Floristic Quality Assessment Coefficients of Conservatism Update

Rare Plant Symposium

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Summary

- Brief introduction to Coefficients of Conservatism and the Floristic Quality Assessment (FQA) and rationale for updating
- Methods, data collection, analysis, QA/QC
- Results
- How you can access and use the FQA data and the taxonomic crosswalk (Ackerfield 2015, Weber & Wittmann 2001, USDA PLANTS)

Floristic Quality Assessment (FQA)

To Evaluate:

- Habitat conservation value
- Ecological integrity
- Naturalness

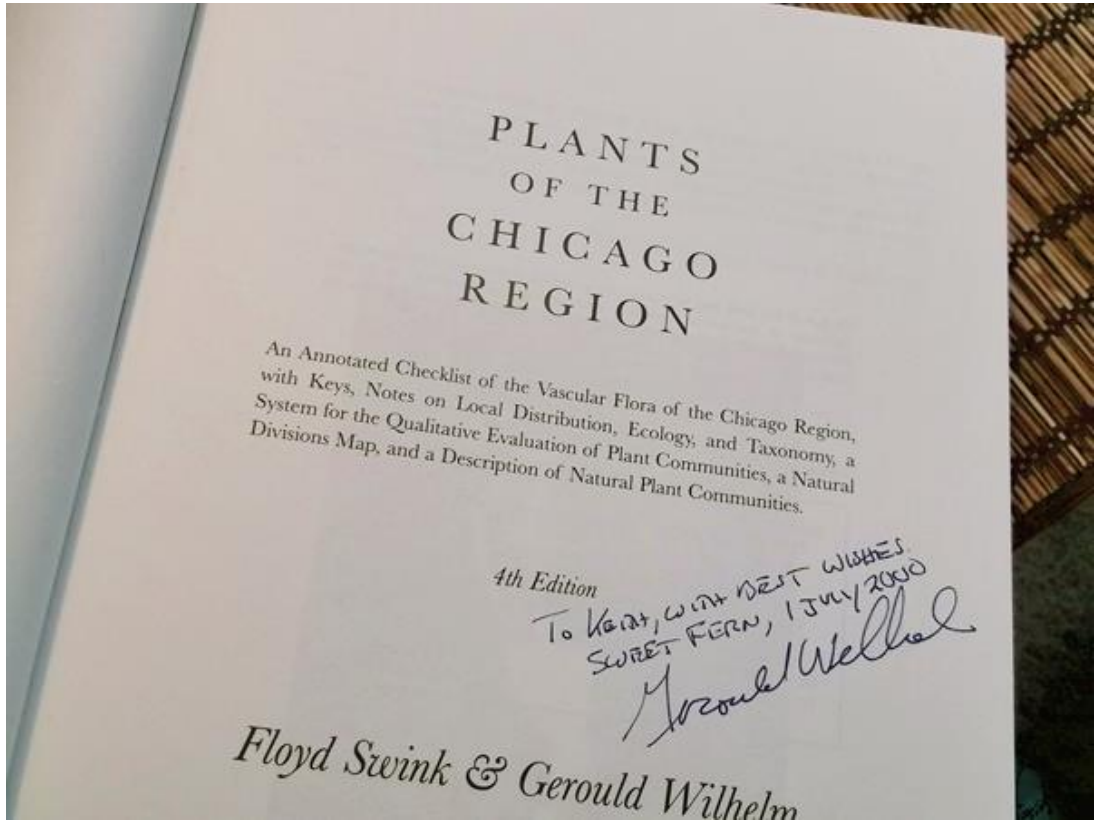
Managers/Landowners use to prioritize land for:

- Protection
- Development
- Purchase
- Restoration potential
- Measure restoration effectiveness

