Co-Creating a Regional Vision for People + Nature
Taking a watershed approach

Dana Coelho, Alliance Director
Metro Denver Nature Alliance

September 29, 2020
Colorado Association of Stormwater and Floodplain Managers
Align nature-based efforts to ensure more equitable access to nature and to promote healthy people, communities, and natural places.

Connecting Communities. Championing Nature.

www.metrodna.org
In support of our mission & vision, Metro DNA performs three mutually reinforcing roles.

Our work is rooted in both conservation + equity.
Collaborative Projects

Metro DNA-led
• **Nature Narratives**: crafting and elevating a shared story and partner voices

• **Safe Summer Kick Off on Get Outdoors Day**: building community health, wealth, and safety through connections to the natural world; partnership with SouthWest Denver Coalition, Denver Parks & Recreation, and National Park Service

• **Regional Vision**: Defining shared social-ecological goals and strategies to achieve those goals; partnership with The Nature Conservancy and Biohabitats

Partner-led
• **City Nature Challenge**: documenting observations of wild plants and animals; Wild Foundation, CO DNR, and TNC

• **Summit for Action**: two-day workshop on solutions-based recommendations for Justice, Equity, Diversity, Accessibility and Inclusion; Ecoinclusive

• **Rx for PRONTOS**: a dialog prescription programs for parks, recreation, outdoors, nature, trails, and open space across the state; Colorado Public Health and Parks & Rec Collaborative, CDPHE, and NPS

• **Stewardship Mapping and Assessment Project (STEW-MAP)**: understanding our environmental stewardship “landscape” – who does what, where, and how are we all connected organizationally; Denver Urban Field Station
CONVERGENCE:

Water/Climate + Habitat Loss + Environmental Justice
**How to Create Nature Champions:***

1. Provide fun, hands-on nature experiences
2. Take learning outside
3. Have kids note 3 good things in nature everyday to improve their connection to nature
4. Share your love of the outdoors with children
5. Repeat!

**The Benefits of Time in Nature:***

- Better Social Skills
- Enhanced Health
- Increased Self Esteem
- Improved Grades
- Pro-Environment Behaviors
- Stronger Emotional Connections to People and Nature

Time outdoors in nature contributes to children's care for nature while supporting their healthy development. ² ¹ ⁰ ¹ ³

**Green Network Benefits:***

**Protect Ecological Resources**
- Water cleaning and storage
- Wildlife habitat

**Provide Beautification**
- Passive recreation
- Gathering/socializing

**Create Reinvestment & Growth Potential**
- Economic development

**Provide Equity & Empowerment**
- Environmental education
- Transportation alternatives

**Improve Health & Quality of Life**
- Cooling and shade
- Active recreation
- Food production
“We have confidence that [a] unified vision of conservation will result in significant progress over the long term. The coming together of nature conservation, historical preservation, ecosystem services, environmental justice and civil rights, sustainability, public health, and science communities is overdue, but when fully accomplished will reap significant reward. As these interests increasingly practice the skills of collaboration, and gain experience in working closely together in more common cause, they will find their collective ‘voice’ to be powerful, influential, and effective.”

Jonathan Jarvis, Designing climate resilience for people and nature at the landscape scale,

https://escholarship.org/uc/item/2mq6v6tn
Regional Conservation Assessment

leverage existing data and planning documents to identify high-quality, connected, and climate-resilient habitat in the metro area
POTENTIAL & EXISTING CONNECTIVITY/VULNERABILITY

