

MEETING DETAILS

Meeting Date/Time: 03/04/2021 9:00AM to 10:30AM (via Zoom)

Attendees: See Q1 in poll results

This document: Meeting details and agenda (Page 1)
 Meeting notes (Page 2)
 Stakeholder Poll Results (Page 4)

Related: Video recording (via Zoom) – available at mhfd.org

MEETING AGENDA

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| 1 | INTRODUCTIONS | MHFD | 5 min |
| | - Mile High Flood District (MHFD) | | |
| | - Wright Water Engineers (WWE) | | |
| 2 | DENVER GREEN ROOF POLICY UPDATE | MHFD | 5 min |
| 3 | STAKEHOLDER SURVEY & DISCUSSION | All | 60 min |
| | - What are the factors that have led to successful green roofs in Colorado? | | |
| | - What are some of the challenges you have encountered with green roofs? | | |
| | - What do you want to see in the USDCM Criteria Manual on green roofs? | | |
| 4 | FEEDBACK & NEXT STEPS | WWE | 10 min |
| 5 | ANNOUNCEMENTS | MHFD | 5 min |
| | - Website | | |
| | - Additional feedback or requests to Morgan Lynch at MHFD (mlynch@mhfd.org) | | |
| 5 | ADJOURNMENT | | |

| TOPICS | DISCUSSION NOTES & COMMENTS |
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| Introduction | <ul style="list-style-type: none"> - “Rooftop Systems” - Holly update on manual & Denver; glad to have some Denver area green roof ordinance. - Focused on stormwater part of this. - Shallow tray system—saw no runoff for WQCV event. - Can subtract from WQCV requirement. - Green Roof initiative on ballot not written very well for CO. - Now have options related to Green Building, not just the green roof. Holly provided options and counts over the past 3 years. Doesn’t really promoting green roofs. |
| Primary Roles/ Experience with Green Roofs | <ul style="list-style-type: none"> - 33% designers - 24% policy - 19% Academia - Half no experience with green roofs, but 35% more than 5 |
| Why Interested? | <ul style="list-style-type: none"> - Interests in lesson learned - Want to encourage more use |
| Concerns | <ul style="list-style-type: none"> - Irrigation requirements - Concerns with maintenance/management - Climate - Plant spec, retained water and irrigation - Expectations on plants - Misinformation: leaking (don’t), irrigation, maintenance—treating them like living systems is necessary - Green roofs in COLORADO - Need to blend plant design on roof |
| Lesson Learned | <ul style="list-style-type: none"> - Legislative side (Sybil)—still hard to capture at commercial buildings—if can capture roof runoff and plant growth—more sustainable. Water sensible urban design. Legislative issues with roof runoff. Gaining more flexibility - Jennifer—5 inches supplemental irrigation for growing season for various plants - Brian— “prefab systems” dialing them in for appropriate climate reasons. - Andy – Building design needs to be taken into account- shading, sunlight, windows, etc. - Microclimates, designing to the roof - Blue roofs should be an option - “postage stamp” green roofs not great—do the whole roof |
| Blue Roof Experience | <ul style="list-style-type: none"> - Water rights issue. - Temporary trays until it evaporates - Slow drain time - Blue/green roof integration—maybe incorporated at national western center - Green Roofs for healthy cities - Several thousand square feet at national western - Jim Lenhart: base tray with wicks that pull up to growing media.; frozen roof breaks; tray system in smaller systems; - Manufactured systems with wicking; slopes - Can have multiple different drain/control points—let water off of certain areas - Language from State Engineer: - "Green roofs are allowable as long as they intercept only precipitation that falls within the perimeter of the vegetated area. Green roofs should not intercept or consume |

