste, Turf mgmt (Fortin), Mow during cooler parts of day to avoid ground-level ozone pollution, tune up equipment and use correct fuel/oil mix. Water Quality Impacts	Bob Olen (lawn care) Connie Fortin (Turf) Cindy Hagley (Water Quality Impacts) MPCA-Duluth (Water Quality Impacts)		http://www.lakesuperiorstreams.org/citizen/springcleaning.html http://www.lakesuperiorstreams.org/citizen/lawn-care.html http://www.earthgauge.net/2011/algae-impacts
Spring	May	rain	1	Miss the brick streets? Bring pervious pavers and pervious concrete into your landscaping plan, rain barrels	Slow the flow! Increase infiltration, some novel ideas, rain barrels, WLSSD, rainbarrel and composter sale.	Jesse Schomberg Erik Larson (pavers) Chris Kleist & Todd Carlson (pavers) LHB Architects/Engineers (pavers) Sarah Lerohl (rain barrels)		http://www.lakesuperiorstreams.org/citizen/pervious.html http://www.duluthmn.gov/downloads/31/20130715-31-2471.pdf
Spring	Mar	rain snow melt	1	Snowmelt and spring floods (mid-March is NWS Flood Safety Week)	In terms of area, property damage and deaths, eight of the most significant floods in the 20th century were snowmelt-related. What contributes to snowmelt flooding? (soil moisture, frozen ground, heavy winter snow, rain, ice jams). Compared to the late 1940s, the Mississippi River is sending an average of two more cubic kilometers of water into the Gulf of Mexico each year, due to increased rainfall in the central United States which may be associated with atmospheric CO2 increases (i.e. climate change).	Chris Kleist Todd Carlson Mark Seely Hilarie Sorenson Jesse Schomberg Carole Christiansen		http://www.floodsafety.noaa.gov/snowmelt.shtml ; http://www.earthgauge.net/2011/climate-fact-controls-on-annual-river-flow-trends http://disastersafety.typepad.com/disaster_safety_blog/

Spring	Apr	snow melt	1	Kayaking North Shore streams	The spring run-off is prime time for some of the region's most extreme athletes. Kayaking North Shore streams is not possible due to naturally low flows during the summer, but in the spring, especially a spring following heavy snowpack, the rivers run high and paddlers challenge themselves on the steep inclines of the streams.	Randy Carlson Tim Bates	http://www.umdrsop.org/ https://www.facebook.com/LesterRiverRace
Spring	Mar	any	2	MN maple syrup, good year or bad, how does the weather influence the flow, earlier start times?	precipitation accumulation through winter, variable temps (early in 2012, late in 2013)	Dave Rogotzke Jim Northrup	http://bangordailynews.com/2013/03/22/business/climate-swings-put-heat-on-maines-syrup-makers-to-start-earlier-think-smarter/
Spring	Apr	any	2	National Garden Month: Duluth Community Garden programs, urban gardens, tree and shrub sale (4.15)	forests for maintaining baseflow, cooling trout streams, reducing impervious surface, change in hardiness zones (Zone boundaries in the new map have shifted in many parts of the United States and two new zones, 12 (50-60 degrees Fahrenheit) and 13 (60-70 degrees), have been added. The new map is generally one five-degree Fahrenheit half-zone warmer than the previous map throughout much of the United States, but some areas shifted to cooler zones rather than warmer ones.)	Jahn Hibbs Carol Andrews John Geissler Hilarie Sorenson	http://www.duluthcommunitygarden.org/ http://www.seagrant.umn.edu/downloads/stormwater10/RandyNeprash-IntegratingStormwaterMgmtUrbanTrees.pdf http://www.ars.usda.gov/is/pr/2012/120125
Spring		any	2	Mosquito outlook, how will the weather impact the mosquitos and other insects?			
Spring	May	any	2	Migratory Birds on the Move, how does weather affect them?	Importance of Prarie Potholes as breeding/feeding ground for migrating waterfowl, status of birds in the SLRE	Jan Green Laura Erickson Gerry Niemi Annie Bracey Ed Zlonis Jennifer Olker	Check BirdCast for weekly regional updates on weather and migration forecasts http://www.lauraerickson.com/AboutLaura.html http://www.nrri.umn.edu/mnbirds/ http://www.hawkridge.org
Spring		any	2	weather impacts on allergies? How did the late, cold winter affect pollen production?	A cold winter and late-season snow storms in some parts of the country could mean that spring allergy season is especially rough this year. Some trees pollinate in the late winter and early spring, but cold temperatures can delay the timing of flowering and pollen release. That means that the pollen from these trees will be released around the same time that other trees and grasses release pollen later in the spring, resulting in a pollen "explosion" of sorts.	Amy Westbrook Essentia St. Luke's	www.earthgauge.net/2014/a-pollen-explosion
Spring		Sunny, warm		Why wash your car in a commercial car wash? Or on your lawn instead of the driveway?			
Spring				Prepping the boat, motorcycle for the spring opener/summer. What to do with the oil.		WLSSD	
Spring	April/W	any		Trash pick-up at UMD		Mindy Granley	



