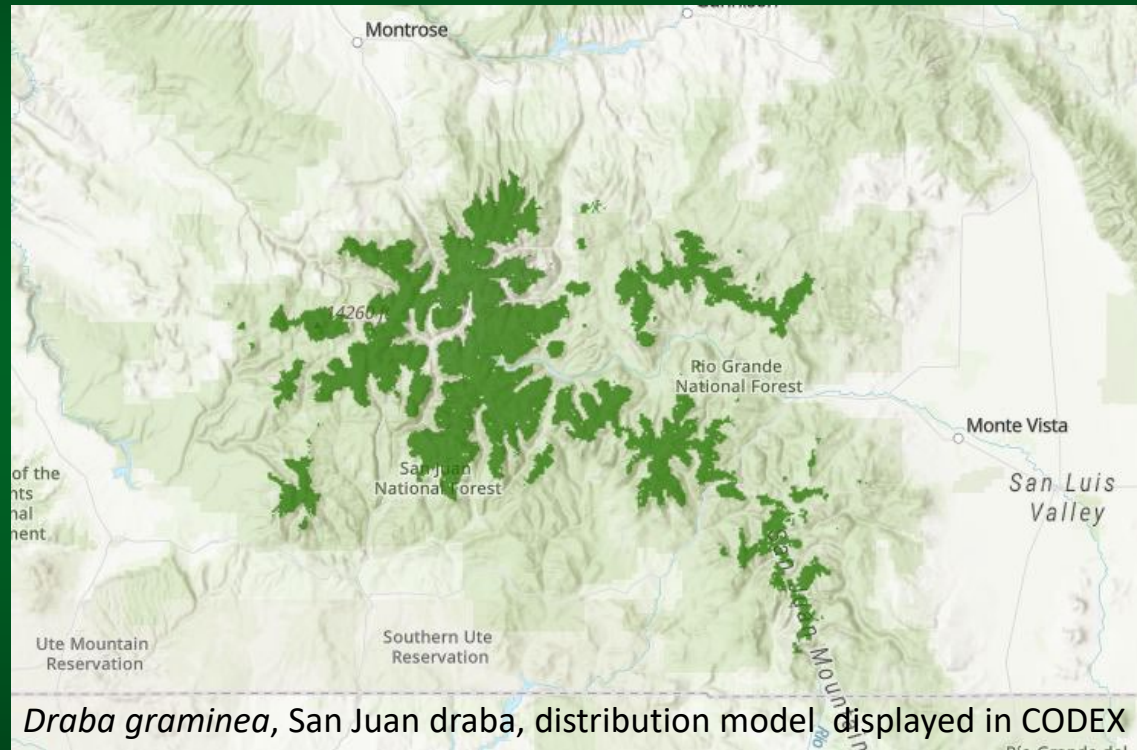


Rare Plant Distribution Models: CODEX Display & Call for Expert Review

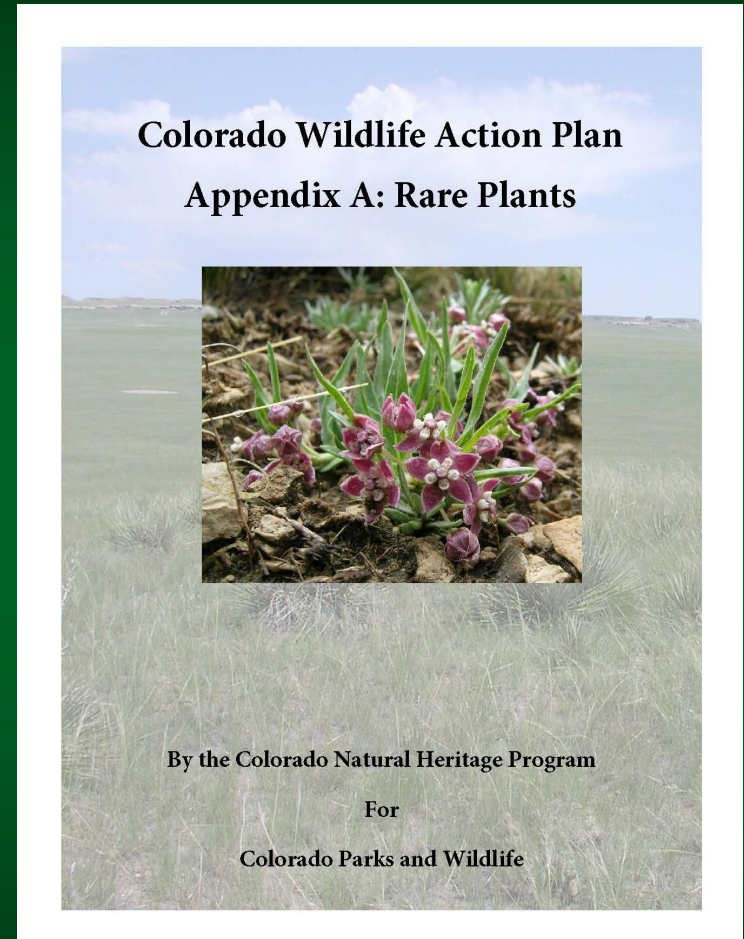
Jessica Smith,
Michelle Fink, Karin
Decker, Jill
Handwerk, Susan
Panjabi,
Georgia Doyle,
Colorado Natural
Heritage Program

