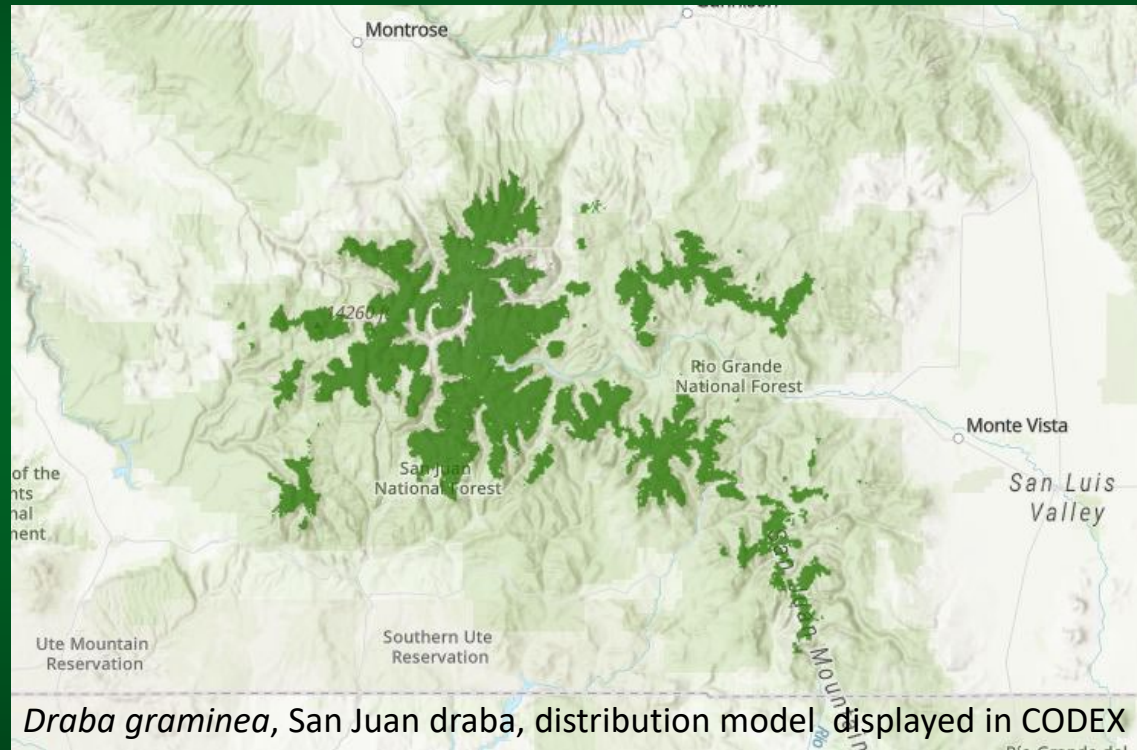# Rare Plant Distribution Models: CODEX Display & Call for Expert Review
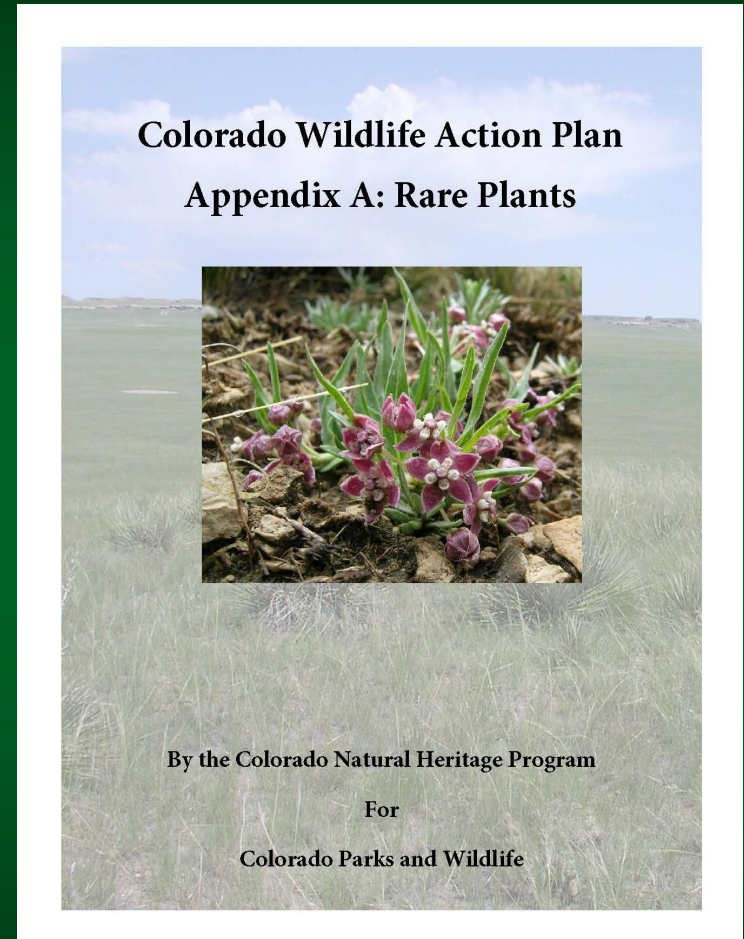
Jessica Smith, Michelle Fink, Karin Decker, Jill Handwerk, Susan Panjabi, Georgia Doyle, Colorado Natural Heritage Program