Figure 2: 'Wild LifeLines'™

Natural Flow
We all do better when everyone thrives.
PRECEDES

Regional water/ecological data + Social-ecological

Inspire deeper understanding of stewardship and dynamics of water

Address human & environmental challenges

Bring people together in shared vision and provide hope

Inspire investments & build momentum

GREEN INFRASTRUCTURE PLAYBOOK
Regional planning framework & ecoregions
<table>
<thead>
<tr>
<th>Ecoregions in Denver Metro Area</th>
<th>Acres in CO</th>
<th>Acres in US</th>
<th>% of ecoregion type in CO</th>
<th>CO proportion of 1/2 earth target</th>
<th>Existing (2018) Protected Areas</th>
<th>CO ecoregional target GAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpine Zone</td>
<td>2,368,625</td>
<td>5,510,834</td>
<td>43%</td>
<td>1,184,313</td>
<td>2,249,737</td>
<td>(1,065,424)</td>
</tr>
<tr>
<td>Crystalline Mid-Elevation Forests</td>
<td>2,850,523</td>
<td>4,984,193</td>
<td>57%</td>
<td>1,425,262</td>
<td>1,733,802</td>
<td>(308,541)</td>
</tr>
<tr>
<td>Crystalline Subalpine Forests</td>
<td>3,050,267</td>
<td>3,914,655</td>
<td>78%</td>
<td>1,525,134</td>
<td>2,678,385</td>
<td>(1,153,252)</td>
</tr>
<tr>
<td>Flat to Rolling Plains</td>
<td>8,455,697</td>
<td>20,767,327</td>
<td>41%</td>
<td>4,227,849</td>
<td>458,557</td>
<td>3,769,291</td>
</tr>
<tr>
<td>Foothill Grasslands</td>
<td>1,155,168</td>
<td>1,155,168</td>
<td>100%</td>
<td>577,584</td>
<td>86,422</td>
<td>491,162</td>
</tr>
<tr>
<td>Foothill Shrublands</td>
<td>2,986,015</td>
<td>7,259,594</td>
<td>41%</td>
<td>1,493,008</td>
<td>1,239,154</td>
<td>253,853</td>
</tr>
<tr>
<td>Front Range Fans</td>
<td>500,215</td>
<td>500,215</td>
<td>100%</td>
<td>250,108</td>
<td>122,166</td>
<td>127,941</td>
</tr>
<tr>
<td>Moderate Relief Plains</td>
<td>3,969,131</td>
<td>8,075,630</td>
<td>49%</td>
<td>1,984,566</td>
<td>534,383</td>
<td>1,450,182</td>
</tr>
<tr>
<td>Piedmont Plains and Tablelands</td>
<td>8,546,418</td>
<td>8,546,418</td>
<td>100%</td>
<td>4,273,209</td>
<td>1,483,492</td>
<td>2,789,717</td>
</tr>
<tr>
<td>Pine-Oak Woodlands</td>
<td>371,522</td>
<td>371,522</td>
<td>100%</td>
<td>185,761</td>
<td>17,848</td>
<td>167,913</td>
</tr>
<tr>
<td>Rolling Sand Plains</td>
<td>2,956,328</td>
<td>6,778,348</td>
<td>44%</td>
<td>1,478,164</td>
<td>316,183</td>
<td>1,161,981</td>
</tr>
<tr>
<td>Other ecoregions in state</td>
<td>28,790,091</td>
<td></td>
<td></td>
<td>18,604,955</td>
<td>10,920,129</td>
<td>7,684,825</td>
</tr>
<tr>
<td>Total acres in state (all types)</td>
<td>66,000,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Red indicates ecoregions only found in Colorado
### Pine-Oak Woodlands

<table>
<thead>
<tr>
<th>County</th>
<th>Total Acres</th>
<th>Protected in Acres</th>
<th>Remaining Acres</th>
<th>% Target Avail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adams</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Arapahoe</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Broomfield</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Denver</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Jefferson</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Douglas</td>
<td>202,761</td>
<td>10,795</td>
<td>191,966</td>
<td>114%</td>
</tr>
<tr>
<td>Boulder</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>County</th>
<th>Total Acres</th>
<th>Protected in Acres</th>
<th>Remaining Acres</th>
<th>% Target Avail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adams</td>
<td>6,015</td>
<td>1,005</td>
<td>5,010</td>
<td>4%</td>
</tr>
<tr>
<td>Arapahoe</td>
<td>14,299</td>
<td>2,189</td>
<td>12,110</td>
<td>9%</td>
</tr>
<tr>
<td>Broomfield</td>
<td>8,046</td>
<td>1,361</td>
<td>6,685</td>
<td>5%</td>
</tr>
<tr>
<td>Jefferson</td>
<td>92,977</td>
<td>33,068</td>
<td>59,909</td>
<td>47%</td>
</tr>
<tr>
<td>Douglas</td>
<td>18,830</td>
<td>6,955</td>
<td>11,875</td>
<td>9%</td>
</tr>
<tr>
<td>Boulder</td>
<td>159,326</td>
<td>51,989</td>
<td>107,337</td>
<td>84%</td>
</tr>
</tbody>
</table>

