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Currents

Runoff and Imperviousness in Drainage Criteria Manual

WWE is pleased to announce that the update to the [Runoff Chapter](#) in the Urban Storm Drainage Criteria Manual of the Mile High Flood District (MHFD) is complete and was published at the end of March 2024.

One of the key updates in the latest version of the Runoff Chapter is new and improved guidance on imperviousness for different land uses and surface cover types. The work involved analysis of recent developments to look at how the density of different types of land uses may have changed since the original guidance was developed several decades ago.

WWE also conducted work to evaluate appropriate imperviousness values for landscaping and solar fields, while Brik Zivkovich, P.E., CFM, of MHFD developed guidance on imperviousness to assign to stormwater control measures.

The following Technical Memoranda provide background on the updated imperviousness criteria:

- [Analysis and Recommendations for Updated Land Use-based Percent Impervious Values.](#)
- [Determination of Water-wise Landscape Imperviousness Criteria.](#)
- [Determination of Solar Panel Field Runoff Coefficients.](#) and
- [Evaluation of Percent Imperviousness for Stormwater Control Measures \(SCMs\).](#)

WWE appreciates the opportunity to work on this important topic for MHFD. Dr. Andrew Earles, P.E., was WWE’s Project Manager and received great support from WWE staff including Dr. Chris Olson, P.E., Victoria Hennon, E.I., Matthew Howard, E.I., Kristin Karashinski, and Michael Ankner, E.I.

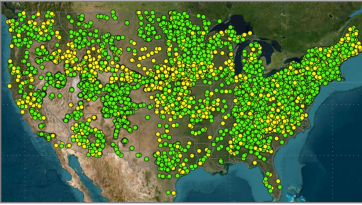
WWE Anniversaries

On May 1, WWE will celebrate our 63rd year in business! It all began in 1961 in a little office in Denver off the South Platte River. The place flooded in June 1965 and Ken Wright’s interest in flood control became all the keener. Ken helped with the development of the Urban Storm Drainage Criteria Manual (referenced above), and the rest is history.

In 1974, WWE water resources engineer Bill Lorah ventured to Glenwood Springs to begin a Western Slope WWE office. After 50 years, the Glenwood Springs office is still thriving, now under the dedicated management of Jonathan Kelly.



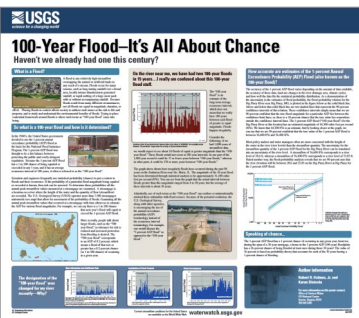
WWE’s Glenwood Springs crew: Jonathan Kelly, P.E., Drake Ludwig, P.E., Leanna Canyon, E.I., Jennifer Cay, Brianna Trotter, E.I., and Scott Schreiber, P.E.



This map by the Creating a National Inventory of Low-head Dams Task Committee shows confirmed low head dam locations (green) and locations requiring more validation (yellow). It is hosted by the Southeast Aquatic Resources Partnership at this [LINK](#), and provides the latitude and longitude of more than 13,500 low head dams across the U.S.



This cistern is part of the former Dye Shop in Pompeii.



Former U.S. Geological Survey (USGS) Senior Scientist Dr. Bob Holmes created this handy poster on the 100-year flood. WWE staff are impressed with Bob's knowledge of river hydrology and hydraulics and are delighted to be working with him on a wide variety of projects around the U.S. The poster is available at this [LINK](#).

National Inventory of Low Head Dams

April is Dam Safety month! In anticipation of this commemoration, the American Society of Civil Engineers (ASCE) Environmental and Water Resources Institute (EWRI) Task Committee has completed its closure report, "Creating a National Inventory of Low-head Dams."

The inventory is a big step forward in raising awareness and disseminating information on low head dams in the U.S. The inventory was completed over a three-year period with thousands of hours of contributed labor by members of the Task Committee and university

students. The 50-member Committee was led by Dr. Rollin Hotchkiss of Brigham Young University and included WWE's Jonathan Jones, Beth Knudsen, and Sam Plaza, along with former WWE engineer Karl Kingery.

The inventory work has spun off an upcoming documentary film, a research project to develop online toolboxes for the analysis of potential dangers at low head dams, and grant applications. Kudos to the Kenneth and Ruth Wright Family Foundation, which provided financial support for this effort.