Draba graminea, San Juan draba, distribution model displayed in CODEX

Project Rationale

- 117 Plants of Greatest Conservation Need (PGCN)

- https://cpw.state.co.us/aboutus/Pages/StateWildlifeActionPlan.aspx

Colorado Wildlife Action Plan
Appendix A: Rare Plants

By the Colorado Natural Heritage Program
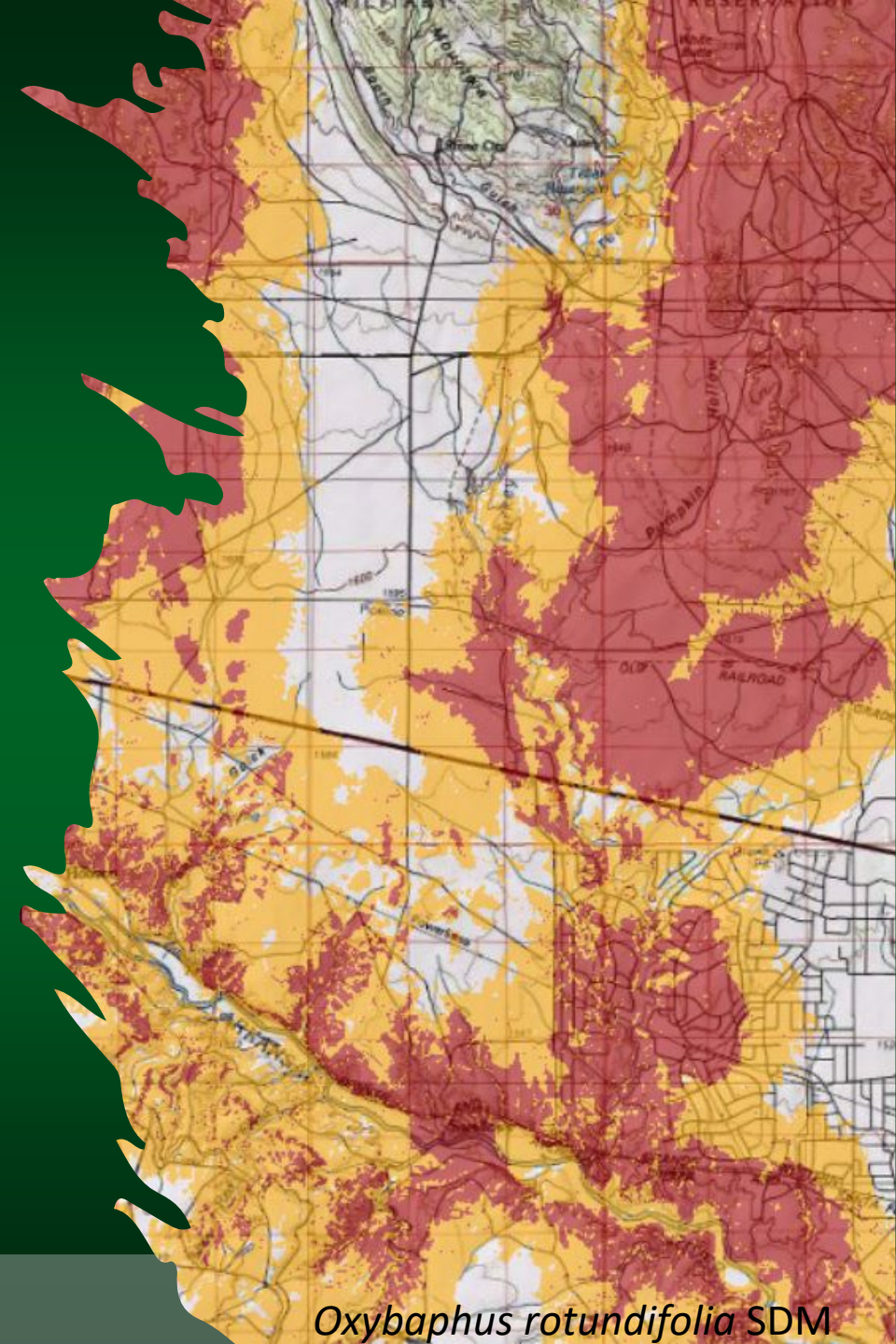
For

