PAGOSA SPRINGS
Conservation Action Plan
2011 Update

Pagosa skyrocket © B. Clearwater

Pagosa skyrocket roadside habitat © B. Neely

Plant Species of Focus:
Pagosa skyrocket (*Ipomopsis polyantha*)

Sponsored by the
Colorado Rare Plant Conservation Initiative

Workshop Dates: June 12, 2008 and August 19, 2010
Report Date: August 25, 2011

Table of Contents

Neely, B., P. Lyon, S. Panjabi, and B. Kuhn. 2011. Pagosa Springs: Conservation Action Plan 2011 Update. Prepared by The Nature Conservancy and the Colorado Natural Heritage Program. Unpublished report prepared for the National Fish and Wildlife Foundation.

I. Introduction

The Rare Plant Conservation Initiative (RPCI) is a diverse partnership of public and private organizations dedicated to conserving Colorado's natural heritage by improving the protection and stewardship of the state's most imperiled plants. With funding from National Fish and Wildlife Foundation, RPCI developed the statewide Colorado Rare Plant Conservation Strategy (Neely et al. 2009) and is working with partners to identify site-specific strategies in areas with the most imperiled species and a reasonable likelihood of conservation success. RPCI led conservation action planning workshops with local partners in 2008 and 2010 to identify conservation strategies in Priority Action Areas for Colorado's most imperiled plants.

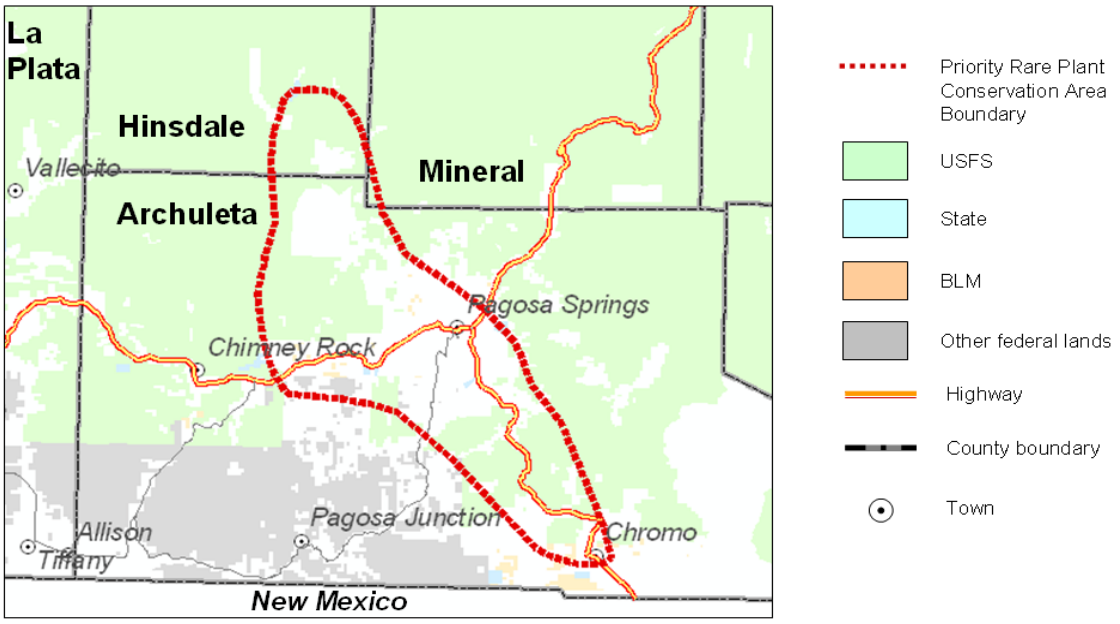
The Pagosa skyrocket (*Ipomopsis polyantha*), listed as endangered by the US Fish and Wildlife Service (FWS) effective August 26, 2011 (FWS 2011a) and ranked as critically imperiled (G1) by the Colorado Natural Heritage Program, is endemic to the Pagosa Springs Priority Action Area. Located primarily in Archuleta and Hinsdale counties, the Action Area includes all known occurrences of the Pagosa skyrocket, as well as significant occurrences of two other globally imperiled (G2) plants: Pagosa bladderpod (*Lesquerella pruinosa*) and Gray's townsend daisy (*Townsendia glabella)*. The Pagosa skyrocket is only known from the immediate vicinity of Pagosa Springs, and nowhere else in the world, despite extensive searches by botanists over the past 25 years. The species is at risk of extinction due to its narrow range and the fact that its range overlaps with the town of Pagosa Springs and associated residential and commercial development.

