Environmental Resource Element

White Rocks/ Gunbarrel Hill ECA
- 100 acres even
- 64 water shares
- $144,000
Parks & Open Space Mission

• To conserve natural, cultural and agricultural resources and provide public uses that reflect sound resource management and community values.

Ag Resources Division – 2016 Summary Report

Jeff Moline, Agricultural Resources Division Manager
Agricultural Land is a nonrenewable resource. Once public and private decisions are made that result in the conversion of agricultural land and/or water to nonagricultural uses, this vital resource is almost always irretrievably lost.

Since 1978: 18,000 acres of agricultural land has been annexed into Boulder County’s municipalities.
Parks & Open Space Mission

• To conserve natural, cultural and *agricultural* resources and provide public uses that reflect sound resource management and community values.

Agricultural Division:
• Collaboration
• Initiative
• Productivity
Breakdown of Ag Lands

Total agricultural land owned by Boulder County: 25,000 acres

- Cropland: 16,000 acres – Mostly Crop Rotation;
  Multi-generation
  • Irrigated: 13,000 acres
  • Dryland: 3,000 acres
- Rangeland: 7,000 acres; Multi-generation
- Out of production: 2,000 acres
- 211 properties under 121 leases
Division Staff – 14 Full-time Employees and 3-5 Seasonals

- Manager
- Administration (2)
- Outreach (2)
- Project Management (2+seasonals)
- Property Management (1+seasonals)
- Resource Specialists (4)
- Water Resources (2+seasonals)

Agricultural Resources Staff – Outstanding in their Field
65 Partners in Conservation

• Ag tenants – farmers and ranchers who work the land and keep it in production

• Dick Tanaka (left) and Isaac Drieth (right), lifelong Boulder County farmers and BCPOS Ag tenants, both passed away in 2016.

• Their dedication to land stewardship was deep-rooted and clear.
Tenant Selection – Open Bid Process

- **Decision Factors:**
  - Who will provide the best stewardship of the land?
  - What is their proposed operation?
  - Experience and past performance?
  - Can they meet the equipment requirements and financial demands of their proposed operation?
  - Not based on the highest bid
Two types of lease

• **Cash Rent**
  – Set amount charged per acre
    • Type of operation – diversified vegetable, crop, grazing...
  – Various factors – type of production, soils, water, irrigation system in place, fencing, etc...

• **Crop Share**
  – County pays for a portion of inputs and expenses; receive that amount in revenue
Agricultural Administration

• In 2016, the Division’s gross rental income was $1,291,989
  – Cash leases (87 of 121) amounted to 45% of income
  – Our share of crop expenses were $58K higher than previous year due to higher input costs
  – 29 leases were renewed in 2016; No leases went out to bid
### Change in Net Revenue 2013 to 2016

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gross Revenue</strong></td>
<td>$1,465,826.34</td>
<td>$1,428,011.50</td>
<td>$1,217,689.21</td>
<td>$1,291,988.88</td>
</tr>
<tr>
<td><strong>Crop Share Expenses</strong></td>
<td>$522,056.77</td>
<td>$479,903.02</td>
<td>$350,236.48</td>
<td>$414,865.60</td>
</tr>
<tr>
<td><strong>Water Assessments</strong></td>
<td>$345,250.42</td>
<td>$430,904.15</td>
<td>$366,619.65</td>
<td>$397,315.55</td>
</tr>
<tr>
<td><strong>Net Revenue</strong></td>
<td>$598,519.18</td>
<td>$517,204.35</td>
<td>$500,833.08</td>
<td>$479,807.73</td>
</tr>
</tbody>
</table>
2016 Gross Revenue by Category

- Cash Rent - 45%, $554,988
- Wheat - 2%, $18,323
- Alafalfa, Grass, Mix - 4%, $53,236
- Corn - 20%, $246,351
- Table Food - 1%, $13,125
- Barley - 13%, $165,402
- Dry Beans - 1%, $11,134
- Tritical - 0%, $4,249
- Residue - 0%, $1,510
- Sugar Beets - 12%, $143,946
- Grazing - 2%, $23,812
- Tritical - 0%, $4,249
- Sugar Beets - 12%, $143,946
- Grazing - 2%, $23,812
2016 Project Management