Photo: P.Smith

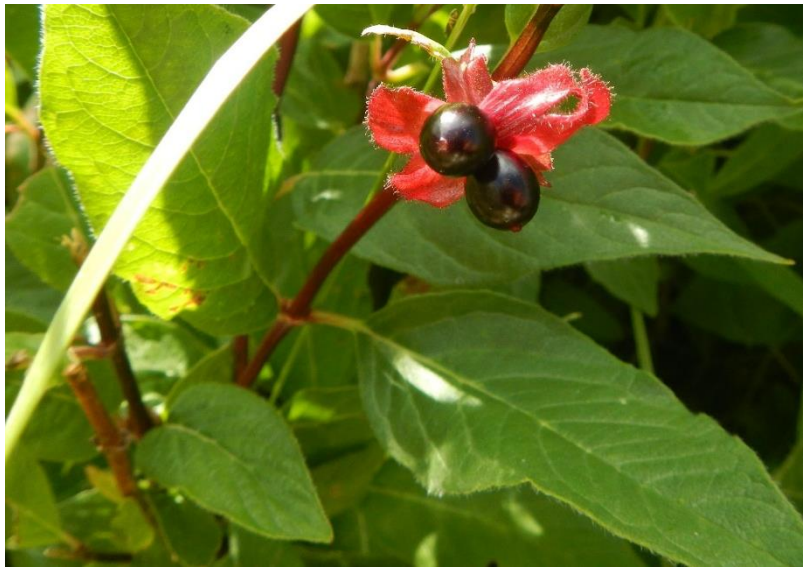
Floristic Quality Assessment

- Developed in the 1970's for the Chicago region (Swink & Wilhelm 1979)
- FQA widely used in N. America and across the world
- A hybrid of judgement based assessments and quantitative metrics



Floristic Quality Assessment

1) Plant list
2) Published values



- Coefficients of Conservatism are numeric values (C values) assigned to each plant in the flora of a State or Region.
- Values range from 0-10 and are assigned by botanical experts.

Lonicera involucrata (Ackerfield 2015)
Distegia involucrata (Weber & Wittmann 2001 and 2012)
Lonicera involucrata var. *involucrata* (USDA PLANTS 2007)
Lonicera involucrata (USDA PLANTS 2020)

Twinberry honeysuckle C value 7 (5 in MT) Photo: P. Smith

Coefficients of Conservatism – **C values**

- Number assigned to an individual plant taxon is based on likelihood of finding it in an anthropogenically disturbed environment (roadside, road cut, reservoir, clear-cut, polluted, farmed, overgrazed etc.).
- 0 or 1 is assigned to taxa that are almost exclusively found in human source disturbance.
- A 10 is assigned to species found in a pristine habitat with a natural disturbance regime.

C value Interpretation

Value	Interpretation
0	Nonnative species, prevalent in new ground or obligate to non-natural areas.
1-3	Commonly found in non-natural areas.
4-6	Equally found in natural and non-natural areas.
7-9	Obligate to natural areas but can sustain some habitat degradation.
10	Obligate to high quality natural areas – no evidence species occurs outside high quality natural areas.

Mimulus eastwoodiae C value 10

Photo: Max Licher, Arizona State University Vascular Plant Herbarium

FQA - Two Primary Metrics

Mean C

- Mean C = Average of C values

$$\text{Mean C} = \sum C/(S)$$

C = C Value

S = # of species

Floristic Quality Index (FQI)

- FQI is the product of the Mean C and the square root of # species (plant richness)

$$\text{FQI} = \text{Mean C} \times (\sqrt{S})$$

Rationale for 2020 Update

- Existing list was published by CNHP (Rocchio 2007).
- A panel of experts assigned values to over 3,000 plant species (taxa).
- 537 taxa (17%) not assigned values in 2007.
- Flora of Colorado has been updated with many taxonomic changes **(Weber & Wittmann 2012, Ackerfield 2015, FNA, USDA PLANTS, BONAP etc).**
- Status changes for species (not known from the state, new to the state, nativity).

Glyceria striata
Photos: Wikipedia

Assembling a Panel of Experts

- ~100 experts from Universities, government agencies, local experts, past participants, contacted to participate in scoring new values
- Two workshops offered by CNHP, one on the East Slope (Fort Collins) and the West Slope (Grand Junction) in fall of 2019.
- Guidelines provided so all using same set of ideas to assign a C value. Past experience showed:

1) *Endemism* and *rarity* often confused with assigning C values.