### Front Range Fans

<table>
<thead>
<tr>
<th>County</th>
<th>Total Acres</th>
<th>Protected in Acres</th>
<th>Remaining Acres</th>
<th>% Target Avail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adams</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Arapahoe</td>
<td>6,015</td>
<td>1,005</td>
<td>5,010</td>
<td>4%</td>
</tr>
<tr>
<td>Broomfield</td>
<td>14,299</td>
<td>2,189</td>
<td>12,110</td>
<td>9%</td>
</tr>
<tr>
<td>Denver</td>
<td>8,046</td>
<td>1,361</td>
<td>6,685</td>
<td>5%</td>
</tr>
<tr>
<td>Jefferson</td>
<td>92,977</td>
<td>33,068</td>
<td>59,909</td>
<td>47%</td>
</tr>
<tr>
<td>Douglas</td>
<td>18,830</td>
<td>6,955</td>
<td>11,875</td>
<td>9%</td>
</tr>
<tr>
<td>Boulder</td>
<td>159,326</td>
<td>51,989</td>
<td>107,337</td>
<td>84%</td>
</tr>
</tbody>
</table>

### Foothill Grasslands

<table>
<thead>
<tr>
<th>County</th>
<th>Total Acres</th>
<th>Protected in Acres</th>
<th>Remaining Acres</th>
<th>% Target Avail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adams</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Arapahoe</td>
<td>20,245</td>
<td>5,787</td>
<td>14,457</td>
<td>3%</td>
</tr>
<tr>
<td>Broomfield</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Denver</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Jefferson</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Douglas</td>
<td>91,759</td>
<td>7,517</td>
<td>84,242</td>
<td>17%</td>
</tr>
<tr>
<td>Boulder</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

### Piedmont Plains and Tablelands

<table>
<thead>
<tr>
<th>County</th>
<th>Total Acres</th>
<th>Protected in Acres</th>
<th>Remaining Acres</th>
<th>% Target Avail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adams</td>
<td>102,346</td>
<td>6,208</td>
<td>96,137</td>
<td>3%</td>
</tr>
<tr>
<td>Arapahoe</td>
<td>104,364</td>
<td>6,711</td>
<td>97,654</td>
<td>4%</td>
</tr>
<tr>
<td>Broomfield</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Denver</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Jefferson</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Douglas</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Boulder</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>
Project Timeline + Process

1. Project coordination and planning
2. Collect, Process & Share Data
3. Develop Detailed Methodology
4. Conduct Mapping & Analysis
5. Share Outcomes

Conservation by Design Step: “Identify Challenges”
Core Team – Prep of baseline materials

Broader user group input on outcomes
Spatial Analysis & Modeling of Habitat Connectivity

Within the Greater Denver Metro Region

Chris Rehak | April 25, 2020
Introduction

Conservation and restoration have become planning priorities in urban-wildlife interface areas across the country due to increased habitat fragmentation resulting from urban sprawl and increasing populations. This fragmentation habitat connectivity can result in negative impacts for ecological function and health for natural communities. Habitat connectivity analysis is a method to improve understanding of these connections and wildlife movement patterns across the landscape and is important in helping to develop strategic approaches.

Purpose

Determine the optimal habitat connectivity patterns within the Greater Denver Metro area for the Mule Deer, which rely heavily on a variety of habitats and riparian areas. It is a good representation of a umbrella species within the study area. The goal is to identify primary connectivity corridors and from this output, identify pinchpoints or areas of impedance and restoration areas that contain the highest potential for improving connectivity.

A Deer Migration You Have to See to Believe | National Ge...
Spatial Analysis & Modeling of Habitat Connectivity

https://www.youtube.com/

Programs Used for Analysis

ArcGIS Pro

Circuitscape
Study Area

- Metro Denver Nature Alliance
- 7 Counties
- Intersected with USGS HUC12 Watersheds
- 6,148 square miles
EPA Level IV Ecoregions (West to East)

- Alpine
- Crystalline Sub-alpine Forests
- Crystalline Mid-Elevation Forests
- Foothill Shrublands
- Front Range Fans
- Moderate Relief Plains
- Pine-Oak Woodlands
- Flat to Rolling Plains
- Piedmont Plains and Tablelands
- Foothill Grasslands
- Rolling Sand Plains
Spatial Analysis & Modeling of Habitat Connectivity

Existing Land Cover Data
- Source: Denver Regional Council of Governments (DRCOG) 1-meter pilot land cover study
- Used as a template for land cover classification in remaining study area.
Colorado Parks and Wildlife
Wildlife Mapping

- Mule Deer Concentration Area (dark)
- Mule Deer Resident Population (light)
- Assists in defining core habitat cores in prairies and grasslands of Eastern Plains.
- Land cover classification tends to struggle differentiating cover types in semi-arid regions.
Land Cover Classification

