




### Evaluating Wetland Condition in Urban Denver



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Colorado Natural Heritage Program  
www.cnhp.colostate.edu

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### Colorado Natural Heritage Program

Provide scientific information and tools needed to help guide effective conservation action in Colorado.

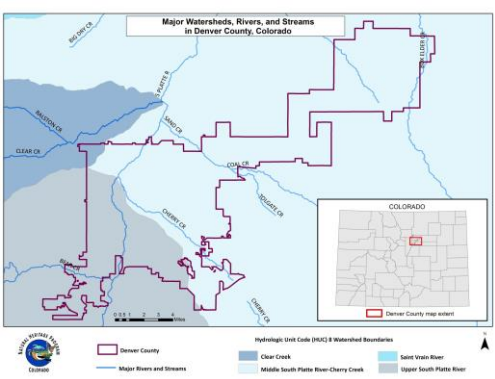
- Inventory for rare species
- Monitor rare species populations
- Provide data for conservation planning and management
- Provide analytical tools for land management organizations
- National Database - NatureServe



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### Purpose and Need



Major Watersheds, Rivers, and Streams in Denver County, Colorado

Hydrologic Unit Code (HUC) & Watershed Boundaries

- Denver County
- Major Rivers and Streams
- Clean Creek
- Middle South Platte River-Cherry Creek
- Saint Vrain River
- Upper South Platte River

### Purpose and Need


Population: 634,265





## Project Background

**Goal:**  
provide current data on the condition, rarity, location, acres and type of the wetlands in Denver County

Timeline: 2012-2014



**Alan Polonsky**  
**Kelly Uhing**  
City and County of Denver




## Wetland Services

- Groundwater recharge/discharge
- Filtration of nutrients and sediment
- Maintenance of stream baseflow
- Recreational and aesthetic value
- Wildlife habitat
- Stormwater retention




## Project Objectives and Outcomes

Objectives:	Outcomes:
Map existing wetlands	Managers use info to prioritize sites for conservation and/or restoration
Assess wetland condition in highest quality sites	Greater public understanding and appreciation for urban wetlands
Create public outreach materials— educational brochure, presentation of results	



## Project Objective #1-Wetland Mapping

Update National Wetland Inventory Maps

Created between 1975-1985

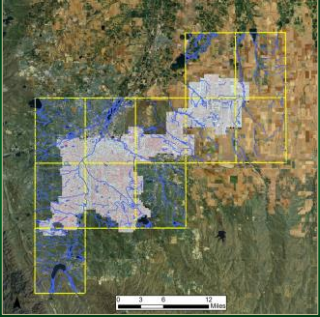




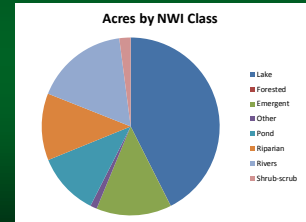
Figure 10-10. The location of data points from the National Wetland Inventory from 1975-1985. Source: U.S. Geological Survey.

## NWI Mapping: Old vs 2011



## NWI Mapping: Results

2,519 acres of wetlands/waterbodies/riparian features  
 2.5% of the county is wetland  
 43% of wetlands are "lakes"



## LLWW: Estimated Wetland Services

Landscape position, Landform,  
 Waterbody, Water Flow Path

- Water Storage
- Groundwater Recharge
- Nutrient Cycling
- Sediment Retention
- Shoreline Stabilization
- Native Plant Conservation Value
- Terrestrial Habitat Value
- Aquatic Habitat Value
- Biodiversity Value

Example: Nutrient Cycling



## Objective #2 – Wetland Condition Assessments

Prioritize a target list of wetlands for field surveys

- Aerial imagery, stakeholder input
- Buffers, size of wetland, access
- ~70 potential sites



## Wetland Condition Assessments

### Ecological Integrity Assessment (EIA)

- Level 1 – Landscape – course scale
- Level 2 – Rapid - site scale
- Level 3 - Intensive multi-metric



## Condition Assessment

- Plants reflect the condition of the wetland as a whole<sup>1</sup>
- Vegetation structure and composition respond to factors to which the evaluator may be oblivious. (i.e. subsurface hydrological features)