Summer Story (Jun-Jul-Aug)

Season	Date	Weather	Priority	Topic	Water message	Contact	Images/Video	Links
Summer	Jun	rain	1	Extreme rain events are increasing in frequency, how has Duluth responded to reduce stormwater run-off and its pollution load into Lake Superior (Water as a "Pollutant" Too much, or too little)	building resiliency into infrastructure, overflow containment/park by Canal Park, Hydrology, erosion. Scientists estimate that we are losing soils 10 to 40 times faster than they can be replaced – 60 percent of soils are washed into our rivers, streams and lakes where they can decrease channel depth, increase potential for flooding and smother aquatic wildlife habitat. You can help control erosion at home by using mulch to cover garden beds and other areas of exposed soil. Planting ground-cover plants or small shrubs will also help stabilize soil. Also, infiltrate water into soil instead of sending it to the curb; and keep driveways and sidewalks "clean" - the curb is the shoreline of a trout stream and of Lake Superior	Chris Kleist Todd Carlson Diane Nelson Kate Kubiak Deserae Hendrickson Brian Frederickson Sarah Lerohl Karen Gran Mark Seeley		http://www.seagrant.umn.edu/downloads/stormwater10/MarkSeeley-https://www.soils.org/files/about-soils/earth-science-week-2007.pdf ; https://www.lakesuperiorstreams.org/understanding/stormwater_hydrology.html Groisman, PY et al. "Changes in Intense Precipitation over the Central United States." Journal of Hydrometeorology 13 (2012): 47-66.) MN Climatology Website http://www.ncdc.noaa.gov/news/impact-weather-and-climate-extremes-air-and-water-quality www.earthgauge.net/2011/stormwater-animation
Summer		any	1	Gone Fishing... in the city?	Tour of Duluth's 16 trout streams, 43 named streams , get rid of lead sinkers	Deserae Hendrickson Dave Zentner Don Schreiner Molly Negus Trout Unltd		http://www.lakesuperiorstreams.org/streams/troutstreams.html www.takemefishing.org/state/page/overview/state/MN http://www.earthgauge.net/2011/gone-fishing http://www.earthgauge.net/2011/lose-the-lead-sinkers
Summer		rain	1	The best defense against catastrophic storms: Mother Nature	Dunes on Park Point	Kinnan Stauber Gene Clark		http://bit.ly/13YHQnR
Summer	Jul	wind any	1	Beach Safety: Bacteria, Rip Currents	how to find out about beach advisories, what causes them, what can be done, Rip Currents, wave height, bacteria and rain (bacteria are all around us, but some even contribute to our weather. Many bacteria return to Earth during rainfall, with both living and dead bacteria serving as cloud condensation nuclei (CCN). CCN are tiny particles that even smaller water vapor droplets cling to as raindrops form. Once enough water vapor droplets gather on the nuclei, raindrops fall. This is a critical part of Earth's water cycle, which moves water from the oceans to the land, making freshwater and life on land possible. Without the nuclei, water vapor would not collect and fall as raindrops.)	Jesse Schomburg Gene Clark Amy Westbrook Randall Hicks		http://www.mnbeaches.org/beaches/lksuperior/ http://www.seagrant.umn.edu/coastal_communities/rip http://www.parkpointbeach.org/ http://www.earthgauge.net/2011/climate-trivia-bacteria-and-rainfall
Summer		any	1	Freshwater Estuaries	The five Great Lakes—Superior, Michigan, Huron, Erie and Ontario—have often been described as “inland seas” and “freshwater oceans.” Besides terminology, they have something else in common with oceans: estuaries. While estuaries are traditionally defined as places where rivers (freshwater) meet the sea (salt water), scientists increasingly recognize that estuary-like conditions prevail along parts of the Great Lakes coasts. While definitions vary as to what constitutes a “freshwater estuary,” most have three characteristics: a drowned river mouth; a zone where river or stream water mixes with lake water; and influence from seiche or wind tides. While the Great Lakes are large enough to have “real” tides, they are tiny. Seiche tides are natural oscillations in water level caused by atmospheric conditions like changes in barometric pressure or disturbances like winds.	Deanna Erickson Erika Washburn		http://lsnerr.uwex.edu/ http://www.earthgauge.net/2011/freshwater-estuaries
Summer	Aug	any	1	National Water Quality Month	early Summer/Spring CSMP, CLMP, WAV, Stream and lake Monitoring in MN and WI	Brian Fredrickson Sue O'Halloran		What Happens When Rain Goes Down the Storm Drain?