• Completed 84 projects totaling $149,605
  – Irrigation Sprinkler Systems
    • Operational in 2016:
      – Cattell-Sherburne
      – Cherry Creek Tree Farm
    • Installed in 2016, Operational in 2017:
      – Campbell-Quicksilver
      – Dodd Farm
  – Smaller and/or Maintenance Projects
Funding Sources for Irrigation Sprinkler Systems

TOTAL SPENT FOR AG CAPITAL IMPROVEMENT = $737,186.14
2016 Total Land Maintenance Project Costs

• $886,791 Total from:
  – Operations and Management Budget
  – BCPOS Capital Improvement Projects
  – EQIP Funding

• 29 of 84 projects dedicated to organic or market farms
  – Total of $252,996
  – 29% of total project expenditures

Photo Courtesy of Ollin Farms
March 17, 2016: Commissioners instructed BCPOS staff to develop a plan that would phase out genetically-engineered (GE) crops on county open space properties.

Commissioners approved revised Cropland Policy on April 13, 2017.
Cropland Policy – Organic Transition

- Hired a full-time Organic Agriculture Specialist
- Approximately 2,517 acres, or 15.7% of the 16,000 acres of cropland, was certified organic or transitioning in 2016
  - 10 properties certified organic
  - 11 properties are in the transition process
Cropland Policy – Organic Transition

Percent of BCPOS Ag Lands Certified or Transitioning to Organic
Cropland Policy – Organic Transition in Context

United States Organic Acreage
- Conventional: 99.52%
- Organic: 0.58%

Boulder County Parks & Open Space Organic Acreage
- Conventional: 84.3%
- Organic & Transitioning: 15.7%

USDA National Agricultural Statistic Service – 2015 Certified Organic Survey
Cropland Policy – Pollinator Protection Initiatives

- **2016 Volunteer Pollinator Monitoring Program**
  - 16 volunteers monitored 34 plots on 12 properties

- **Xerces Society for Invertebrate Conservation**
  - In 2017 will host a two-day Xerces Society Pollinator Conservation short course
  - Use one county-owned property as a teaching case for the process of developing a custom pollinator conservation plan
Cropland Policy – Prairie Dog Management

- Staff uses several methods to manage prairie dogs on No Prairie Dog (NPD) designated properties, including:
  - Live Trapping
  - POS Staff Control
    - Treated 32 properties
  - Tenant Control Program
    - 12 tenants received training
    - Controlled 15 properties
  - 9 neighbor complaints
    - Used barrier fencing, lethal control or live trapping
Livestock and Grazing

• 1,905 head of livestock on BCPOS properties in 2016
  – Increase of 305 animals from 2015
Water Resources - Portfolio

• Water portfolio with estimated value of $200M

• Ownership or interest in:
  – 98 incorporated and unincorporated ditches
  – 7 reservoirs
  – Various staff members serve on a number of ditch boards
Water Resources - Activities

• Water Resources staff:
  – Work with State Engineer’s Office to:
    • Call for water
    • Resolve ditch issues and accounting issues
    • Assist with geospatial information on infrastructure
    • Coordinate design reviews for flood and creek restoration projects
  – Adding electronic recording devices to better account for water resources
• Kenosha Ponds – pending water court application
Education and Outreach (E&O) Activities - Tours

• Ag Tours – 2 in 2016
  – Tours highlight three types of operations:
    • Field and forage crops
    • Vegetable crops
    • Livestock
  – Tenant farmers answer questions and discuss their operations.

