Speakers

1) Victoria Arling
   Colorado Basin Program Manager, WaterNow Alliance

2) Lindsay Rogers
   Water Policy Analyst, Western Resource Advocates

3) Matthew Cook (Quint) Redmond V
   Co-Founder/CEO, Agriburbia LLC

4) Kevin Reidy
   Senior Water Efficiency Specialist, Colorado Water Conservation Board
EVALUATING URBAN AGRICULTURE AS A WATER MANAGEMENT TOOL

Victoria Arling, CO Basin Program Manager, WaterNow Alliance

Lindsay Rogers, Water Policy Analyst, Western Resource Advocates
Who is WNA?

WaterNow is a nonprofit network of local water leaders advancing sustainable, affordable, equitable, and climate resilient water solutions in their communities.

- **Policy advocacy** - to create pathways for sustainable and affordable strategies
- **Forum for engagement** - to connect water leaders to ideas, resources, opportunities, and one another
- **Technical assistance** - to implement projects on the ground
“All production of plants or animals that takes place in or near a city, whether for personal use, for sale, or for charitable distribution, regardless of growing medium.”
Benefits

Social

Environmental

Economic
1. Can urban agriculture in Colorado help us to both manage stormwater runoff and reduce our demand on municipal water supplies?

2. And if so, what policy actions can be taken to encourage urban agriculture as a land use planning and water resource management tool?
Project Scope

Phase 1
Literature Review

Phase 2
Stakeholder Interviews
Project Scope

Phase 1
Literature Review

Phase 2
Stakeholder Interviews

Phase 3
Policy Action Roadmap
Water Conservation and Urban Agriculture

- Water savings
- Difficult to quantify
Water Savings Quantified

• Community gardens: 11 gal/ ft^2
• Traditional bluegrass: 18 gal/ ft^2
  • 40% water savings

Aurora Water (2015)
• Turf to veggie conversions at two sites (City Hall and Griswold)
  • 74% water savings

California Farm & Garden (2021)
• Replacing lawns with vegetable and fruit gardens
  • 75% water savings
Water Conservation Implications

- Embodied water savings
- Fallow ground during drought times
Xeriscape
Water Conservation BMPs

- Irrigation techniques
- Soil amendments
- Mulch
- Crop type
- Rain barrels / water capture
Water Conservation Challenges

- Education
  - Watering techniques / crop selection
- Lawn culture
“Urban agriculture is an innovative green stormwater infrastructure tool that can be implemented in vacant lots or previously vegetated areas. Urban agriculture not only reduces stormwater runoff but it also increases the nutritional health of the surrounding community, improves the local economy, and provides residents with green space.”

- American Rivers, 2015
Stormwater Management and Urban Agriculture

- Sister Garden Farms - Denver
  - Designed proactively to manage stormwater

- City and County of Denver - Green Infrastructure Implementation Strategy (2018)
  - Water Resources Center at the National Western Complex

- New York (2016)
  - Community gardens in NYC may be retaining 12 million gallons of stormwater annually
Stormwater Management BMPs

- Regenerative Farming Practices
  - Garden placement
  - Water control / diversion
  - Crop selection
Stormwater Management Challenges

- Inundating crops
- Raised beds
- GSI features / equipment
- Nutrient runoff
WHO IS WRA?

Western Resource Advocates

- We are a conservation organization with more than 30 years experience in the Intermountain West
- We use law, science, and economics to craft innovative solutions to the most pressing environmental challenges
- We work to conserve western lands, advance clean energy, ensure healthy rivers, and protect air quality throughout the region

OUR MISSION: Western Resource Advocates is dedicated to protecting the West’s land, air, and water to ensure that vibrant communities exist in balance with nature.

www.westernresources.org
1. Can urban agriculture in Colorado help us to both manage stormwater runoff and reduce our demand on municipal water supplies?

2. And if so, what policy actions can be taken to encourage urban agriculture as a land use planning and water resource management tool?
Knowledge & Research Gaps

1. **Studies/demonstration projects** quantifying water use & retention associated with urban ag in CO
   - Variables: varying water years, irrigation type, crop type, soil type and amendments, garden layout, scale of operation, location

2. **Green stormwater design** and BMPs for urban ag in CO
   - e.g. addressing infiltration challenges

3. **Next generation urban ag practices**
   - Green roofs, indoor vertical farming, Cannabis

4. **Drought-tolerant, climate resilient crop varieties**
1. Cost of Water
2. Access to Water
3. Water Reuse
4. Turf to Urban Ag Conversions
5. Water Education, Resources & Funding
Cost of Water

Challenge:
- Municipal, treated supplies more expensive than raw, ditch water
- Unique infrastructure needs (e.g. backflow prevention)

Policy Considerations:
- Shift in thinking - Urban ag as a form of infrastructure
- Subsidies to reduce cost of water or plot fees (low-income gardeners)
Access to Water