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| | <p>concentrated flow, and should not store water below the root zone.” https://mhfd.org/wp-content/uploads/2019/12/UDFCD_Stormwater_Legislation_Memo_2016-03-09-1.pdf</p> <ul style="list-style-type: none"> - Sybil: storage of 5 inches is not that much to store—need to change legislation to allow reuse from roofs. |
| Success | <ul style="list-style-type: none"> - Experience - Irrigation - Important for visual/physical access - Get involved early—can’t do as an afterthought - EPA green roof—large droplet, low evaporation rotor 0.25 irrigation; overhead with larger drop (MP Rotator); stream spray vs. flat spray; wind patterns - Importance of media related to drip |
| Challenges | <ul style="list-style-type: none"> - Owner interest in maintenance |
| Resources | <ul style="list-style-type: none"> - Plant Pallets - Pool information - BMP photo map - Jennifer- provided professional citations- solar panel, EPA, DBG - Carnegie Mellon effort (monitoring) - Ongoing resource share – will email to Holly/ Morgan |
| Should Blue Roofs be Considered in Updated Fact Sheet | <ul style="list-style-type: none"> - All say yes - Yes: consider blue roofs in design. |
| Green Roofs and WQCV Req’s | <ul style="list-style-type: none"> - Flight at the Taxi Development; not a lot of experience on this - Most of the green roofs—stormwater hasn’t been the primary objectives, waterproof protection <p>Other challenges:</p> <ul style="list-style-type: none"> - Green roofs end up being an evolution - Perception to meet those requirements elsewhere |
| What’s Missing from Current Criteria? | <ul style="list-style-type: none"> - Need more local data DBG green roof - Request to email comments - Can get more specific to our climate - Guidance vs. prescriptive; tend to like guidance - Modernize - Education – expand on climate specific guidance |
| What do you want to see in the Update? | <ul style="list-style-type: none"> - More case studies - Design irrigation and maintenance - Growing media specs, lightweight media - Green roofs.com - Focusing more on human connection - Photos – Send to Brik/ Morgan |
| Additional Discussion | <ul style="list-style-type: none"> - Green roofs should be spaces to celebrate, not just regulatory - Want to see more education and sharing. - Desire to keep innovation. - Elizabeth Fassman—reactive membrane? - Talked about adding amenity/human connection |

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| | <ul style="list-style-type: none"> - Climate benefits/carbon/cooling - Talked about co-benefits a bit (see what Stream covers) - Maybe Co-benefits report from Corona & Mines |
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STAKEHOLDER SURVEY – POLL EVERYWHERE RESULTS

Q1: Introduce Yourself:

- Andy Creath, Green Roofs of Colorado
- Jennifer Boussetot, Ph.D. and Green Roof Professional (GRP), Assistant Professor in the Department of Horticulture and Landscape Architecture at Colorado State University.
- Dan Dodson, Bio Clean
- Jim Watt, MHFD
- Tracy Bolger, Muller Engineering
- Brian Wethington, CCD DOTI Office of Green Infrastructure
- Mark West, HKS
- Cassie Kaslon, Valerian
- Tiffany Clark, SEMSWA
- JC Culwell, Wenk Associates
- Laraine Sanfilippo, Oldcastle Infrastructure
- Jane Clary, Wright Water Engineers
- Jim Lenhart, Consultant

Q2: What is your Primary Role:

| Response | Count |
|-----------------------------|-------|
| A - Designer | 7 |
| B - Policy/Regulation | 5 |
| F - Research/Academia | 4 |
| H - Manufacturer | 2 |
| I - Other (type in chat) | 1 |
| E - Maintenance | 1 |
| D - Construction/Contractor | 1 |
| C - Reviewer | 1 |
| Total | 22 |

Q3: How many green/blue roofs installations have you been involved in during the last five years?

| Response | Count |
|------------------|-------|
| A - None | 6 |
| E - More than 10 | 3 |
| B - 1 to 2 | 3 |
| D - 5 to 10 | 2 |
| Total | 14 |

Q4: What is one interest/reason for attending today’s meeting on Green/Blue Roofs?

- I'm new to these - to learn more about the issues involved with design and construction
- Learning about how the criteria may help encourage green roofs in the future
- Want to see more and better quality green roofs in Denver, so hopefully this is an opportunity to provide a framework for projects to understand them better.
- Seeing how we can expand this criteria to get green roofs more incorporated into storm calcs
- listen in to hear others thoughts
- Shape the future

- understanding the MHFD criteria for design
- To help update the criteria on green roofs as I helped write the first round over 10 years ago and we have learned a lot since then.
- Add and clarify existing Green roof info
- opportunity to guide process

Q5: Do you have concerns with green roofs on the Colorado Front Range?