Pompeii Dye Shop

After years of filing requests, our Pompeii research team was allowed access to the Dye Shop during their last research field trip in Italy. The Dye Shop, formally known as the "Officina Tinctoria of Terentius," featured two large cisterns in addition to the dye processing area.

Wayne Lorenz, Catherine Trowbridge, and their team collected dimensions of both the processing area basins (which feature large lead vats) and the cisterns, (which were estimated to hold about 11,000 gallons of water in total).

Colorado Shakespeare Festival

WWE is pleased to continue sponsorship of the Colorado Shakespeare Festival on the University of Colorado Campus in Boulder.

This summer's performances will be *Macbeth*, *The Merry Wives of Windsor*, and *Arden of Fevershem*. Tickets will sell out quickly, so get yours at this [LINK](#).

Sandra McDonald is New Adjunct Scientist

WWE has welcomed Sandra McDonald as a new adjunct scientist. Sandra served the City of Arvada for more than 20 years as Stormwater Administrator. She successfully supported the effort to implement a stormwater utility in 2002 and has been a stalwart manager of Arvada's MS4 compliance.

Our Project Manager for City of Arvada stormwater services, Lily Montesano, says that Sandra "understands stormwater compliance issues from every angle and brings thoughtful solutions to the table."

WWE worked with and for Sandra on construction and post-construction stormwater oversight and other MS4

issues. WWE looks forward to integrating Sandra's environmental regulatory compliance and enforcement experience into some of our projects!

Eucha Dam and Lake in Oklahoma

Chris Olson and Jon Jones are happy to be providing engineering support to an organization in Oklahoma called the Green Country Conservation Alliance, Inc.

WWE's work is on various aspects of Eucha Dam and Lake on Spavinaw Creek in northwest Oklahoma, close to Arkansas. WWE has been asked to evaluate such topics as spillway operations during flood events, stream channel stability, and habitat downstream from the dam, including

restoration potential and lake and stream water quality.

WWE participated in a recent meeting with staff from the City of Tulsa, the U.S. Army Corps of Engineers, and other organizations to discuss these topics.

WWE performed considerable work in Tulsa in the 1980s and 1990s, led by Ken and Ruth Wright, who were focused on flood hazard mitigation.

Jason Ullmann Appointed as New State Engineer

Governor Jared Polis has appointed Jason Ullman as Colorado's new State Engineer. Jason has more than 20 years of experience in water resources engineering, 14 years of which have been with Colorado's Division of Water Resources (DWR). He was the assistant Division Engineer to Bob Hurford in Division 4, the Gunnison River basin.

Before his time with DWR, Jason was City Engineer for the City of Montrose and was a consulting engineer for

various ditch and reservoir companies throughout Colorado.

Jason has a great deal of experience working with WWE clients and industries on Western Slope water issues like the Colorado River.

Durango water rights expert Pete Foster says that Jason is a "very bright, hard-working engineer who will have a lot of knowledge on Western Slope water rights."

New Mexico Land and Water Summit

Andrew Earles attended the 2024 New Mexico Land and Water Summit on March 8. The Land and Water Summit was created in 1986 by the Xeriscape Council of New Mexico and brings together a wide variety of participants, from engineers and scientists, to governmental agencies and tribes, to farmers and ranchers.

Andrew was part of a presentation led by Rifka Wine, P.E., CFM, of Bohannon Huston, Inc. (BHI). Rifka and Andrew's presentation was "Harmony in the Desert Sun: Merging Nature's

Resilience with Solar Brilliance through Green Stormwater Infrastructure."

This presentation focused on criteria that WWE worked with BHI to develop for Bernalillo County relative to calculating runoff from solar fields.

Andrew and Rifka were impressed with the number of questions that they received following their presentation and enjoyed interacting with the audience. Andrew would like to thank BHI for inviting him to participate in this presentation with Rifka.



Above: Claire ("Slipper") Jones (front row, almost center), daughter of Jon and Karen Jones, graduated from the Captains Career Course at Ft. Sill in Lawton, Oklahoma, on March 20. Her compatriots in Field Artillery include three international allies from Oman, Morocco, and Croatia. Slipper has now returned to her roles as a paratrooper and Captain with the 173rd Airborne Brigade based in Vicenza, Italy. WWE is proud of Slipper and grateful for her service!