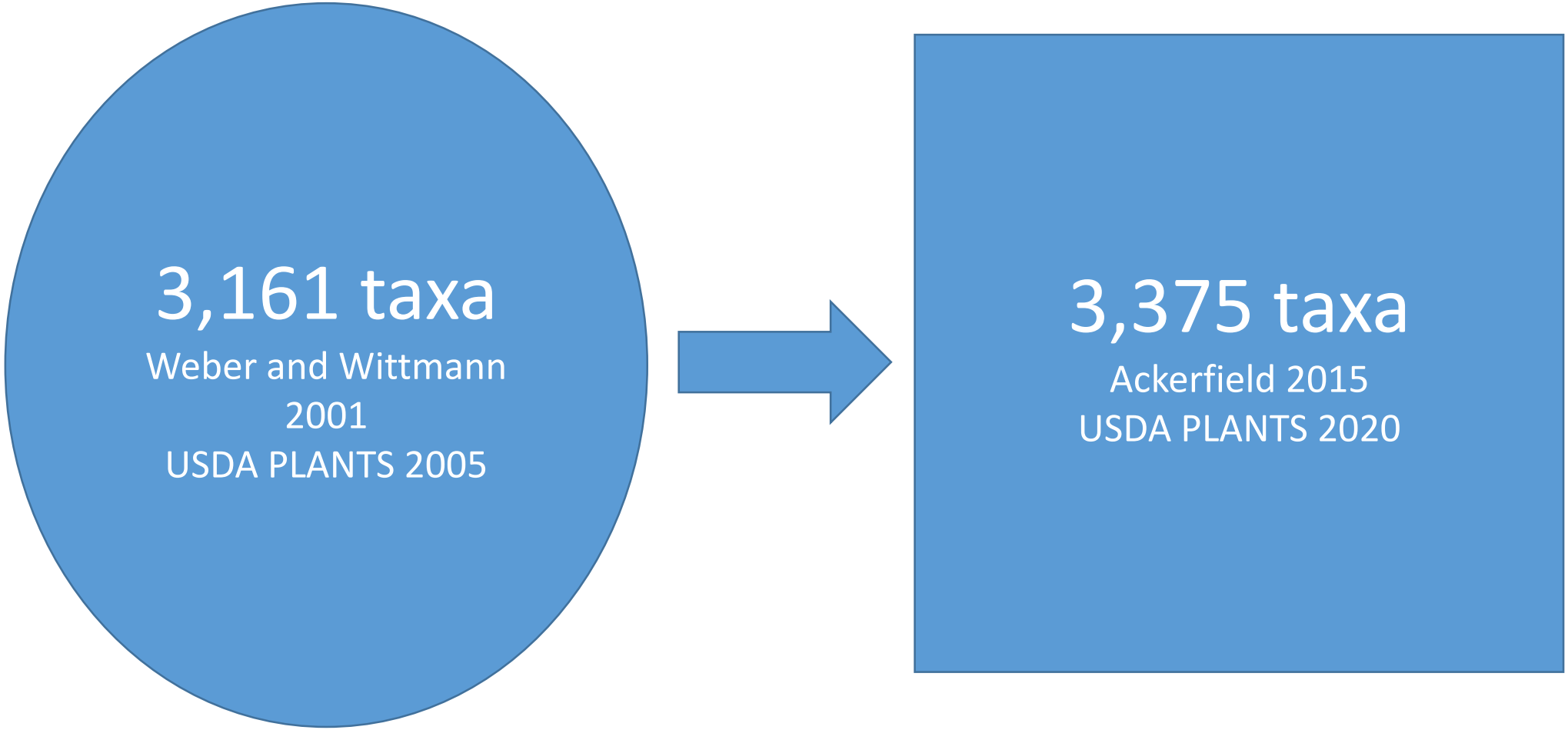
2) People afraid to assign a 10.

3) Recognition of anthropogenic disturbances (hydrological, climate change and/or pollution)

METHODS

- Taxonomic considerations – development of a crosswalk
- Native vs Not
- Data analysis
- QA/QC

Taxonomy


3,161 taxa
Weber and Wittmann
2001
USDA PLANTS 2005
3,375 taxa
Ackerfield 2015
USDA PLANTS 2020
2007
2020

Taxonomy

1. Original 2007 List
2. Added Ackerfield 2015 species
3. Crosswalk

Notes in Ackerfield 2015

Notes in Weber and Wittmann 2001 and 2012

USDA PLANTS

Integrated Taxonomic Information System (ITIS)

Flora of North America (FNA)

Biota of North America Program (BONAP)

SEINet (CU, CSU, DBG, RM herbaria)

New species, corrections, name changes, lumping and splitting, new understanding due to genomic sequencing/DNA

Taxonomic Tangle

- W&W 2001 + 2012 — *Potentilla flabelliformis* and *P. gracilis*
- USDA PLANTS — *Potentilla gracilis* var. *flabelliformis*
- ITIS — *Potentilla gracilis* var. *flabelliformis*
- FNA — *Potentilla gracilis* var. *flabelliformis* (not in CO)
- BONAP — *Potentilla gracilis*
- Ackerfield 2015 — *Potentilla gracilis* (variety not recognized for Colorado)

- Current FQA — *Potentilla gracilis* (C-value 5)