Summer	Aug	drought	1	Drought and water scarcity	Baseflows, groundwater flows	Don Schriener John Swenson Howard Moers Karen Gran	
Summer	Jun	heat rain	1	Weather and Health	A 2009 NOAA study found that floods, extreme heat and rip currents are leading causes of weather-related fatalities. Common causes of weather-related injuries are tornadoes, extreme heat and winter storms. With winter weather largely behind us, most of the weather-related risks to life and safety are coming up in spring and summer. (Heat, floods, lightning, cold/frostbite,	Amy Westbrook	http://www.earthgauge.net/2011/weather-and-health
Summer		heat	1	Temperatures and Heat Islands	increases stress on aquatic organisms, On hot, sunny days, surface temperatures of roofs and pavement can be from 50 to 90 degrees Fahrenheit warmer than the air temperature! These hot surfaces contribute to "urban heat islands" where temperatures in cities are hotter than surrounding, less developed areas. The urban heat island effect can be particularly pronounced at night, when city temperatures may be as much as 22 degrees Fahrenheit higher than surrounding areas.	temp reducing BMPs	www.epa.gov/aging/resources/epareportst.htm#temp http://www.earthgauge.net/2011/handling-heat-islands http://www.epa.gov/heatisd/impacts/index.htm ;
Summer		any	2	Invasive Species- Stop the hitchhikers	Boat and equipment maintenance to limit the spread of invasives, don't move firewood	DNR Doug Jensen Carrie Sonda	http://www.lakesuperiorstreams.org/understanding/impact_invasives.html http://nas.er.usgs.gov/taxgroup/mollusks/zebramussel/maps/zebraquaggamapanimation.gif www.dontmovefirewood.org
Summer	Aug	any	2	Back to School	Welcome Week	Mindy Granley	
Summer	Jun	any	2	Grandma's Marathon/Inline ma	Weather, health concerns,		
Summer	Aug	any	2	Labor Day water savings	The average household spends as much as \$650 per year on its water and sewer bill. But did you know you could save about \$200 per year by retrofitting with water-efficient fixtures and incorporating water-saving practices? (check toilet for leaks, add a faucet aerator, replace old showerheads with water efficient ones	Eric Larson Chris Kleist Sarah Lerohl Eric Schlacks-COD	www.epa.gov/watersense/pubs/simple_steps.html
Summer	Aug	any	1	Wild Rice	Typically harvested in late summer, wild rice is a staple of the region's indigenous people. But a healthy crop takes more than harvesting, it requires the right water levels and also fluctuates on a semi-annual cycle with nutrients in the water and soils.	John Pastor Nancy Schuldt Darren Vogt	
Summer	July	any	1	Lake Superior days		Julie McDonnell	



Fall Story (Sep-Oct-Nov)