• Water Tour – 1 in 2016
  – Focused on the Left Hand water basin

• Group Tours – CU, NCAR, Schools
E&O – Presentations, Social Media

- Ag staff presented at 6 conferences or classes in 2016

- Ag Division posts on the BCPOS facebook page, and also tweets (@BoulderCountyAg)
  - 624 followers
  - 197 tweets in 2016
  - 831 tweets since opening account
E&O – Our Lands to Your Hands

- Educational half-day events for 4th grade students in St. Vrain Valley and Boulder Valley school districts

- Approximately 1200 students attended 2 events in both districts

- Presenters from a number of organizations teach kids about the importance of agriculture and conservation in their daily lives:
  - the food they eat
  - the clothes they wear
  - the multiple products they use daily that are derived from agriculture sources.
E&O – Ag101

• Educational opportunities offered to all BCPOS staff
  – Participants develop in-depth insights into complexity of ag operations in Boulder County

• Held 3 tours in 2016:
  – Sombrero Ranches in May
  – Schlagel Farms in June
  – 7th Generation Farms in August
E&O – Tenant Outreach

• Boulder County Ag Forum (February 29th)
  – “Sustaining Agriculture in Boulder County: Real and humorous stories of urban interface excitement”

• Annual Tenant Appreciation Barbeque (June 17th)
  – Held at the Dougherty Museum in Longmont

• Barbed Wire Post (December)
  – Annual newsletter sent to all ag tenants
Local Food Initiatives

- Volunteer Gleaning Projects
  - 2 gleaning events held in October on the Darby property
  - Collected 4500 pounds of pumpkins and squash to donate to Community Food Share

- Double SNAP at area Farmer’s Markets
  - DUFB’s allow participants to double their dollar for local fruit and vegetable purchases
  - The Ag Division gave seed money to this program in 2014 and continues to provide some funding
  - Since 2014, SNAP and Double Up Food Bucks (DUFB) transactions have increased by 219%
Local Food Initiatives

• Locally Grown Pinto Beans
  – Held meetings in 2013 around growing pintos to sell locally
  – First two crops were not successful
  – 2016 crop produced 150,000 pounds, BCPOS received 1/3 under crop share agreement
Local Food Initiatives

- Locally Grown Pinto Beans
  - Ag Division donated 10,000 pounds of pinto beans to Community Food Share
  - Staff spent an afternoon bagging beans to distribute to area families
Local Food Initiatives

• Boulder County Meat Marketing Cooperative

• Fairgrounds Kitchen/ Food Preservation Project
Thank You!

Working pivots make us jump for joy!
Questions?
Agricultural Resources Monitoring

Boulder County Parks & Open Space
Monitoring – per Cropland Policy

Soil Health

Water Quality

Pollinators & Pesticides
Soil Health
Boulder County Cropland Policy

4. Soil Health and Quality

4.8 implement monitoring regimes

4.10 gathers and maintains the key indicators of soil health
Soil Health is the continued capacity of the soil to function as a vital living ecosystem that sustains life and is regenerated by the management of plants and animals by humans.
2014 & 2015

- 8 sites, 6 assessments
2016 BCPOS Soil Health Goals

- redesign and expand program
- Include all aspects of soil health
  - Physical
  - Biological
  - Chemical
- engage tenants
- engage public

- Team Effort
### Colorado NRCS Soil Health Cropland Resource Concern Assessment v. 1.7