Taxa not Recognized in Ackerfield 2015

64 Taxa Retained on the FQA List (~2% of list)

Name accepted by other sources
Had an existing C value

New to the flora of Colorado

Lumping

Iliamna crandallii	CNHP	9
Iliamna grandiflora	CNHP	7
Iliamna rivularis		8

25 CNHP Tracked species not included in Ackerfield 2015

Iliamna rivularis
Wild Hollyhock

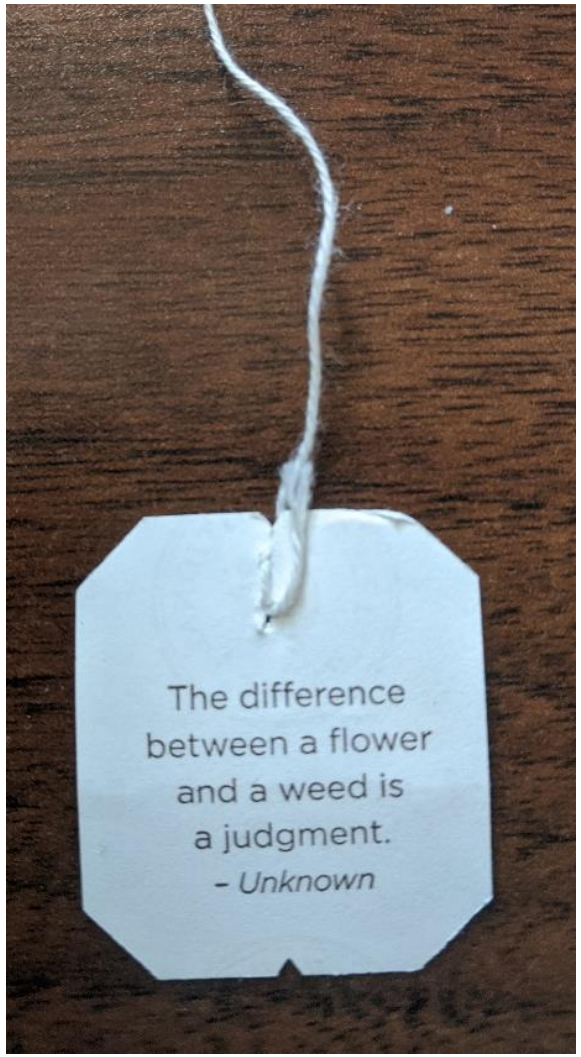
Native or Not….

- Used BONAP as main resource

- 68 species previously considered non-native (C value = 0) and currently considered native
  - 82% assigned a non-zero C value by botanist(s)

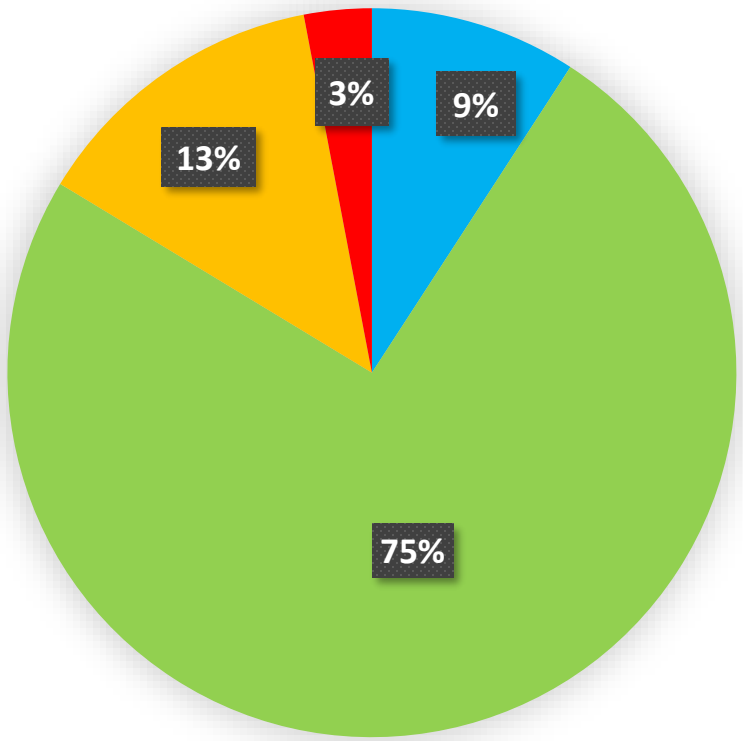
    Ambrosia trifida now C value of 3

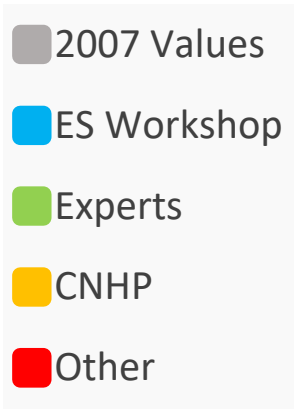
    Conyza canadensis now C value of 1
  - 7% assigned a C value of 1
  - 10% Not Assigned