Colorado Parks and Wildlife

Project Rationale

- Model Inputs

  - CNHP geospatial database of rare plant locations

  - Spatial environmental variables based on habitat requirements

  - Maxent

Project Deliverables

- Species Distribution Model for PGCN

  – Full probability surface (0-1)
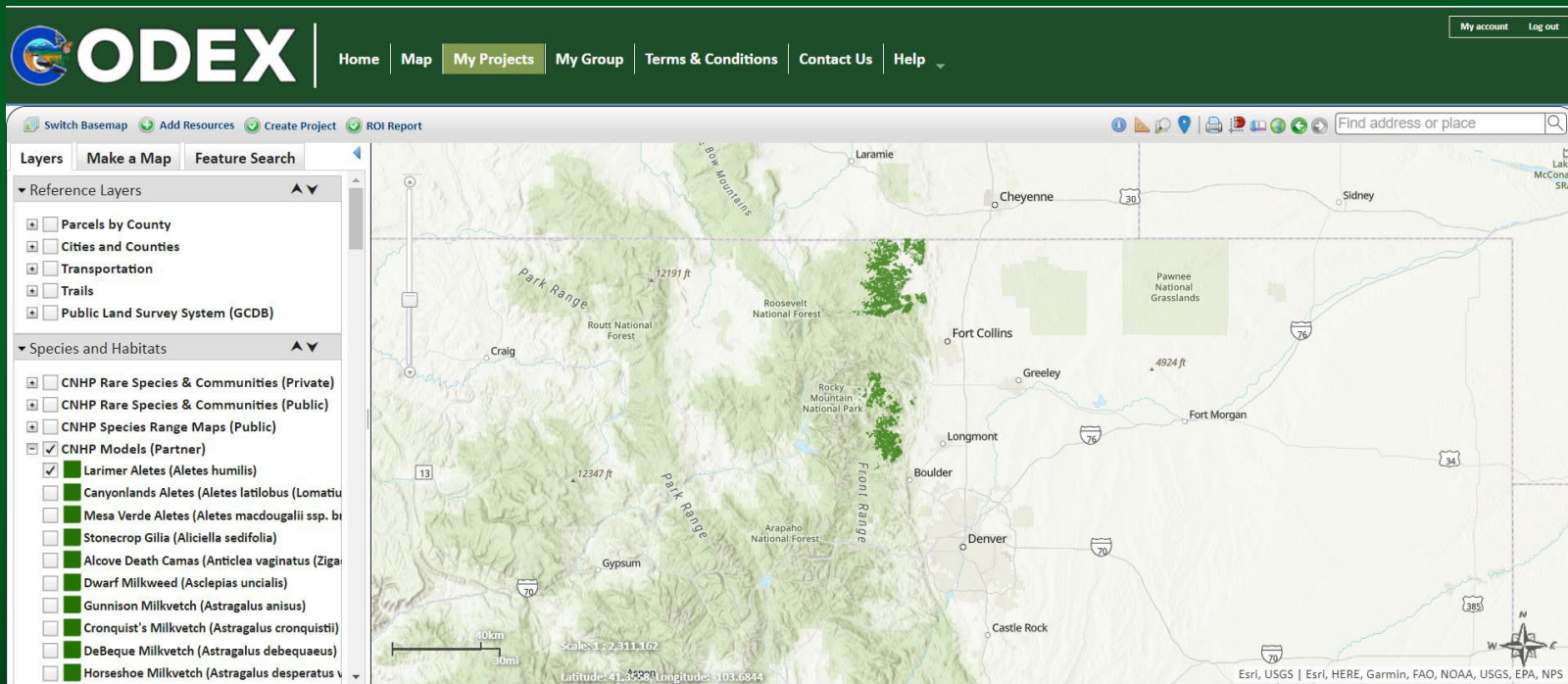
  – Binary model