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Least preferred</th>
<th>Indicator Values</th>
<th>Most preferred</th>
<th>Value for Each Location</th>
<th>Observations</th>
<th>Soil Moisture (est.)</th>
<th>Soil Profile</th>
<th>Soil Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Erosion</td>
<td>Evidence of rills and sheet erosion, pedestals, basal roots, or ephemeral gullies observed, sediment build up apparent around fence post</td>
<td>Some rills and evidence of sheet erosion, few pedestals or basal roots observed, evidence of sediment build up around fence row</td>
<td>Absence of rill or sheet erosion, no pedestals or basal roots observed and sediment build up absent from fence row</td>
<td>1</td>
<td>2</td>
<td>1.6</td>
<td>1.9</td>
<td>flood irrigated erosion in furrow</td>
</tr>
<tr>
<td>Soil Structure</td>
<td>Coarse blocky structure, platy structure or Structureless and hard rupture resistance</td>
<td>Medium blocky structure, moderately hard rupture resistance</td>
<td>Granular or fine blocky structure, friable rupture resistance</td>
<td>2</td>
<td>1.5</td>
<td>1.5</td>
<td>Soil moisture relatively high, almost no structure, pliable layer</td>
<td></td>
</tr>
<tr>
<td>Aggregate Stability</td>
<td>&lt;25% of clod remains intact at 5 minutes</td>
<td>25-75% of clod remains intact at 5 minutes</td>
<td>&gt;75% of clod remains intact after 5 minutes</td>
<td>2</td>
<td>1.5</td>
<td>1.5</td>
<td>Crusts mostly in furrow</td>
<td></td>
</tr>
<tr>
<td>Soil Crusts</td>
<td>Surface crust throughout the field, &gt; 5 mm thick</td>
<td>Surface crusts in places, &lt; than 5 mm thick</td>
<td>No evidence of surface crusts</td>
<td>1.5</td>
<td>2</td>
<td>1.5</td>
<td>2&quot; rough pan, top 5&quot; soft, then more compacted, residue primarily on ridges, canopy covered</td>
<td></td>
</tr>
<tr>
<td>Compaction</td>
<td>Clear evidence of compacted layer within 12&quot; (300 psi)</td>
<td>Some penetration resistance within 12&quot; depth (&gt;200 psi)</td>
<td>No evidence of compaction</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Medium blocky, low size diversity, fine to very fine roots, some rhizoholes</td>
<td></td>
</tr>
<tr>
<td>Residue and Canopy Cover</td>
<td>0.6% of surface covered residue; note crop stage</td>
<td>25.75% of surface covered residue; note crop stage</td>
<td>&gt;75% of surface covered residue; note crop stage</td>
<td>1.5</td>
<td>2</td>
<td>1.5</td>
<td>Low size diversity, fine to very fine roots, some rhizoholes</td>
<td></td>
</tr>
<tr>
<td>Roots and Pores</td>
<td>&lt;10% of roots covered in rhizoholes no pores or root diversity</td>
<td>&gt;10% but &lt;50% of roots covered rhizoholes, little root and pore diversity</td>
<td>&gt;50% of roots covered in rhizoholes, diversity of roots and pore sizes</td>
<td>1.5</td>
<td>2</td>
<td>1.5</td>
<td>Low size diversity, fine to very fine roots, some rhizoholes</td>
<td></td>
</tr>
<tr>
<td>Soil Color and Smell</td>
<td>Light pale or yellowish brown, no color change with depth; smells like mineral</td>
<td>Light brown; slight color change from top to bottom; little to slight earthy smell</td>
<td>Black or dark brown; distinct color change from top to bottom; strong earthy smell</td>
<td>2</td>
<td>1.5</td>
<td>1.5</td>
<td>Worms only, some castings</td>
<td></td>
</tr>
<tr>
<td>Soil Food Web</td>
<td>No earthworms, very few macroinvertebrates observed</td>
<td>Presence of 1-5 earthworms, some macroinvertebrates observed</td>
<td>&gt;5 earthworms, fungal hyphae observed, macroinvertebrates clearly evident</td>
<td>1.5</td>
<td>1.25</td>
<td>1.3</td>
<td>Good canopy, mapping reading Sun: &gt;80°, 2&quot;; 70°-71° shade: 25°</td>
<td></td>
</tr>
<tr>
<td>Soil Temperature</td>
<td>Soil surface temperature and soil temperature at 2&quot; differs &gt; 20° F</td>
<td>Soil surface temperature and soil temperature at 2&quot; differs &lt; 20° F but &gt;10° F</td>
<td>Soil surface temperature and soil temperature at 2&quot; differs &lt; 10° F</td>
<td>2</td>
<td>3</td>
<td>2.7</td>
<td>2°; 70°-71° shade: 25°</td>
<td></td>
</tr>
</tbody>
</table>

**W** = Regulates and partitions water and solute flow; **N** = Stores and cycles nutrients and carbon; **D** = Sustains biological diversity, activity, and productivity; **S** = Physical stability and support for plants and structures associated with human habitation.