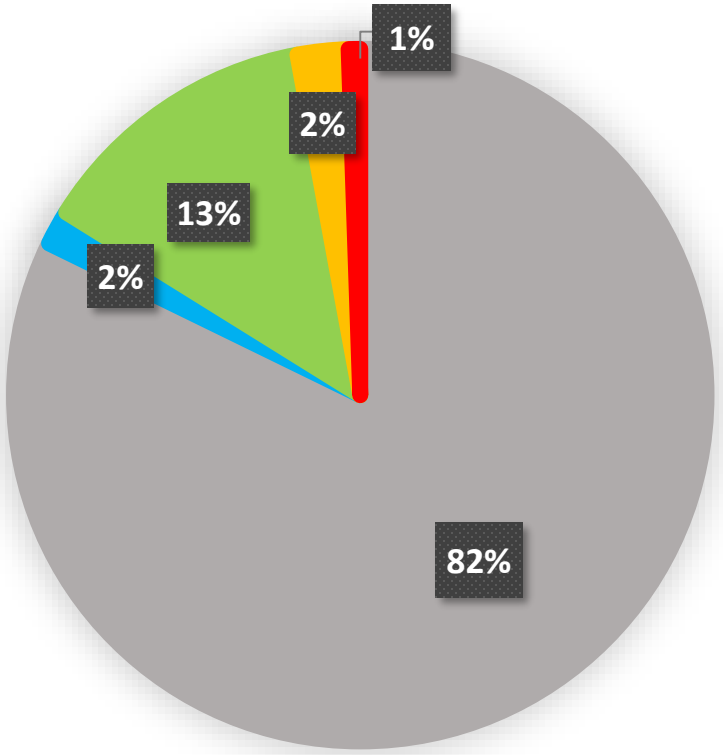
Data analysis

New C values
600 taxa





All C values
3375 taxa



Old Man of the Mountain

Hymenoxys grandiflora (Torr.& A. Gray ex A. Gray) Parker

Rydbergia grandiflora

Tetraneuris grandiflora

SEINet: **697** specimens

Alpine, 10,000-14,000 ft

Workshop = 8

8,8,4 = 6.77

Photo:
CoNPS

C value = 8

Little Redstem Monkey-Flower
Mimulus rubellus A. Gray

SEINet: 39 specimens

1862-2016

Montrose, Gunnison, Mesa, Garfield, Grand, La Plata, Moffat, Routt

Sagebrush, oak shrublands, rock crevices and along streams, sandstone, willow bottoms, 5,500-8,600 ft