Below: Jon and Karen enjoyed attending Slipper's ceremony and felt honored to meet her classmates.



Rifka Wine and Andrew Earles speak to a full house in Albuquerque, New Mexico, on the use of green infrastructure principles for solar fields.



Jon and Karen Jones' granddaughter, Isabelle, playing with dog, Gracie, in Superior.



Catherine Trowbridge's dog, Kona, in Westminster, proving he was made for snow.



Even during the snowstorm, Natalie Collar found a way to enjoy her hot tub in Golden.



WWE Water Resources Engineer Jessie Egan visited "Stumpy," the famous cherry tree, in March, when the cherry blossoms were at a bloom level of 4 out of 5. The Washington Monument can be seen across the estuary.

Mountain Snowpack in Colorado

A big March storm that forced many people to work from home contributed to Colorado's mountain snowpack, now measuring 109% of the 30-year norm. Many of us were concerned earlier this winter when snowpack levels were lagging at about 70% of average, but the

biggest storm in three years in parts of Colorado provided a great reset.

Western portions of Denver received 20 to 24 inches of snow, while the small town of Nederland near Boulder received 53 inches. Amazingly, the Front Range's commonly referenced source of precipitation data, Denver International Airport, received less than six inches of snow.

Snowpack is now 106% of normal in the closely-watched Upper Colorado River Basin, a crucial source of water for 40 million people in seven states and the nation's agriculture.



Above Left: Jon and Karen Jones' patio furniture supported about two feet of snow.

Above Right: Kristine and Charlie Thrush's home in Superior.

Beth Knudsen is New Chief Administrative Officer

Beth Knudsen has taken on a new role at WWE as our Chief Administrative Officer (CAO). Beth's mission is to optimize daily operations, drive the needs of the business, and provide support for our staff.

governance, IT (infrastructure), licensing compliance, marketing, people operations, and professional development.

During Beth's four years at WWE, she has already been engaged in most of these areas, and we thank her for her leadership in these critical matters.

As CAO, Beth will be involved in accounting operations, administrative operations, communications, corporate

Stumpy's Last Stand

Time is running out for people who want to visit "Stumpy," Washington, D.C.'s most iconic cherry tree. Stumpy is a thwarted, yet resilient, little tree that resides along the south bank of the Tidal Basin, which manages tides from the Potomac River. For years, Stumpy has survived twice daily flooding and being stripped of bark by hungry beavers. Stumpy's persistence has made it a folk hero among D.C. tourists.

much as five feet since their initial construction around the turn of the last century, while the sea levels have been rising. This has necessitated a large restoration project to repair and enhance the seawalls that involves the removal of 300 trees, including Stumpy.

Clippings from Stumpy will be sent to the National Arboretum to create genetic matches. The hope is to plant little Stumpy clones on the National Mall or nearby parks.

Portions of the Tidal Basin and West Potomac Park seawalls have settled as

City of Montrose River Monitoring

The City of Montrose contracts with WWE to monitor and calibrate their automated streamflow measurement device located on the Uncompahgre River upstream of the City’s wastewater treatment facility.

WWE makes semiannual site visits to Montrose to conduct a stream cross-

section level survey and a manual discharge estimate to determine whether recalibration of the automated measurement equipment is required.

In March, Trevor Downing and Jonah Howe made the trek to Montrose on behalf of Project Managers Hayes Lenhart and Pete Foster.

Where Does Colorado River Water Wind Up?

A [NEW STUDY](#), published in the journal *Communications Earth & Environment*, reviews two decades of data to determine where Colorado River water is going.

Not surprisingly, irrigation—water for five million acres of cropland—uses more than half of the Colorado River’s

annual flow, the paper found. The vast majority of that went to alfalfa and other grasses to support the country’s beef and dairy industries.

This suggests that more efficient agricultural water use would provide the most opportunity for conservation of Colorado River water.

Western Slope Water Issues Conference Reminder

The Colorado Association of Stormwater and Floodplain Managers (CASFM) Western Slope conference is scheduled for Friday, April 26, from 9 am to 3 pm, at the Glenwood Springs Community Center.

Drake Ludwig is organizing the event with CASFM’s Northwest Region Representative, Lisa Froshaug, from the City of Grand Junction.