## Soil Health Card Summary

<table>
<thead>
<tr>
<th>Physical Section</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
<th>Property 4</th>
<th>Property 5</th>
<th>Property 6</th>
<th>Property 7</th>
<th>Property 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Texture (field)</td>
<td>SIC, SC, C</td>
<td>SICL, SCL</td>
<td>CL</td>
<td>CL, SCL</td>
<td>SCL, SICL</td>
<td>SL, SCL</td>
<td>CL, L, SCL</td>
<td>SICL</td>
</tr>
<tr>
<td>Soil Texture (lab)</td>
<td>CL</td>
<td>CL</td>
<td>SL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erosion</td>
<td>2.3</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>2.7</td>
<td>3.0</td>
<td>1.9</td>
<td>3.0</td>
</tr>
<tr>
<td>Soil Structure</td>
<td>1.3</td>
<td>2.5</td>
<td>1.5</td>
<td>2.0</td>
<td>2.0</td>
<td>1.7</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Slake Test (aggregate stability)</td>
<td>2.0</td>
<td>NA</td>
<td>2.5</td>
<td>2.0</td>
<td>2.5</td>
<td>1.0</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Soil Crust</td>
<td>1.0</td>
<td>2.8</td>
<td>2.3</td>
<td>1.0</td>
<td>1.5</td>
<td>2.5</td>
<td>1.5</td>
<td>3.0</td>
</tr>
<tr>
<td>Compaction</td>
<td>1.0</td>
<td>2.0</td>
<td>2.1</td>
<td>1.3</td>
<td>2.2</td>
<td>1.3</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Biological Section</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
<th>Property 4</th>
<th>Property 5</th>
<th>Property 6</th>
<th>Property 7</th>
<th>Property 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>residue</td>
<td>2.0</td>
<td>2.5</td>
<td>2.0</td>
<td>2.3</td>
<td>3.0</td>
<td>2.7</td>
<td>1.5</td>
<td>3.0</td>
</tr>
<tr>
<td>roots and pores</td>
<td>1.3</td>
<td>2.5</td>
<td>2.0</td>
<td>1.7</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>soil color and smell</td>
<td>1.2</td>
<td>2</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>1.3</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Soil Food Web</td>
<td>1.0</td>
<td>2.75</td>
<td>2.0</td>
<td>2.4</td>
<td>1.9</td>
<td>1.3</td>
<td>1.3</td>
<td>2.0</td>
</tr>
<tr>
<td>Soil Temperature</td>
<td>1.0</td>
<td>3</td>
<td>1.0</td>
<td>3.0</td>
<td>1.0</td>
<td>2.3</td>
<td>2.7</td>
<td>2.0</td>
</tr>
</tbody>
</table>

| SH Field Score | 1.4 | 2.6 | 2.0 | 2.1 | 2.0 | 1.9 | 1.6 | 2.2 |
## Combined Results

<table>
<thead>
<tr>
<th></th>
<th>Property 1</th>
<th>Property 6</th>
<th>Property 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Score</td>
<td>1.4</td>
<td>1.9</td>
<td>2.6</td>
</tr>
<tr>
<td>CASH Score</td>
<td>36</td>
<td>39</td>
<td>52</td>
</tr>
<tr>
<td>Haney Score</td>
<td>3.91</td>
<td>5.37</td>
<td>10.2</td>
</tr>
</tbody>
</table>
Water Quality
2016 Sampling Design: Dry Creek
2016 Sampling Design: Dry Creek
2016 Sampling Design

- Dry Creek Watershed
- Study Field Impacts
- Study Stream Impacts
2016 Monitored Attributes