  – Metadata

Oxybaphus rotundifolia SDM

Project Deliverables

- Return potential rare plant habitat in environmental review

https://codex.cnhp.colostate.edu/

Astragalus naturitensis

Model Uses

- Environmental Review & Conservation Planning

  - Flag for potential habitat

  - Landscape scale spatial analysis

  - Aid in management & avoidance of impacts

- Identify environmental drivers of habitat

Model Constraints

- One of factors in planning decisions

- Models are coarse-scale
  - Statewide datasets
  - Inputs over entire species range

Limnorchis zothecina

Project Deliverables

- Round I Expert Model Review

- Kick-Off for Round II Review

- Report

    – Environmental drivers, methodology, external model review results

    – **https://cnhp.colostate.edu/ library/reports/**

        - See Decker et al. 2022

Aletes humilis SDM on CODEX
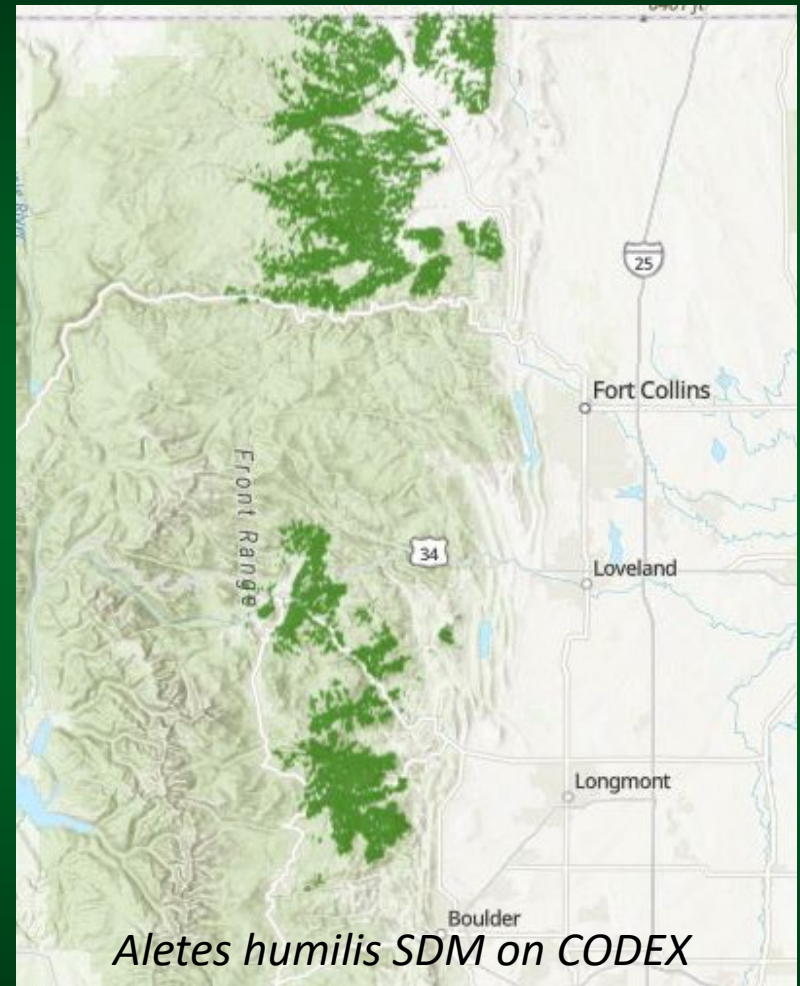