9, 7, 7.5 = 7.88

Photo: SEINet

C value = 8

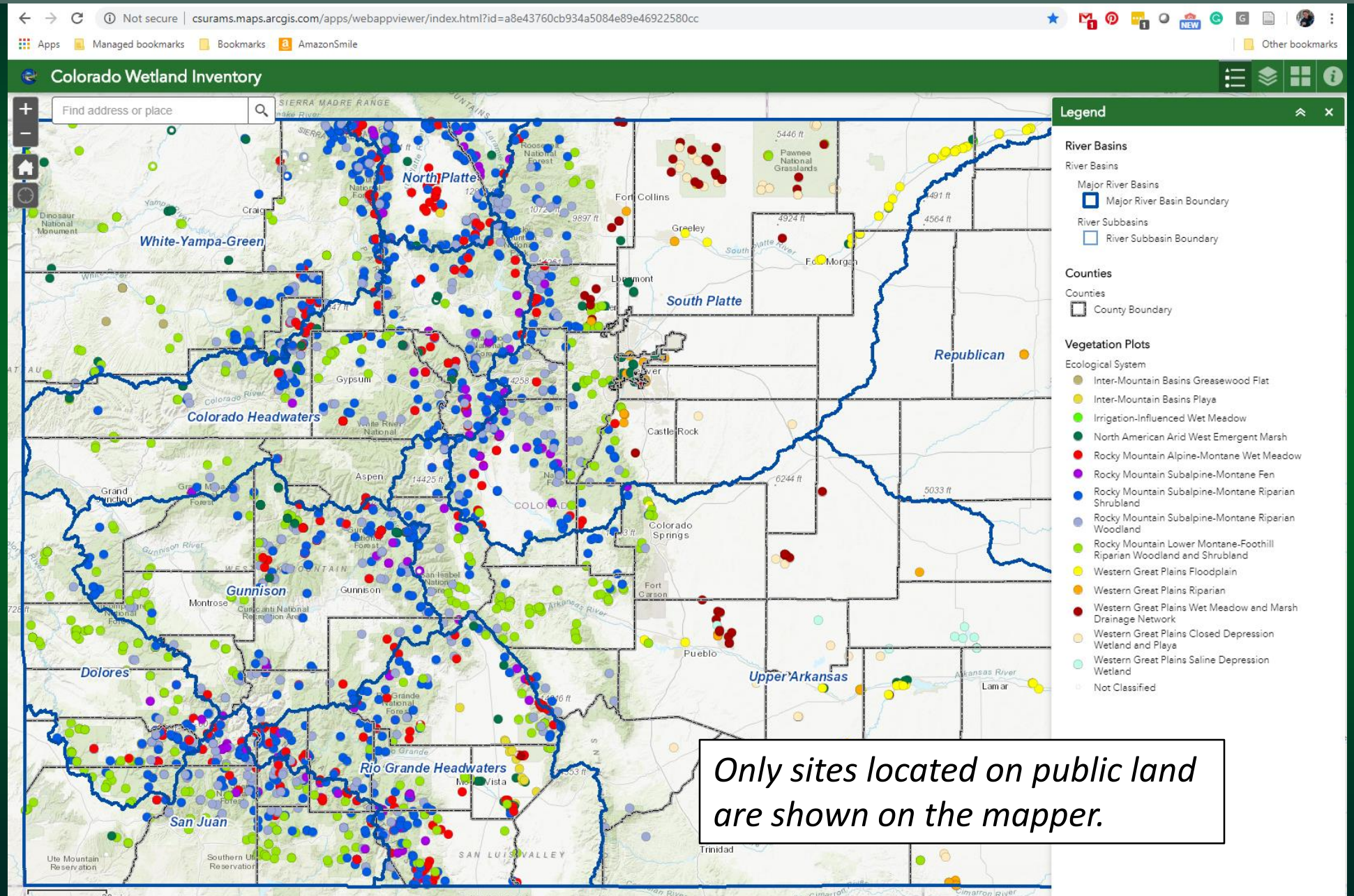
Revised C values

- Change greater than 4 units
  - *Campanula aparinoides* 10 to 5
  - *Euthamia occidentalis* 9 to 4 (workshop)
  - *Ranunculus aquatilis* 10 to 3

- Change less than 4 units
  - *Physaria bellii* 4 to 6 (workshop)
  - *Mentzelia rhizomata* 9 to 7 (2 experts in agreement)

Campanula aparinoides
Photo: Jennifer Ackerfield

QA/QC with Wetland Plots Database



Only sites located on public land are shown on the mapper.

QA/QC with Wetland Plots Database

- *~975 species occur within at least 5 plots*
  - *Land Disturbance Index (LDI)*
  - *Site specific conditions based on field work*
    - *Element Occurrence (EO) Rank*
    - *Ecological Integrity Assessment (EIA) Score*