Funding from the
Colorado Natural Areas
Program/Colorado
Parks & Wildlife



Project Rationale

- 117 Plants of Greatest Conservation Need (PGCN)
- <https://cpw.state.co.us/aboutus/Pages/StateWildlifeActionPlan.aspx>





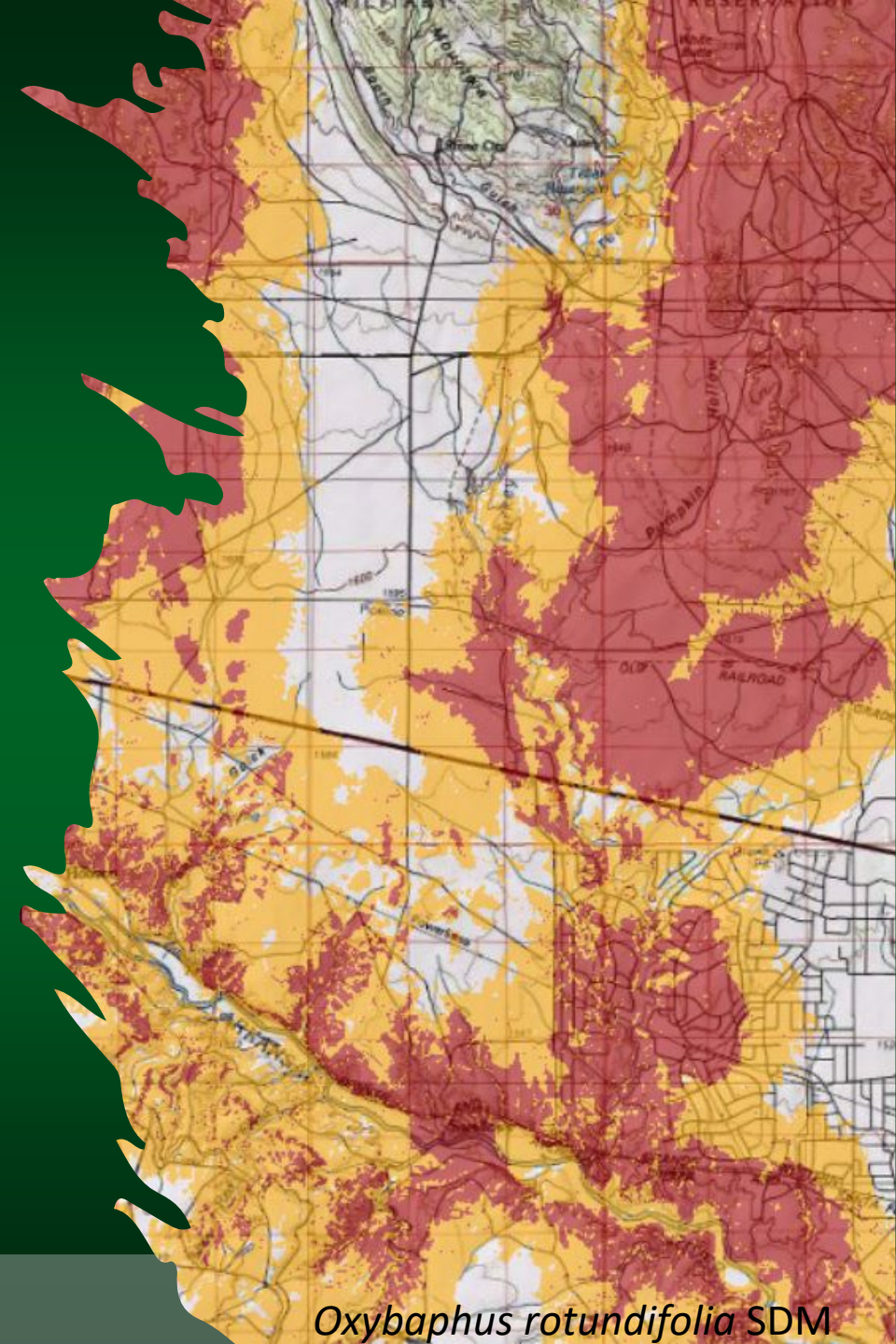
Project Rationale

- 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

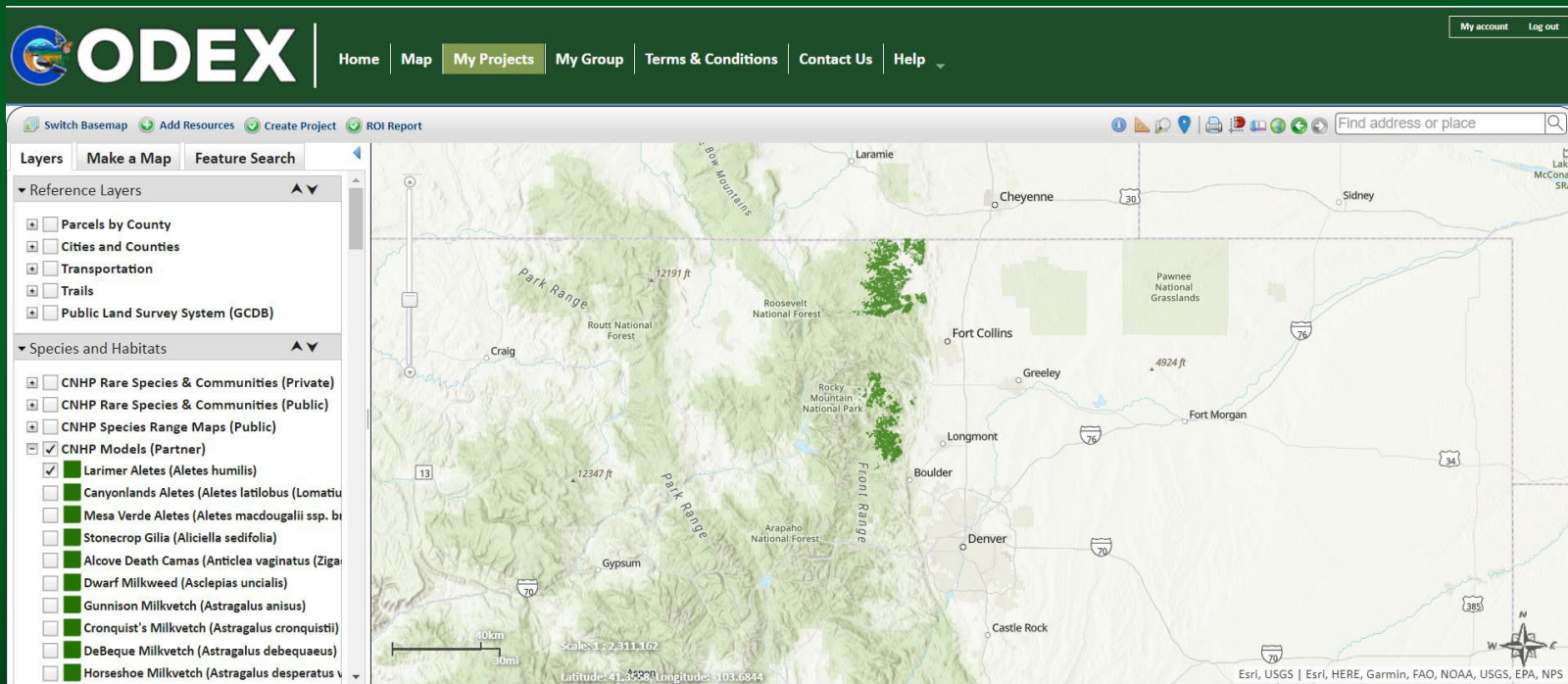


Oxybaphus rotundifolia SDM



Project Deliverables

- Return potential rare plant habitat in environmental review



The screenshot displays the ODEX web application interface. The top navigation bar includes the ODEX logo, a search bar, and links for Home, Map, My Projects, My Group, Terms & Conditions, Contact Us, and Help. The main content area features a map of Colorado with several layers visible. The legend on the left is organized into two sections: Reference Layers and Species and Habitats. The Species and Habitats section is expanded, showing a list of species and their corresponding map symbols. The map itself shows a topographic view of the Colorado Rockies, with several green shaded areas indicating potential rare plant habitats. The map includes a scale bar, a north arrow, and a search bar for finding addresses or places.

Layers | Make a Map | Feature Search

Reference Layers

- Parcels by County
- Cities and Counties
- Transportation
- Trails
- Public Land Survey System (GCDB)

Species and Habitats

- CNHP Rare Species & Communities (Private)
- CNHP Rare Species & Communities (Public)
- CNHP Species Range Maps (Public)
- CNHP Models (Partner)
 - Larimer Aletes (*Aletes humilis*)
 - Canyonlands Aletes (*Aletes latilobus* (Lomatium))
 - Mesa Verde Aletes (*Aletes macdougallii* ssp. b.)
 - Stonecrop Gilia (*Aliciella sedifolia*)
 - Alcove Death Camas (*Anticlea vaginatus* (Zigadenaceae))
 - Dwarf Milkweed (*Asclepias uncialis*)
 - Gunnison Milkvetch (*Astragalus anisus*)
 - Cronquist's Milkvetch (*Astragalus cronquistii*)
 - DeBeque Milkvetch (*Astragalus debequaeus*)
 - Horseshoe Milkvetch (*Astragalus desperatus*)

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





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

Astragalus naturitensis



Model Constraints

- One of factors in planning decisions
- Models are coarse-scale
 - Statewide datasets
 - Inputs over entire species range