- Are the building energy benefits in Colorado comparable to Southeast building cooling occurs year round and where irrigation is not needed?
- Plant specification, retained water criteria and irrigation
- Proper training and understanding of green roof construction
- Climate demands a different approach and expectation than other areas.
- As a green roof researcher, I have no concerns with green roofs as an application. I do have concerns with misinformation and ineffective management of green roofs.
- Misconceptions regarding irrigation needed
- Unrealistic expectations from clients
- Irrigation water requirements and impact to water balance

Q6: What is one thing you have learned about green roofs, blue roofs, or water capture and reuse (rainwater harvesting) in the past 5 years:

- Like all living systems, GRs need ongoing care. This is more likely when it is visible to users.
- Need to understand the impacts of building orientation and aspect.
- The perception that green roof off-the-shelf systems are easier/cheaper when they are actually more difficult to maintain and keep alive than well-designed built-up systems.
- Local Data from DBG and EPA providing on the roof information for stormwater detention.
- I am immersed in green roof research so I have learned a lot. One of the key things is that we can get a low-water green roof in Colorado to survive on only 5 inches of irrigation per year.
- That blue roofs can easily be incorporated to a green roof system, it's just modification of the drain detail and adequate structural loading. Easier to do in design phase, less on retrofit buildings
- Blue roof are still emerging and a bit tricky. Need more accountability by GR providers using some standards of verification.
- Benefits for building energy efficiency

Q7: Do you have experience using blue roofs over green roofs? If so, please share.

| Response | Count |
|----------|-------|
| No | 12 |
| Yes | 2 |
| Total | 14 |

Q8: What are the factors that have led to successful green roofs in Colorado?

- Dual purpose green roofs, make them amenities
- Visual and/or physical access

- Managing clients expectations
- Knowledgeable design and maintenance.
- Irrigation
- Education and experience

Q9: What are some of the challenges you have faced with green roofs?

- Lack of knowledge and experience - if they are done correctly, green roofs thrive here.
- Access, owner interest in maintenance

Q10: What existing resources, references, or case studies are you aware of concerning vegetation on green roofs in the Front Range (or other semi-arid environments)?

- FLL guidelines???
- Jen Busselot – Professional Citations:
 - Schneider, A., Landis, M., and Busselot, J.M. Accepted. Observations on the survival capacity of 118 plant taxa on a green roof in a semi-arid climate: 12 year update. Journal of Living Architecture
 - Busselot, J.M., Russell, V., Tolderlund, T., Celik, S., Retzlaff, B., Morgan, S., Buffman, I., Coffman, R., Williams, J., Mitchell, M.E., Backer, J., and DeSpain, J. 2020. Green roof research in North America: A recent history and future strategies. Journal of Living Architecture, 7(1): 27-64. <https://doi.org/10.46534/jliv.2020.07.01.027>
 - Busselot, J.M., Slabe, T., Klett, J.E., and Koski, R.D. 2017. Photovoltaic array influences the growth of green roof plants. Journal of Living Architecture: 4(3): 9-18. <https://doi.org/10.46534/jliv.2017.04.03.009>
 - Schneider, A., Fusco, M., and Busselot, J.M. 2014. Observations on the survival of 112 plant taxa on a green roof in a semi-arid climate. Journal of Living Architecture: 1(5). <https://doi.org/10.46534/jliv.2014.02.01.010>
- Open to providing data on existing roof projects and photos throughout the years to collect more data

Q11: Should blue roofs be considered in the green roofs?

| Response | Count |
|----------|-------|
| A - Yes. | 6 |
| Total | 6 |

Q12: Have you used the green roofs to satisfy the WQCV requirement?

- Working on one currently in Boulder at Hotel project
- We try...not a priority to owners/builders
- Yes - Washington DC, Seattle, New York, Toronto, Chicago
- I would love to help on that - but haven't been asked to participate on one yet. Jen
- Yes, Flight at the Taxi Development

Q13: What is missing on the current USDCM fact sheet?

- Intensive or deeper soil volumes? maybe it's already there
- It's been a while since I have read it - I think that a complete refresh is a good idea. I can help with that.
- Can you email copies to the attendees for comments/edits?
- More local data

Q.14: What do you want to see in the USDCM Criteria Manual on green roofs?

- More information on growing media specs, specifically light weight media
- Clear guidance on design, irrigation, and maintenance for our region.
- More case studies

Q15: What do you want us to know about green roofs?

- Opportunities for gardens/harvesting, not sure how calculations would work into this but opportunity
- That green roofs can be used as spaces to celebrate rather than just a regulation/problem.

STAKEHOLDER POLL RESULTS

- Enter meeting agenda here.