This document identifies conservation strategies and actions for Pagosa skyrocket, based on an assessment of the plant's viability and threats by participants of an initial June 2008 workshop and an August 2010 follow-up workshop. The primary audience is intended to be the workshop participants and other stakeholders interested in helping to implement the strategies.

Since the 2008 workshop, the FWS proposed listing of the Pagosa skyrocket on June 23, 2010, and published the final rule to list the species as endangered on July 27, 2011. They also provided funding, with the Colorado Natural Areas Program, for Ecosphere Environmental Services (Ecosphere), a local contractor, to do monitoring, outreach, and private landowner contacts, with the overarching purpose of protecting and better understanding the life and history of the Pagosa skyrocket. The FWS and Ecosphere also worked with the state's Partners for Wildlife Program to fence out livestock grazing on one private property. The Colorado Department of Transportation has been conducting annual training for field maintenance crews about the Pagosa skyrocket and has marked no spray/mowing zones. Amy Greer conducted a pollination study for 4H. The RPCI held a workshop on August 19, 2010 to assess progress towards conservation action plan implementation, update viability, threats and strategies, and determine priorities and roles for the Pagosa Springs Important Plant Area. RPCI also conducted private parcel prioritization to determine/identify high priority private parcels for the conservation of the Pagosa skyrocket and communicated results to the local conservation organizations.

II. Map

All known occurrences of the Pagosa skyrocket and most of the Colorado occurrences of the Pagosa bladderpod and Gray's Townsend daisy occur within the Pagosa Priority Action Area, shown below.



III. Pagosa Springs Priority Action Area and Associated Rare Plants

This document focuses on rare plants within the Pagosa Springs Priority Action Area as identified by the Colorado RPCI. A Priority Action Area is an area needing immediate conservation action to prevent the need for listing, extinction, or further losses of imperiled plant species. Selection was based on the level of imperilment of rare plant species, quality of the occurrences, urgency of the management and protection actions, and other opportunities such as funding and land ownership patterns. These areas are based on the Potential Conservation Areas identified by the Colorado Natural Heritage Program, at Colorado State University, with input by the RPCI and the Rare Plant Technical Committee (RPTC).

Located primarily in Archuleta and Hinsdale counties, the Pagosa Springs Priority Action Area includes all known occurrences of the Pagosa skyrocket (*Ipomopsis polyantha;* G1, listed as endangered under the Endangered Species Act effective August 27, 2011).

Although the focus of the workshop was on the Pagosa skyrocket due to its imperilment, future planning efforts should include the two globally imperiled plants (frosty bladderpod and Gray's Townsend daisy) and other significant species and plant communities in this area (See Attachment 1).

Table 1. Globally imperiled plants known from the Pagosa Springs Priority Action Area.

Common name	Scientific name	Known occurrences	Global rank*	Status	CNHP Rare Plant Field Guide Link
Focus of the workshop and this document					
Pagosa gilia; Pagosa skyrocket	*Ipomopsis polyantha*	2 in the world, limited to the Pagosa Priority Action Area.	G1	Listed as Endangered effective August 27, 2011	CNHP Rare Plant Field Guide http://www.cnhp.colostate.edu/download/projects/rareplants/pdfs/23253.pdf
Other important rare plants – focus of future efforts					
Pagosa bladderpod; frosty bladderpod	*Lesquerella pruinosa*	18 in the world, 17 of which are in Colorado, all in the Pagosa Priority Action Area.	G2	BLM and FS sensitive	CNHP Rare Plant Field Guide http://www.cnhp.colostate.edu/download/projects/rareplants/pdfs/18927.pdf
Gray's townsend daisy	*Townsendia glabella*	21 in the world, 18 of which are in Colorado, 9 are in the Pagosa Action Area.	G2	None	Not yet included in guide.

*G1 = critically imperiled. G2 = imperiled. For more detail on global ranks please visit the Colorado Natural Heritage Program's website at http://www.cnhp.colostate.edu/heritage.html.