Challenge:
- Tap fees are cost prohibitive
- Accessing water early/late in the season on CII property

Policy Considerations:
- City subsidizes urban ag tap fees
- Work with developers to negotiate discounted tap fees
- Develop long-term agreements, relationships with CII property owners
- Subsidies/funding for frost free hydrants or water tanks
Challenge:
- Restrictions on graywater, rainwater capture and centralized recycled water

Policy Considerations:
- Update Reg 86 to allow for irrigating edible produce
- Update HB16-1005 to allow rain barrels on CII properties; expand stormwater capture regulations
- Reg 84 implementation - pilot programs, reclaimed water infrastructure
Turf to Urban Ag Conversion

Challenge:
● Unlike xeriscape, urban ag doesn’t receive rebates/incentives for turf changeouts

Policy Considerations:
● Recognize urban ag as conservation tool in Water Efficiency Plans
● Update turf replacement rebate guidelines to allow for conversion to urban agriculture
Water Education, Resources & Funding

Challenges:
● Equity / access to information and resources
● Under-resourced nonprofits / Extension programs
● Lack of state funding

Policy Considerations:
● Colorado Water Equity Partnership
● Educational centers
● Metro Basin Roundtable representation
● Metro Water Conservation District
● Funding for urban ag non-profits / universities
● CDA’s new Urban Ag specialist to act as “hub”
Land Use Barriers & Policy Considerations

1. Access to land
2. Season extension
3. Edible crops & livestock limitations
Access to Land

- Prioritize/recognize in Planning (Comp Plan, Sustainability Plan)
- Allow in all or most zoning districts
- Require/incentivize in new development
  - Menu of options to meet community amenity requirements
  - % of open space / park space
- Include in Low Impact Development ordinance, MS4 criteria manual
- Create long-term leases on City-owned property/parks

Montava plans town center, working farm in first phases of 4,000-home Fort Collins project

Pat Ferrier  Fort Collins Coloradoan
Published 12:51 p.m. MT Aug. 10, 2021  Updated 3:32 p.m. MT Aug. 10, 2021
Season Extension

- Create permitting processes & exemptions for high tunnels (streamlined & affordable)
Edible Crops & Livestock Limitations

- Animal husbandry limitations
- Vegetable gardens in planting strips / ROW
- Setback requirements/buffers for small lots
- HOA limits around urban ag
Next Steps

Policy action roadmap w/ recommendations for Water Plan:

1. Acknowledge urban ag and associated water benefits
2. Identified knowledge gaps and research needs
3. Identified funding/resource needs
4. State and local policy opportunities w/ BMP Guide
THANK YOU!

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Victoria Arling,
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APA Colorado

September 8, 2021
Building the Infrastructure for the Next Generation of Food...
Introductions

• Partners and Associates
  o Jon Beckner      Real Estate and Finance
  o Paul Newton     Design and R&D
  o Nate Newman     Technology
  o Jan Cleveland   Legal and Administration
  o Steve Long      Operations
  o Jon Fenton      Young Go to Guy
Agriburbia LLC (holding company)

- **Aburb Development LLC**
  - Real Estate Development, Finance
  - Sustainable Development Management
    - Ag Feasibility
    - Ag Supply Chain Consulting
    - Ag Infrastructure Design and Consulting
    - Ag Estate Planning

- **Aburb Design/Build LLC**
  - Landscape Architecture
  - Land Planning
  - Civil Engineering
  - Agricultural Construction and Management

- **Aburb Operations LLC**
  - Farming, Agricultural Operations
  - Food Sales, Supply chain
Trends: U. S. Population
Trends: Farm Population
Trends: Percentage Farmers in US Labor Force
Trends: Number of Farms
Trends: Obesity Rate
Trends: Health Cost in Billions
Trends: What is the Real Problem?
Do We have Enough Water to Make Ourselves Healthy?
Agricultural Infrastructure (Water)

Which Uses Would You Pursue if You Wanted to Save Large Amounts of Water?

Calories Per Acre/Foot

Source: USGS Estimated Water Use in the US, 2004 (Colorado Statistics)
Embodied Water in Food…

This amounts to 3496 litres per day which means that 92% of the water we use is invisible and it is hidden in our food!

Source: http://thewaterweeat.com
Industrial Irrigation and Commodities
Intensive Irrigation and Edibles
Water – Irrigation

- Water Sources
  - Any source, surface, well or public
  - Public – Potable is best
  - 1 acre or more
  - Commercially viable
13 Million Acres Short (currently)

The US is 13 Million Acres Short of Vegetables and Fruits to Meet Current Population Dietary Recommended Intake

** Does not account for Future Population Growth

** Based on revised USDA DRI allowance & the American Farmland Trust (2010)

- Colorado Population: 5,024,748 (about 1.6% of US)
- By Population Colorado Needs **208,000 Additional** Acres
- 208,000 Acres of Farm = 83,200 Jobs
30 Million New Farmers…

- There is a national call for new professional commercial farmers.
- These are not overalls and tractor guys…
- They are hospitals, clinics, school districts, inspired developers and cities and counties that want a healthy future.
New Decision Drivers...