**Standard Water Quality Parameters**
- E-coli bacteria
- Total nitrogen (Total N)
- Total phosphorus (Total P)
- Potassium (K)
- Total Suspended Solids (TSS)
- pH
- Electrical conductivity (EC)
- Water temperature
2016 Monitored Attributes

Specific herbicide/pesticide residues

- Glyphosate
- AMPA
- 2,4-D
- Dicamba
- MCPA
- Neonicotinoids
  - Acetamiprid
  - Clothianidin
  - Dinotefuran
  - Imidacloprid
  - Thiacloprid
  - Thiamethoxam
2016 Results/Trends

- E-coli bacteria declined over stream/season
- Herbicides detected in 7/16/16 samples
- But not other dates
- Field results difficult to assess
- Future work to concentrate on tailwater and stream measurement relationships
- Better instrumentation/sampling
Pesticides & Pollinators
## Soil Pesticide Monitoring

<table>
<thead>
<tr>
<th>Location</th>
<th>Pesticide</th>
<th>Concentration Found</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ertl (corn, alfalfa)</strong></td>
<td>Pendimethalin</td>
<td>herbicide</td>
</tr>
<tr>
<td></td>
<td>AMPA</td>
<td>herbicide</td>
</tr>
<tr>
<td></td>
<td>Glyphosate</td>
<td>herbicide</td>
</tr>
<tr>
<td><strong>Ludlow (corn, pinto beans)</strong></td>
<td>p,p'-DDE</td>
<td>insecticide</td>
</tr>
<tr>
<td></td>
<td>Terbufos</td>
<td>insecticide</td>
</tr>
<tr>
<td></td>
<td>AMPA</td>
<td>herbicide</td>
</tr>
<tr>
<td></td>
<td>Glyphosate</td>
<td>herbicide</td>
</tr>
<tr>
<td><strong>Macy (barley and corn)</strong></td>
<td>Dieldrin</td>
<td>insecticide</td>
</tr>
<tr>
<td></td>
<td>AMPA</td>
<td>herbicide</td>
</tr>
<tr>
<td><strong>Montgomery (wheat, alfalfa)</strong></td>
<td>Terbufos</td>
<td>insecticide</td>
</tr>
<tr>
<td><strong>Quicksliver (barley)</strong></td>
<td>p,p'-DDE</td>
<td>insecticide</td>
</tr>
<tr>
<td></td>
<td>p,p'-DDT</td>
<td>insecticide</td>
</tr>
</tbody>
</table>
## Pollen Neonicotinoid Monitoring

- **3 properties**

<table>
<thead>
<tr>
<th>Neonicotinoid</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetamiprid</td>
<td>Not Detected</td>
</tr>
<tr>
<td>Clothianidin</td>
<td>Not Detected</td>
</tr>
<tr>
<td>Dinotefuran</td>
<td>Not Detected</td>
</tr>
<tr>
<td>Imidacloprid</td>
<td>Not Detected</td>
</tr>
<tr>
<td>Thiacloprid</td>
<td>Not Detected</td>
</tr>
<tr>
<td>Thiamethoxam</td>
<td>Not Detected</td>
</tr>
</tbody>
</table>
Pollinator Monitoring

- 16 volunteers
- 12 properties
- 34 plots
- 124 honey bees
- 42 striped sweat bees
- 38 bumble bees
- 24 tiny dark bees
- 14 green metallic bees
- 4 hairy belly bees
- 3 hairy leg bees
Checklists for 10 crops
Over 1000 fields
Still collecting 2016 data
Rangeland Monitoring
Rangeland Photo Monitoring

- Began in 1997
- Purpose: assess trends over time, meeting goals
- Established data points
- Divided into 3 Areas
  - One volunteer for each Area
    - East – 5 Properties, 24 Locations
    - North – 9 Properties, 25 Locations
    - South – 8 Properties, 26 Locations
  - Total – 22 Properties, 75 Locations
- 3 Volunteers
  - 14-24 hours each per season
Rangeland Vegetation Monitoring

- Contractor: 18 Properties 3 year cycle