Dr. Natalie Collar will present on “Developing a Wildfire Ready Action Plan (WRAP) for the Middle Colorado Watershed Council: Approach and Lessons Learned” with co-presenters Paula Stepp (MCWC) and Angie Fowler (SGM).

Other topics will include Clean Water Act Section 404 permitting, a Colorado River District update, and more. More details are available at this [LINK](#).

Eliminating “Futile Calls” on the Arkansas River

Division 2 of the DWR plans to eliminate the general use of “futile calls” on the Arkansas River by the spring of 2025.

Futile calls have been made in the Arkansas River basin in situations where the river runs dry below the junior user’s headgate. The junior user has been allowed to take the water because it appeared the water would not reach senior water users downstream.

The DWR now has a more sophisticated understanding of groundwater and surface water hydrology and it has determined that futile calls are injurious to senior water rights holders downstream.

WWE’s water rights specialists encourage those junior water users on the Arkansas River who routinely rely on futile calls to account for this change when conducting their water planning.



Above: Trevor Downing logs depth and velocity measurements to create a manual stream discharge estimate for the Uncompahgre River.

Below: Jonah Howe collects depth and velocity measurements in the river.



A new article called, “Drainageway vegetation management helps protect investments and promote values” by Noah Greenberg and Andrew Earles, was published by *Stormwater Solutions*. The article, available at this [LINK](#), explores the options and benefits vegetation can bring to communities. Planted areas provide important environmental services, including songbird and raptor habitat; biogeochemical processing of nutrients and other pollutants; sediment sequestration; scour and erosion prevention; shading and associated temperature moderation; and interception and capture of rainfall, which moderates peak runoff rates.

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WWE was delighted to receive a visit from Zoe Bjorn McSwain and her mom Kristi McSwain to celebrate Zoe's four-month birthday. Zoe, who we assume is a future engineer, is the granddaughter of WWE Controller Kristine Thrush.

WWE Athletes

WWE employs many excellent athletes. Starting with runners Ken Wright and Jon Jones, the active culture at WWE is pervasive. WWE staff members participated in four events in the last few weeks, alone!



Above: Jonah Howe raced in the "Cannonball Run" at Powderhorn Mountain Resort in March. He skied 37 runs (about 49 miles and 60,000 vertical feet) in seven hours and came in second place in the competition. The winner also skied 37 runs but beat Jonah by a minute on the last run to win! (Jonah wishes he hadn't stopped to grab that last Snickers bar...)
Photograph: Powderhorn Mountain Resort

Right: Drake Ludwig and his partner, Chloe Ward, competed in the Aspen "Power of Two" ski race for a second time this year. They were cheered on by friends who work for the City of Aspen at the top of Ajax (Aspen Mountain) before their final descent to the finish line.

Ajax was the first ski mountain developed in the region, putting Aspen on the map as a ski resort. Ajax does not have any beginner runs.



Left: Tracie De Feo competed in two "Rock 'n' Roll" series races in Las Vegas. These unique runs are scheduled in the evening so competitors can run "under the lights" of the Strip. Tracie ran a 5K on Saturday evening and a 10K on Sunday evening. Race organizers had 25,000 medals to give out on Sunday, alone, and Tracie says she found the other runners and the crowd very invigorating. Tracie ran her first 10K in 2015 and she hopes she never has to stop. She is already registered to run the "Rock 'n' Roll" races again in 2025.



Left: Leanna Canyon and her partner, Ethan McGill, competed in the Defiance Challenge at Ski Sunlight in March. The goal was to see how many runs two people can do in 10 hours in a predetermined 40-lap circuit of black and double black diamond runs. Leanna and Ethan skied 50,000 feet in 10 hours and completed the entire 40-lap circuit! The winners of the race were a 12-year-old boy and his grandfather with 46 laps. "It was amazing to see the oldest and youngest people in the entire race be the winners," said Leanna.

2024 Hydrologic Sciences Symposium

Andrew Earles has been invited to be a guest speaker at the 2024 Hydrologic Sciences Symposium at the University of Colorado (CU) in Boulder. The 18th annual symposium is being held at the University's Sustainability, Energy and Environment Community (SEEC) and online April 11–12.

Andrew will present his talk, "Incorporating Climate Change and

Uncertainty into Stormwater Infrastructure Design" on April 12 from 2:00–2:30 pm.

Information and registration for the symposium can be found at this [LINK](#).

Andrew thanks Santiago Ramirez at CU Boulder for the invitation; he is excited to participate.