- 2017 USDA NAIP Imagery (1 meter) 4-band imagery (NIR) allows for vegetation extraction.
- 636 individual images, Mosaicked into a single image.
- Imagery clipped into 15 quadrants for manageable land cover classification.
Final Land Cover Classification

- 11 classes (excluding shadows)
- All classified segments mosaicked into a single raster and clipped to study area boundary.
- Resampled to 10-meter resolution for processing and analysis of habitat cores.
Habitat Core Analysis

- Utilized land cover classes of tree canopy, grassland, prairie, herbaceous and shrublands.
- Region Group geoprocessing tool creates outputs that identify contiguous/connected regions and assigns a unique ID.
- Zonal Geometry geoprocessing tool calculates the area of these unique rasters.
- Manual digitization of “Habitat Core” polygons are created around core areas.
- CPW Mule Deer habitat information was utilized in plains to determine specific habitat core areas.
Landscape Resistance

- Determines impedance to movement across the landscape
- Impervious surfaces such as buildings, roads, rock outcrops are 30-100
- Waterbodies are 20
- Croplands are 8
- Shrubland, Vegetation, Grassland/Prairie are 1-3
Circuitscape Current Map

- Represents connectivity and ease of movement across the landscape.
- Lower values = low resistance to movement.
- Higher values = high resistance to movement.
- Can begin to visualize currents and patterns across the study area.
Least Cost Path Analysis

- Shortest and most efficient path from one habitat core to another
- Theoretically represents the most cost efficient route given the input information
- This would be the most optimal path for a Mule Deer to take to get from one habitat core to another
- Often follows riparian areas and waterways
Pinchpoint Analysis

- Hybrid approach using least cost pathways and circuit theory to identify most efficient movement pathways.
- Helps to identify critical pinchpoints within these pathways that often occur at wildlife-urban interface.
Barrier Analysis (Approximated Restoration Value)

- Detects important barriers that affect the quality and/or location of corridors.
- Restoration practices in these areas will theoretically have the most positive impact for improving habitat connectivity.
- Concentrated along least cost path corridors and wildland-urban interface.
- East/Southeast Denver and North Denver are biggest hot spots.
Project Timeline + Process

Collect, Process, & Share Data
- Complete classification of 2016 1m land cover data and conduct accuracy assessment
- Obtain and review other relevant spatial data
- Get updates on parallel studies (CDOT, CPW) at different scales

Develop & Confirm Methodology
- High Quality and Resilient Habitat Assessment
  - Habitat framework
  - Focal species
  - Metrics and weighting
  - Connectivity Analysis
    - Focal habitats/guilds/species
    - Habitat cores
    - Resistance/barrier values
  - Check in and review meetings (monthly)

Conduct Mapping & Analysis
- Execute High Quality and Resilient Habitat Assessment
- Review with Advisory group
- Incorporate minor refinement (if necessary)
- Execute Connectivity Analysis for one species/movement guild
- Review with Advisory group
- Repeat for additional species/movement guilds

Biohabitats
Project team + collaborators

- **Core Team**: TNC, Biohabitats, and Metro DNA; meet weekly to coordinate all aspects of the project.

- **Leadership Council**: decision makers from land and water management agencies committed to project implementation, meets 2-3 times per year.

- **Technical Advisory Team**: technical experts from a range of institutions who will directly shape the analysis and project outcomes, meets once every other month.
Project deliverables

• **Regional Conservation Strategy**: portfolio of targets, metrics, and priority lands and waters to guide collaborative actions.

• **Biodiversity Atlas for decision-makers**: publicly-available geo-database used to prioritize protection, restoration, and enhancement activities.

• **A diverse, engaged, and invested** Leadership Council, Technical Advisory Team, and partner network.

https://www.marc.org/Environment/Natural-Resources/Natural-Resources-Inventory/Natural-Resource-Inventory.html
Desired outcomes

- Influencing how decision makers prioritize lands and waters to protect, connect, restore, and enhance;
- Ensuring all people can have equitable access to nature and build community well-being;
- Supporting wildlife in the face of a changing climate;
- Creating a base of ecological knowledge to inform future policy, planning, and funding actions;
- Deepening collaboration between key organizations in the region; and
- Improving planning and decision-making through the development of shared goals, priorities, and metrics.
GOAL SCENARIO:
Our job is to filter for decision-makers!