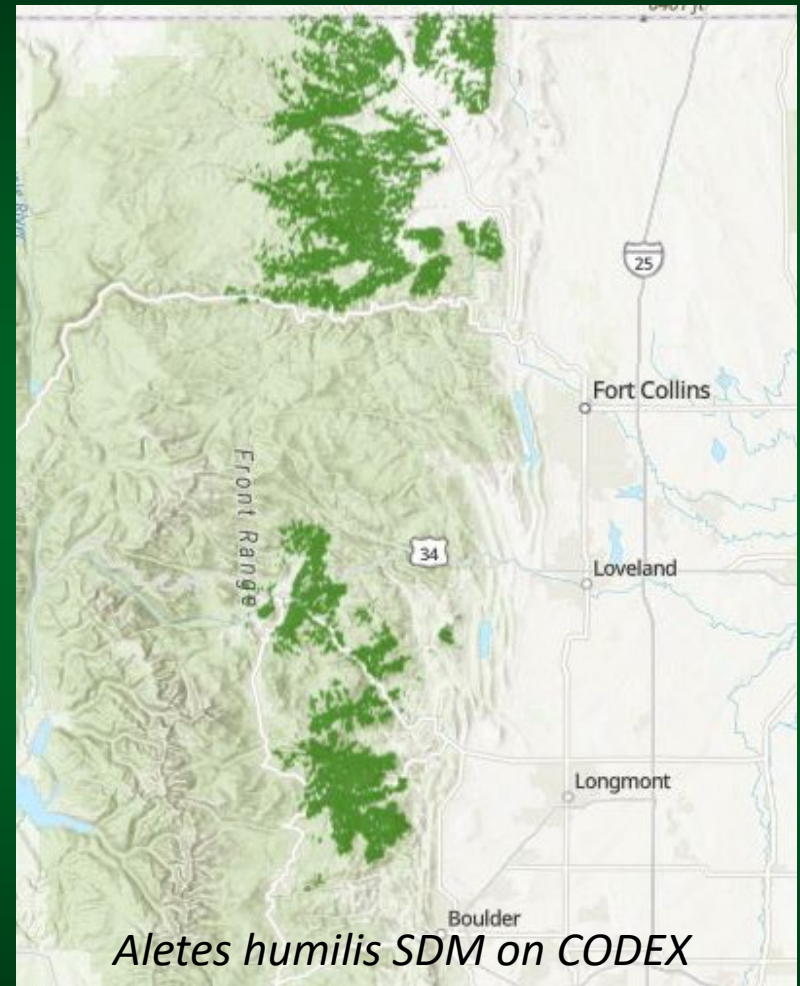


Limnorchis zothecina



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



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

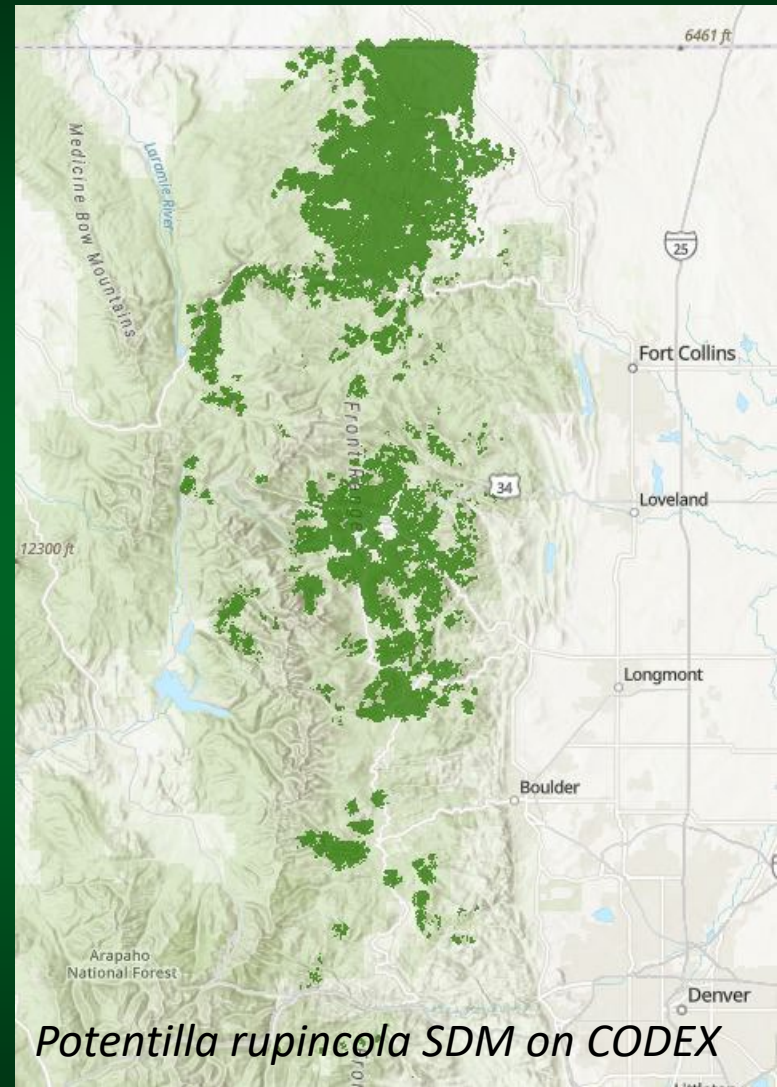


Thelypodopsis juniperorum



Round I Review - Results

- >80% reviews: good or higher for “Overall Correctness”
- Common sources of model dissatisfaction:
 - Too broad/widespread
 - Incorrect conclusions
 - Missing known occurrence
 - Data refinement desired
 - Unclear on model purpose
- 4 models revised



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

Thelypodopsis juniperorum

Thelypodium paniculatum

Townsendia fendleri

Trifolium dasyphyllum ssp.
anemophilum





Thank you!

Jessica Smith

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Colorado State Wildlife Action Plan

<https://cpw.state.co.us/aboutus/Pages/StateWildlifeActionPlan.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?