Round I Expert Review - Results

- 75 total reviews:

  - 39 individual botanists reviewed 46 models

  - Local, state, federal agencies, universities, herbaria, Colorado Native Plant Society

- ArcOnline Project & Google Form

- Overall correctness, fit, distribution

- Reviews were EXTREMELY valuable

Thelypodiopsis juniperorum

Round I Review - Results

- >80% reviews: good or higher for "Overall Correctness"

- Common sources of model dissatisfaction:

  - <u>Too broad/widespread</u>

  - <u>Incorrect conclusions</u>

  - Missing known occurrence

  - Data refinement desired

  - Unclear on model purpose

- 4 models revised

Potentilla rupincola SDM on CODEX

Round II External Review - Revisions

- Feedback form and CODEX documentation better describes purpose and use of models
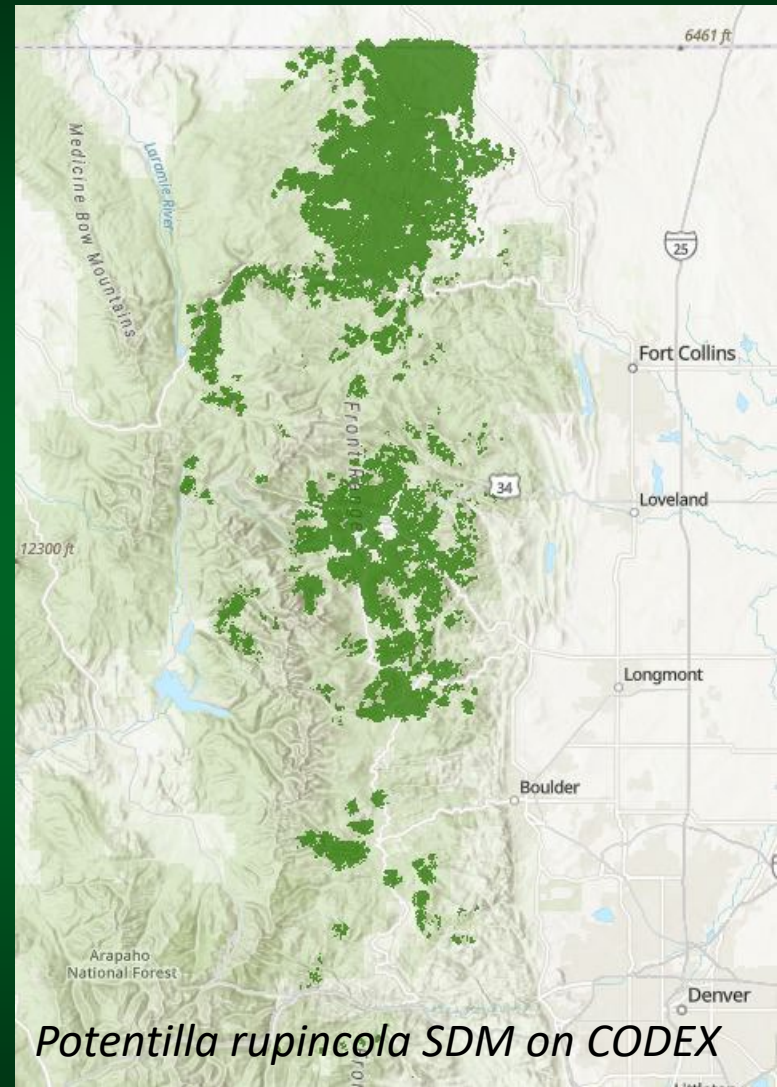
environmental review and conservation planning