NATURAL HABITAT & CONNECTIVITY

Regional Conservation Assessment
• Close Coordination with Land Managers & Decision Makers
• Science-Driven Assessment & Map of Priority Areas to Protect, Restore, and Enhance
• Key Focal & Indicator Wildlife Species

SOCIAL VULNERABILITY & ACCESS TO NATURE

• Socioeconomic Status
• Household Composition & Disability
• Minority Status & Linguistic Isolation
• Housing & Transportation
• 10-Minute Walk to a Park

REGIONAL VISION FOR PEOPLE + NATURE

• Provide decision-makers with information and strategies to efficiently incorporate conservation needs into policies.
• Combined, dynamic, and applicable vision for nature, natural infrastructure, access, and land use for the Metro Denver region

Regional Outcomes
- Improved Water & Air Quality
- Species Preservation & Restoration
- Equitable Access to Recreation & Nature
- Stable / Decreased Greenhouse Gas Emissions
- Decreased Mitigation & Restoration Costs
- Shrinking Inequality Gap
Metro Denver Nature Alliance (MetroDNA)

Overview:

Metro Denver Nature Alliance (MetroDNA) is an emerging alliance of organizations with a compelling vision: Within one generation, the Metro Denver area will be a thriving place for both people and nature.

The Metro Denver Nature Alliance will provide the critically needed regional awareness, vision, and coordination to help our entire community become a thriving place for both people and the rest of the natural world. Primary aims include: 1) working collaboratively to understanding existing needs and assets of local community organizations; 2) leveraging those assets to improve the health of people and nature; and 3) deepening people’s connection to the natural world, especially children from under-resourced communities. Recognizing that there are many organizations already working directly with residents and communities, the unique function of MetroDNA will be to serve the organizations as our direct stakeholders who in turn represent their constituents in the community.


Help Documents:

Description of data layers:

Web Portal Users Guide:

www.metrodna.org/projects/trust-for-public-land-mapping-project/
The Denver Stewardship Mapping and Assessment Project (STEW-MAP)

Across the country, people are planting trees, organizing community gardens, monitoring local ecosystems, and cleaning up nearby parks or natural areas. Those who do this work may not think of what they do as “stewardship,” however, they are indeed stewards of their local environments. Care of shared natural resources in urban areas increasingly relies on the work of environmental stewardship groups and coalitions. At the same time, land managers and other decision makers often do not understand the roles and contributions of civic stewards, themselves may also not be aware of others doing similar work in their area.

Why do we need STEW-MAP?

At present, no natural resource agency or organization is collecting or distributing comprehensive civic stewardship data at the local level. The Denver Stewardship Mapping and Assessment Project (STEW-MAP) will fill this gap by surveying formal and informal stewardship groups across seven Colorado counties. Based on methodology developed by the New York City Urban Field Station, the Denver STEW-MAP will paint a picture of the region’s environmental stewardship landscape, documenting where the many private and public sector organizations work, how they are connected, and from where they source information and tools.

STEW-MAP will enable government and civic groups alike to enhance the capacity of the stewards of our communities. This tool can support civic participation, increase neighborhoods’ social cohesion, and support requests for funding and programming. Better understanding of civic environmental stewardship in urban areas will lead to less duplication of effort and better coordinated land and resource management. By collecting, analyzing, and sharing this information, the USDA Forest Service will be able to meet its obligation to provide timely civic stewardship information to local land managers and policy makers.

Methodology

The Denver Stewardship Mapping and Assessment Project (STEW-MAP) seeks to answer the question. What are the social and spatial (geography) interactions among groups that conserve, manage, monitor, advocate for, and educate the public about their local environments? Methods include an organizational-level survey with subsequent map and social network datasets created from survey responses. In this way, the project adds a social layer of
Where does stewardship happen?

24 mapped areas
24 respondents named at least one group for a total of 183 different named groups.

Average number of connections: 9.17 groups

Top 4 named organizations:

- City and County of Denver 9
- US Forest Service 8
- Colorado Parks & Wildlife 6
- Metro DNA 6
Living infrastructure

A strategically planned and managed network of working landscapes, natural lands and waterways at multiple scales that conserve ecosystem functions, restore ecosystem processes and regenerate healthy, robust and resilient communities.
PARTNER BENEFITS

network connections, mission alignment and context within a shared vision, increased capacity, expanded reach, and leveraged resources

COMMON OUTCOMES

more equitable access to nature, healthier people and places