<sup>1</sup>Lemly, J., B. Johnson, L. Gilligan, and E. Carlson et al. 2013. *Setting Mitigation in the Watershed Context: Demonstration and Description of the Watershed Approach to Compensatory Mitigation*. Colorado State University, Colorado Natural Heritage Program, Fort Collins, CO

## Condition Assessment: Methods

- Size
- Feature description: natural or modified
- Interspersion of zones
- Plant list with ground cover and vertical strata estimates
- Water quality, soils
- Estimate cover and depth of standing water, when present
- Hydrology metrics, connectivity, source
- Landscape fragmentation, continuity
- Wildlife
- Buffer condition & extent to 500m



## Condition Assessment: Buffers



### Condition Assessment: Landscape Context



Vast landscapes of impermeable surfaces prevent nutrients from returning to the soil, water, and atmosphere with flashy polluted runoff systems.

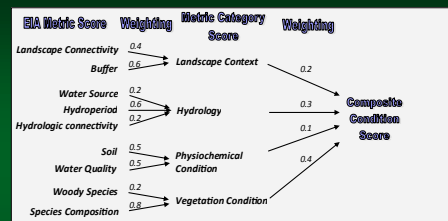
### Condition Assessment: Hydrology



### Condition Assessment: EIA Metrics

ECOLOGICAL CATEGORIES	KEY ECOLOGICAL ATTRIBUTES	INDICATORS & METRICS (mix of quantitative and qualitative)
Landscape Context	Landscape Composition	landscape fragmentation (all wetlands) riparian corridor continuity (riverine wetlands)
	Buffer Index	buffer extent, buffer width, buffer condition
Biotic Condition	Community Composition	native plant cover, noxious weed cover, aggressive native cover,
	Community Structure	woody species regeneration, litter accumulation, structural complexity
Hydrologic Condition	Hydrological Regime	water source, hydrologic connectivity, alteration to hydroperiod (all wetlands) bank stability, beaver activity (riverine wetlands)
Physiochemical Condition	Chemical /Physical Processes	soil surface disturbance, water quality

### Schematic of EIA Scoring Process (Lemly et al. 2013)

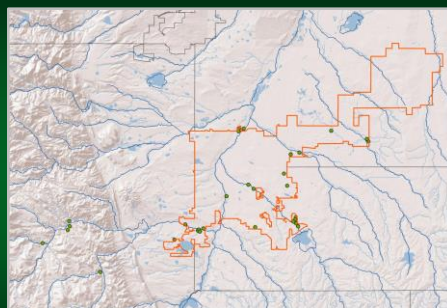


Scores from the metrics in each category are weighted and summed. Category weights are then themselves weighted and summed to produce Composite Condition Score.

### Condition Assessment: EIA Scoring

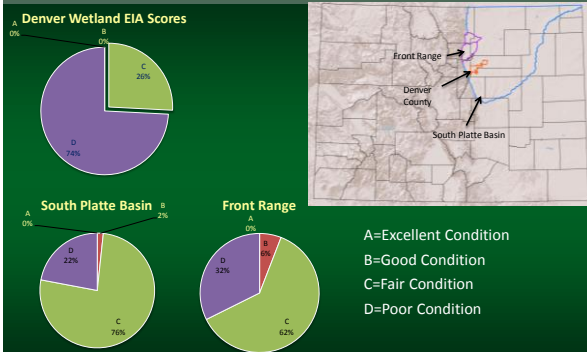
Rank	Narrative Category	Interpretation
A	Excellent	Wetland functions within the bounds of natural disturbance regimes. The surrounding landscape contains natural habitats that are essentially unfragmented with little to no stressors; vegetation structure and composition are within the natural range of variation, nonnative species are essentially absent, and a comprehensive set of key species are present; soil properties and hydrological functions are intact. <i>Management should focus on preservation and protection.</i>
B	Good	Wetland predominantly functions within the bounds of natural disturbance regimes. The surrounding landscape contains largely natural habitats that are minimally fragmented with few stressors; vegetation structure and composition deviate slightly from the natural range of variation, nonnative species and noxious weeds are present in minor amounts, and most key species are present; soils properties and hydrology are only slightly altered. <i>Management should focus on the prevention of further alteration.</i>
C	Fair	Wetland has a number of unfavorable characteristics. The surrounding landscape is moderately fragmented with several stressors; the vegetation structure and composition is somewhat outside the natural range of variation, nonnative species and noxious weeds may have a sizeable presence or moderately negative impacts, and many key species are absent; soil properties and hydrology are altered. <i>Management would be needed to maintain or restore certain ecological attributes.</i>
D	Poor	Wetland has severely altered characteristics. The surrounding landscape contains little natural habitat and is very fragmented; the vegetation structure and composition are well beyond their natural range of variation, nonnative species and noxious weeds exert a strong negative impact, and most key species are absent; soil properties and hydrology are severely altered. <i>There may be little long term conservation value without restoration, and such restoration may be difficult or uncertain.</i>