- **Resilience**
  - CEOs looking to invest...
    - Energy
    - Water
    - Food

- **Health & Wellness**
  - Medical industry changing models

- **Creativity**
  - iPhone 25...who cares...
Agriburbia Types

♦ Development
  o Public Civic Farms (Open Space)
  o Private Steward Farms
    • Edible Landscape (Permaculture)
    • AABEs
  o Office / Industrial Parks

♦ Institutional
  o Hospitals
  o Schools and School Districts
  o Academic Higher Ed Campus
  o Churches
  o ?
Agriculture as Infrastructure

- (Sub)Urban Utilities:
  - Water
  - Sewer
  - Roads
  - Electricity / Energy
  - Digital
  - Agriculture?
Green Infrastructure – Floodplain Drainage

Adams Crossing
- 430 New Dwelling Units
- 101 acres first phase
- 48% in intensive agriculture
- Geothermal
- Solar
- Complete Streets
- LID (low impact development)
Green Infrastructure – Green Roofs
FarmKit™

◊ AABEs:
  o Wellness
  o Chiropractor
  o Dentist
  o Daycare
  o STEM School
  o Agriculture ?
Amazon Proof

Agriculturally Augmented Business (AAB) Opportunities

Occupational Therapy Center

Agriculturally Augmented Business (AAB) Opportunities

Farm-Based Daycare

Agriculturally Augmented Business (AAB) Opportunities

Chiropractic Services

Agriculturally Augmented Business (AAB) Opportunities

Natural Dental Care

Dental care has been practiced throughout the world for over 10,000 years. In the United States today, dental care looks very different than it has for most of recorded history. Most dental procedures are performed in uninviting medical office environments, employing substances known to be toxic to the human body (triazine, sodium laurel sulfate, and fluoride to name a few).

Consumer markets are increasingly driven by demand for local products and supply chain transparency. Meeting this growing demand will require the integration of new models for contemporary dentistry.

Agricultural augmentation of contemporary dental practice will provide multiple benefits to practitioners and communities alike. A comfortable and stimulating agricultural environment will aid in attracting and maintaining a client base. On-site cultivation of various crops (peppermint, stevia, etc.) will enable the on-site production of natural toothpastes and mouthwashes free from toxic chemicals.
Research and Planning Agenda

- Fundamental and Applied Research at the Intersection of Agriculture and Real Estate
  - Food Security Planning
    - Community Food Fraction™ (Caloric Proximity)
    - Irrigation and Water Security (Calories per Acre/Foot)
    - Agricultural Infrastructure (Land / Water / Labor)
  - Carbon Consumption Modeling (Carbonless Food)
Smart Cities / IoT

Our Technology Intellectual Property (Patents Pending)

**FarmKit™ Site Technology**
Agriburbia’s systems and methods are covered by one or more pending patents.

- Comprehensive Analysis
  - LIDAR Drone Surveys
  - Geospatial Database Management
  - Soil Quality/Constituent Testing

**FarmKit™ Building Technology**
Agriburbia’s systems and methods are covered by one or more pending patents.

- Streamlined Construction Process
  - Pre-designed and pre-fabricated kit of parts arrives on site
  - Geographically-based teams (salaried, skilled labor positions) assemble kits on site

**FarmKit™ Production Technology**
Agriburbia’s systems and methods are covered by one or more pending patents.

- Agricultural Hardware
  - Modular Trellis, Sparky Farmer
    - ADA and 55+ accessible
    - GPS and RFID tracking
    - Designed to integrate with existing agricultural technologies

- Multidisciplinary Design
  - BIM Modeling
  - GIS Database Management
  - Natural Resource Planning
  - Production Planning

- Resilient Live/Work Habitat
  - SIP Construction
  - Geothermal and Energy Recovery
  - Layout enables varying uses:
    - Winery Module
    - Brewery Module
    - Doctors Office Module
    - Pickling Module
    - Bakery Module
    - Day Care Module

- Big Data
  - Collection, Analysis and Distribution
    - RFID and Drone Data Retrieval
    - Real-time Trend Analysis
    - On-demand Data
    - On-farm Market Analysis tools
Smart Cities / IoT

COMM. RAIL & SENSOR MOUNT
SMART PLACARD
IMAGE / DATA SENSORS
COVERS
CROP ROW I.D.
PRODUCE INVENTORY TAG
DRIP IRRIGATED BEDS

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Trans-Disciplinary Nature (Economics)

- **WHAT** do we need to eat? (Health/Nutrition)
- **WHERE** do we Eat it? (Geography) . . then . . .