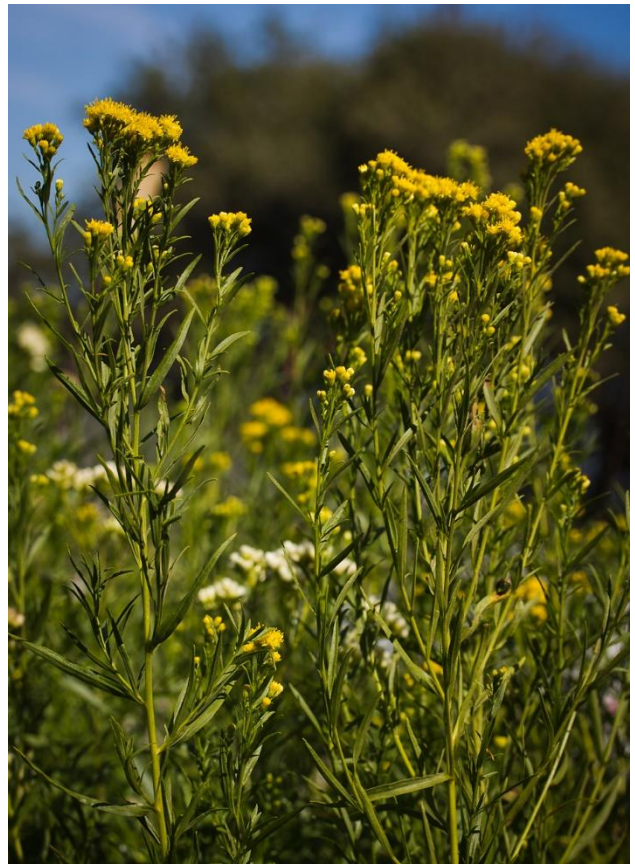
Plot Data and C Value Assessment

National_SciName_noAuthority	*C-Value*	*Mean LDI Score*	Mean Land Use Index (L2)	*EIA OR EORank*	*Mean EIA Score*	*Mean EORank*	*Avg of all*
Polemonium confertum	10	0	4.00	3.64	3.64		5.0
Salix myrtillifolia	10	79					5.0
Carex vernacula	10	0	3.83	3.67	3.67	3.75	4.9
Arnica rydbergii	10	24	4.00	3.66	3.66	4.00	4.9
Carex nova	10	58	3.94	3.64	3.64	3.50	4.7
Agrostis humilis	10	38	3.80	3.57	3.57	3.53	4.7
Platanthera obtusata ssp. obtusata	10	17	4.00	3.62	3.62	3.00	4.7
Juncus triglumis	10	33	4.00	3.68	3.68	3.00	4.6
Angelica grayi	10	93	3.75	3.48	3.48	3.28	4.3
Aquilegia elegantula	10	87		3.23		3.23	4.3
Mitella stauropetala var. stenopetala	10	44		3.29		3.29	4.3
Anemone narcissiflora var. zephyra	10	128		3.13		3.13	4.0
Kobresia simpliciuscula	10	119					4.0
Primula egaliksensis	10	139					4.0
Ranunculus longirostris	**10**	**198**	**2.50**	**2.74**	**2.74**		**3.3**
Ranunculus trichophyllus var. trichophyllus	**10**	**127**	**2.60**	**2.60**	**2.60**	**2.00**	**2.8**
Sorghastrum nutans	**10**	**369**	**1.00**	**2.13**	**2.13**	**3.00**	**2.7**
Menyanthes trifoliata	9	0	3.50	3.66	3.66		5.0
Carex heteroneura var. chalciolepis	9	60	4.00	3.63	3.63		5.0

Ranunculus aquatilis wikipedia image

Plot Data and C Value Assessment

Carex scirpoidea	9	102	4.00	2.84	2.84		3.8
Carex limosa	9	51	3.67	3.49	3.49	2.00	3.7
Aster alpinus var. vierhapperi	9	53		2.60		2.60	3.7
Viola labradorica	9	93		2.88		2.88	3.7
Athyrium filix-femina	9	346		3.20		3.20	3.6
Aralia nudicaulis	9	230	3.00	2.56	2.56	3.00	3.5
Cystopteris fragilis	9	251	3.25	2.78	2.78	3.20	3.5
Carex hallii	9	135	2.50	2.83	2.83	3.33	3.5
Gentiana prostrata	9	104	3.00	2.96	2.96		3.5
Euthamia occidentalis	9	872	1.28	2.00	2.00		1.5
Trifolium parryi	8	19	3.90	3.69	3.69		5.0
Antennaria umbrinella	8	97	3.69	3.55	3.55		5.0