Models are a broad, inclusive representation of locations recommended for survey where suitable habitat may exist.

Current land use was not included as a factor during model creation: due to this and modeling limitations, some unsuitable habitat may be included.

Layer Description: CNHP Models (Partner) — ✕

CNHP. Exported 20220421 (actual model dates vary by species)

Rare Plant models are intended to facilitate conservation and protection of these species through environmental review and conservation planning. Models are a broad, inclusive representation of locations recommended for survey where suitable habitat may exist. Current land use was not included as a factor during model creation; due to this and modeling limitations, some unsuitable habitat may be included.

Google Model Review Form:

https://tinyurl.com/PGCNmdlrv

External Review - Conclusions

- Highly useful in flagging potential rare plant habitat on the landscape

- Over 80%, reviewer believed overall correctness of the model to be good or higher

- Allow prioritization of model revisions, expert input into potential environmental drivers of habitat, and to gauge confidence

- Future Work:

  – Refined environmental inputs

  – Field validation and incorporation of negative data

  – Ensemble models

Round II: Additional PGCN Models

Aletes macdougalii ssp. *breviradiatus*

Anticlea vaginatus

Astragalus cronquistii

Astragalus equisolensis

Astragalus iodopetalus

Astragalus missouriensis var. *humistratus*

Astragalus naturitensis

Astragalus piscator

Boechera crandallii

Calochortus ciscoensis

Cirsium perplexans

Delphinium ramosum var. *alpestre*

Delphinium robustum

Draba graminea

Erigeron kachinensis

Eriogonum clavellatum

Eriogonum coloradense

Lepidium crenatum

Limnorchis zothecina

Lomatium concinnum

Mentzelia paradoxensis

Mertensia humilis

Oreocarya osterhoutii

Penstemon mensarum

Physaria alpina

Physaria pruinosa

Potentilla rupincola

Salix arizonica

Telesonix jamesii

Thelypodiopsis juniperorum

Thelypodium paniculatum

Townsendia fendleri

Trifolium dasyphyllum ssp. *anemophilum*

Thank you!

Jessica Smith
jp.smith@colostate.edu

Colorado State Wildlife Action Plan
https://cpw.state.co.us/aboutus/Pages/State WildlifeActionPlan.aspx

CODEX PGCN Modeling Report
https://cnhp.colostate.edu/library/reports/
See Decker et al. 2022

CODEX
https://codex.cnhp.colostate.edu/

Rare Plant Monitoring within the Lens of Ecological Niche Models - Workshop

- Potential Topics:

  - Review rare plant monitoring methodology (design, statistical considerations, results, lessons learned)

  - Brainstorm life history attributes in relation to ecological niche models

  - Categorize our G1, G2 and some G3 plants into ecological niche models

  - Develop foundational template for monitoring for each model

- Actively Fundraising

- Planning Committee - Spring 2023?

- Workshop - November 2023?