  - How do we have **LAND** there? (Business/Real Estate/Design)
  - How do we have **WATER** there? (Design/Engineering)
  - How do we get **LABOR** there? (Business/Law)
  - How do we **GROW** it there? (Agriculture/Agronomy)
Local is NOT Cute…

- Every calorie we generate within the boundaries of our own communities (water and sewer)…

- Saves WATER globally (using technology)
- Saves ENERGY (less transportation, less refrigeration)
- Is SAFER (because we know the supply chain)
- Is HEALTHIER (time of nutrients and quality)
- Creates VALUE (jobs, interest, opportunity)
- …Needs a FARMER…
As professional farmers, suburbanites, and city dwellers, we need to work together to use our resources as wisely as possible – land, water, and human ingenuity - to prosper in the coming days.

1785 Oct. 28.

“It is not too soon to provide by every possible means that as few as possible shall be without a little portion of land. The small landholders are the most precious part of a state.” (TJ to James Madison, B.8.682)
APA Colorado

September 8, 2021
Urban Agriculture from the State Water Plan Perspective

Kevin Reidy
Senior Water Efficiency Specialist
Colorado Water Conservation Board
Urban Agriculture

Urban agriculture is agricultural production that occurs in or near a city and is often centered around communal benefits such as community cohesion, food security, soil health, and urban biodiversity enhancement. [1]
Colorado Water Plan

● The original plan doesn't touch on urban agriculture water issues/opportunities (neither does the South Platte or Metro BIPs, for that matter)

● Based on our October listening session and literature review project, we now know that there's a growing urban agriculture community in Colorado and that they face some unique water issues

● Urban ag can play a pivotal role in expanding recycled water and can help further green infrastructure and water conservation objectives
Cross Cutting Themes

Denver One Water Plan

- Strengthen land-water-food-energy nexus by linking urban water management more closely to urban agriculture for increased food security, community benefits, and environmental health
  - Identify opportunities where regulatory updates can be made to allow more urban agriculture (urban gardens, plant nurseries, etc.), improve existing agricultural systems and management practices, and streamline the permit process.
  - Work with CPD to incorporate the One Water Plan into ongoing urban agriculture planning efforts. Collaborate with Colorado State University about their research and efforts related to water resources, water management, and urban agriculture.
  - Establish policies and regulations that create a path forward for developers to take advantage of the food security goals established by the 2017 Denver Food Plan and Denver’s Comprehensive Plan 2040 ("Denveright").
Cross Cutting Themes

Denver One Water Plan

- Integrate water aspects of City and County of Denver’s Green Infrastructure Implementation Strategy, Denver Living Streets, Water Quality Management Plan, and Storm Drainage Master Plan

  - Use DOTI pilot projects as an opportunity to test new requirements and innovative water treatment and conservation strategies as established in the plans noted in Strategy 5.1.
Cross Cutting Themes

Denver One Water Plan

- Create a framework with comprehensive criteria to identify and prioritize multi-benefit projects or water management strategies based on measures of social, environmental, and economic benefits and costs
  - Update development regulations to create a definitive path forward for developers to implement enhanced water conservation, water reuse, flood mitigation, ecosystem restoration, water quality, greenhouse gas (GHG) emissions reduction, and energy recovery plans into their projects.
Actions/Next Steps

- Pursue demonstration projects with municipal and agricultural partners to understand the water use/conservation tradeoffs between urban agriculture and other landscaping options.

- Demonstration projects can inform state and local government land and water use planning efforts such as Growing Water Smart, water efficiency plans, and municipal integrated water planning initiatives to incorporate urban agriculture as a water conservation strategy with significant community co-benefits.
Actions/Next Steps

- Create a demonstration project assessing the green infrastructure and carbon sequestration benefits of urban agriculture in a semi-arid state.

- Results will inform state planning and programming, including making urban agriculture development an eligible activity under the 319 Non-Point Source Grant Program and the state Clean Water Revolving Fund.
Actions/Next Steps

- Develop a technical assistance and financial resources water hub for urban agricultural producers for the Front Range region

-Securing funding to address infrastructure needs
- Developing model ordinances to encourage urban agriculture
- Hosting training events on topics such as recycled water for edible crops
Actions/Next Steps

- Launch a recycled water demonstration project focusing on edible crop cultivation. Demonstration of the project will assess the cost-effectiveness for producers to transition from municipal tap (potable) to recycled water and evaluate other potential concerns such as salinity levels, nutrient management, and crop quality.

- CWCB will work with local partners and water providers to develop education materials for producers to assist in navigating the current recycled water regulations and associated food safety requirements.
Audience Q&A

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