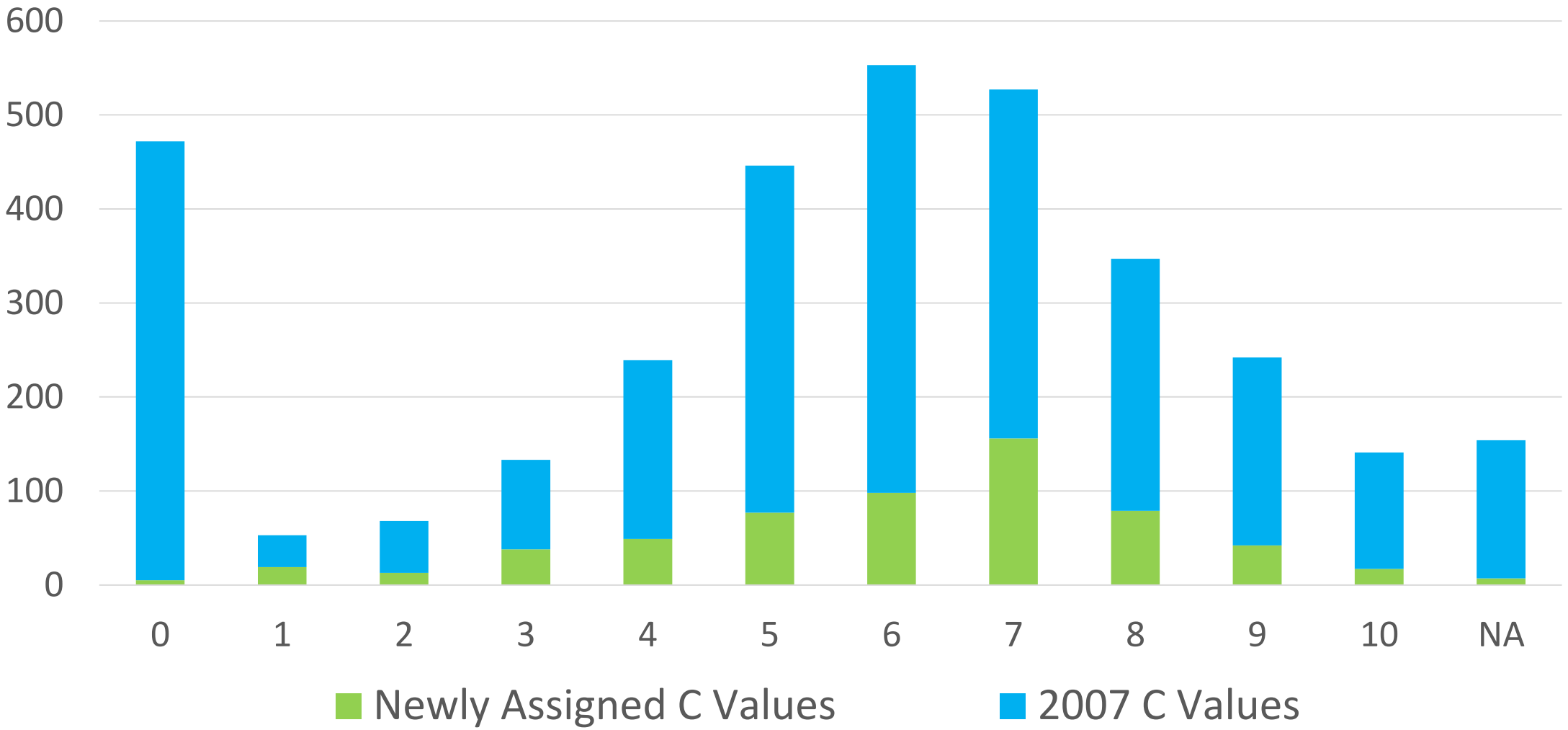


Euthamia occidentalis
www.watershednursery.com

RESULTS FQA Database 2020

	FQA 2007	FQA 2020
# of taxa	3,191	3,375
# New C values	NA	600 (18%)
Not Assigned	525 (17%)	154 (5%)
Non-native	502 (16%)	472 (14%)

All C Values 2020 – 3,375 taxa



What is in it for you?

Colorado Wetland Information Center (CWIC) website hosts information on the FQA for Colorado.

1) Full written report
2) Downloadable file with a synonymized list of taxa with:
    1) C values
    2) Wetland Status
    3) Updated nativity status
    4) CNHP tracking status
3) Online Calculator

Colorado Floristic Quality Assessment Panel 2007

- Dave Anderson – Colorado Natural Heritage Program
- David Buckner – ESCO Associates, Inc.
- Kathy Carsey – U.S. Forest Service
- Dina Clark – Botanical consultant
- Janet Coles – U.S. National Park Service
- Denise Culver – Colorado Natural Heritage Program
- Craig Freeman – Kansas Natural Heritage Inventory
- Brad Johnson – Colorado State University
- Steve Kettler – U. S. Fish and Wildlife Service
- Gwen Kittel – NatureServe
- Peggy Lyon – Colorado Natural Heritage Program
- Joe Rocchio – Colorado Natural Heritage Program
- Harvey Sprock – U.S. Natural Resources Conservation Service
- Gerould Wilhelm – (moderator)

Colorado Floristic Quality Assessment Panel 2020

- Jennifer Ackerfield – Denver Botanic Gardens
- **David Anderson** – Colorado Natural Heritage Program
- Gay Austin – U.S. Forest Service
- Megan Bowes – City of Boulder
- Justin Chappelle – BLM
- **Dina Clark** – University of Colorado Herbarium
- **Denise Culver** – Colorado Natural Heritage Program
- Carol Dawson – BLM
- Carla DeYoung – BLM
- Georgia Doyle – Colorado Natural Heritage Program
- **Craig Freeman** – University of Kansas
- Jill Handwerk – Colorado Natural Heritage Program
- Tim Hogan – University of Colorado Herbarium
- David Inouye – RM Biological Laboratory
- Joanna Lemly – Colorado Natural Heritage Program
- Ann Lezberg – City of Boulder
- **Peggy Lyon** – Colorado Natural Heritage Program
- Anthony Massaro – Jefferson County Open Space
- Steve Olson – U.S. Forest Service
- Lynn Riedel – City of Boulder
- **Joe Rocchio** – Washington DNR
- Pam Smith – Colorado Natural Heritage Program
- Neil Snow – Pittsburg State University - Kansas
- Crystal Strouse – City of Fort Collins
- Irene Weber – Jefferson County Open Space
- Jeanne Wenger – Colorado Native Plant Society
- Lorraine Yeatts – Denver Botanic Gardens

Thank YOU!

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