### Objective #4 – Condition Assessments



Completed assessments of 46 sites in 2013/2014

### Condition Assessment: Results



### Project Objective #5 -Prioritized List

Site	EIA (0-5)	Rank (A-D)	Site	EIA (0-5)	Rank (A-D)
LOL_I_20130716	1.4	D	RC-I_20130710	2.1	D
FLC-I_20130918					D
HEP-I_20130808					D
NBP-I_20130808					D
CC-I_20130717					D
CC-I_20130729					D
LD-I_20130802					D
SR-I_20131007					C
BVP-I_20130805					C
HH-I_20130729					C
KO-I_20130801					C
BF-I_20130723					C
FCN-I_20130823					C
BCE-I_20130905	2.1	D	OPP-I_20130904	3.1	C
RC-EM_20130708	2.1	D	CWT-I_20130821	3.3	C

## Prioritized List of Wetlands

- Aid in protection/restoration efforts
- Detailed descriptions of CCD wetlands
- Overall picture of the condition of CCD wetlands
- Baseline for future studies to determine improvements or declines



## Condition Assessment: Floristic Quality

### Denver County

- Mean Species Richness: 76
- Non-Native: 53%
- Mean C value (range 0-10): 1.75
- AA size: 2-85 acres, average 14



### Denver Mountain Parks

- Mean Species Richness: 97
- Non-Native: 27%
- Mean C value (range 0-10): 3.91
- AA size: ~9 - 16 acres



## Condition Assessment: Urban Wildlife



## Wetland Habitat Metric Development

Tested new wildlife habitat quality indices (CPW)

17 priority wetland-dependent wildlife species

Measured key habitat variables during condition assessments

Variables are used to create overall score (0-1) for habitat quality


Dabbling Ducks  
American Bittern  
Short-eared Owl  
Frogs  
Red-Sided Garter Snakes  
Fish  
Piping Plover



## Condition Assessment: Urban Wildlife

Wildlife Species Lists

- Songbirds- bushtits, warblers, robins, blackbirds
- Shorebirds – avocets, egrets, herons, pelicans, ducks, gulls
- Wild turkeys
- Coyote, squirrels, deer, fox Rabbits, skunks
- Evidence for beavers, muskrats
- Mice, voles
- Hawks, osprey, eagles, falcons
- Frogs – bullfrogs, northern leopard frogs, woodhouse toads
- Dragonflies, Damselflies
- Snakes, turtles
- Crayfish






100+ taxa

## Urban Wildlife



## Condition Assessment: Rare Plants


- **Broadfruit burr-reed**  
(*Sparganium eurycarpum*)
- **Sweetflag**  
(*Acorus calamus*)
- **Watermeal**  
(*Wolffia columbiana*)

## Management Recommendations

Water Quality Improvement:

- Reduce mowing and to increase vegetation buffer sizes
- Re-evaluate herbicide use in highly disturbed habitats





## Summary

- Wetlands in Denver are in poor condition but they host a surprising amount of plant/wildlife taxa
- They need restoration and protection
- Every wetland acre is increasingly important
- Efforts should focus on improving wetland buffer



## Acknowledgements

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