Season	Date	Weather	Priority	Topic	Water message	Contact	Images/Video	Links
Fall		any rain	1	Aquifers, fossil groundwater	loss to oceans without recharging aquifers			http://www.earthgauge.net/2011/climate-number-28-cubic-miles
Fall	Oct	clear	1	lawn Care/Fall clean-up	Create more free time this fall. Instead of raking the leaves into a pile and bagging leaves and grass clippings, try just mowing over all of it. But - Do Not rake or blow them into the gutter or street. They are an excess source of organic matter that can deplete oxygen in the water. Where to bring leaves?	Sarah Lerohl		http://www.epa.gov/osw/conservation/rrr/composting/grassmulch.htm ; http://www.lakesuperiorstreams.org/citizen/fall.html http://www.lakesuperiorstreams.org/understanding/impact_nutrients.html
Fall		any	1	Hormones in the water	How to dispose of medicines, (don't flush it!) but how/why are frogs, fish(?) being affected by endocrine disruptors	Jennifer Olker, Pat Schoff Sarah Lerohl		http://www.lakesuperiorstreams.org/understanding/impact_pharmaceuticals.html WLSSD Pharm Day?
Fall	Nov	any	1	More or Less Snow?	Which trend to warmer temps has predominated? The N hemisphere snow season is getting shorter. American snowfall might decline in the future, another found that the biggest snow-producers – extreme snowstorms – have increased. But the biggest change is winter low temperatures getting warmer	Carol Christenson Jay Austin		http://www.earthgauge.net/2011/climate-trivia-more-or-less-snow http://www.earthgauge.net/2013/climate-fact-american-snowfall
Fall		any	1	Bottled or Tap, plastics	Bottled or Tap? What are the issues that affect our drinking water (Costs, regulatory issues, Standards for tap water are much more stringent than bottled water)?Municipal DW regulated by federal and State Laws and routinely monitored; Bottled water regulated as a food by FDA with virtually no testing beyond sanitation of container rules. What about industries/businesses that capitalize on the resources available here? Breweries moved to the area for clean water access.	Amy Westbrook Mike Luhrsen Anita Anderson Bryon Tonnis or Laura Mullen Bent Paddle Emily or Joel Vikre		http://www.lakesuperiorstreams.org/understanding/drinking.html
Fall		any	1	Spirit Mtn pulling water from St. Louis River instead of treated city water, Lutsen pulling water from lake	A waste of energy to use drinking water unnecessarily; But a water supply issue for MDNR to take stream water, especially if ecologically significant amounts are pumped during low flow periods which can be tough on fish and other organisms even if trout are not present	Spirit Mtn-?? Tom Rider-Lutsen John Lindgren		http://www.mprnews.org/story/2011/06/19/lutsen-dnr-water-permit
Fall		any	1	Geography and Weather (mid-Nov. is national Geographic Society's Geography Awareness	Geography is all around us and varies from region to region in the United States. Did you know that geography and weather are very closely linked (ex. Lake effect snow,)	Howard Moers		www.nationalgeographic.com/geography-action/index.html http://www.earthgauge.net/2011/geography-and-weather
Fall		any	2	Beach Sweep/Coastal Clean-up	Citizen Science, Plastics (BagIt)	Great Lakes Aquarium Lorena Rijos		http://www.greatlakes.org/ADOPTABEACH

Fall		any	2	Moose on the Move changing range of birds and mamals	Loss of habitat, changing climate, exposure to disease all weigh on the moose pop. In MN. Warmer winters and especially summers are a important factor.	Ron Moen Dave Zentner	http://www.nrri.umn.edu/moose/
Fall		any	2	Composting for Spring Gardens	Vermicompost/Worm watch vs worms for composting. BUT don't let them get free, they are an invasive species affecting northern forests	Ryan Huffmeier Suzy Darley-Hill	http://glaquarium.org/conservation/beach-sweep/
Fall	Sept.	any			Cardboard boat races-Civil Engineering Students on Bagley Pond		
Fall		any			Green Roofs in Bloom, St Louis CO Parking lot, UMD's Bagley classroom and civil engineering		
Fall		any			Harvesting food at UMD farm, sustaina ble aspects of farm include: composting, drip irrigation		



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 It all comes down to your water



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