***Ipomopsis polyantha* (Pagosa skyrocket)**

Taxonomy

Class: Dicotyledoneae
Order: Solanales
Family*:* Polemoniaceae

Taxonomic Comments: Sometimes placed in the genus *Gilia*. As treated by Kartesz (1999), the plants sometimes called *Gilia brachysiphon* and *G. polyantha* var. *whitingii* are included here, without recognition of varieties or subspecies, but the species is considered by Kartesz to be endemic to Colorado. FWS tracks as *Ipomopsis polyantha*, but in a narrower sense, excluding the *brachysiphon* and *whitingii* plants. Colorado Natural Heritage Program botanists believe plants of their state (the typical variety) are distinct from those of New Mexico and Arizona (locality of var. *whitingii*).

Ipomopsis polyantha. Photo © Al Schneider, SW Colorado Wildflowers

CNHP Ranking: G1S1

State/Federal Status: Proposed for listing by FWS (2010). BLM and Forest Service sensitive species.

Description and Phenology: Anderson (1988) described *Ipomopsis polyantha* as follows: "Herbaceous perennial or possibly biennial (monocarpic) up to 30 to 60 cm (12 to 24 inches) tall, branched from near the base, with grayish deeply divided leaves with linear leaflets scattered up the stem. The inflorescences occur along the stem in the axils of the leaves as well as at the top of the stem. The white flowers may be flecked with purple dots and have short tubes with flaring lobes." These dots are occasionally so dense as to give the flower a pinkish or purplish hue (Colorado Natural Heritage Program 2003). The corolla is 10 mm long with a short throat (4.5 to 6.5 mm) and flaring lobes. The stamens are noticeably exserted. All members of *Ipomopsis* have tubiform or salverform flowers (Grant 1956, Grant 1959). Early flowering occurs during the first week of June. A few plants were observed at the Pagosa Springs population in late flower during the last week of August 1988, but most were dried up and/or no longer present. Jennings 1995). Since the plants are most conspicuous during flowering, the bestinventory period is late May to late July.

Habitat Comments: In Colorado, found on rocky clay soils of the Mancos Shale in the southern San Juan Mountains, typically on road shoulders where the soil has been disturbed. Highest densities are under *Pinus ponderosa* forests with montane grassland understory (Anderson 2004, Anderson 1988). 2073-2195 meters elevation.

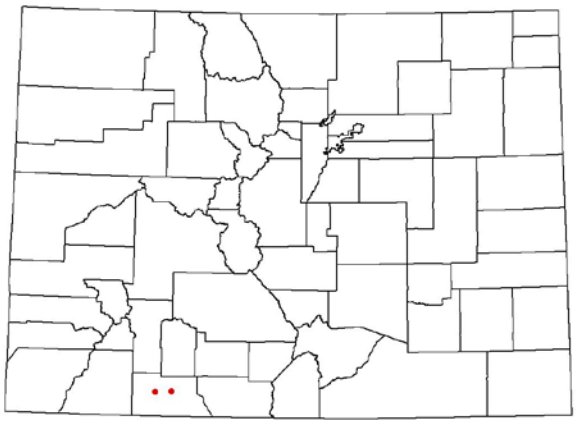
Global Range: Known from Archuleta County in southern Colorado. It is considered a Colorado endemic when treated narrowly (as done here).

State Range: Archuleta County, in the Pagosa Springs area.

Distribution/Abundance: Estimates of the total number of plants are difficult to make, but they are expected to number several thousand individuals**.**

Known Threats and Management Issues: Residential and commercial developments are considered to be the primary threats to the species at this time (Anderson 2004, CNHP Scorecard 2006). The species is also threatened by livestock grazing, exotic species invasion, right-of-way management, effects of small population size, recreation, wildflower gathering, global climate change, and pollution. The entire global range of Pagosa skyrocket is planned for residential development in the Archuleta County Community Plan. Pagosa skyrocket does not tolerate heavy livestock grazing and is thus largely limited to highway rights-of-way and ungrazed properties. Given the serious nature of the threats to Pagosa skyrocket, it is among the most endangered species in Colorado (Anderson 2004).

Potential Conservation Areas with *Ipomopsis polyantha*: Mill Creek at Pagosa Springs and Stollsteimer Creek North.



Distribution in Colorado

Habitat of *Ipomopsis polyantha*. Photo © Al Schneider, SW Colorado Wildflowers

IV. About the Workshop

Purpose: The objective of the initial workshop in July 2008 was to identify strategies and actions needed for conserving the Pagosa skyrocket, based on an assessment of the viability of and threats to its occurrences. The objectives of the August 2010 workshop were to assess progress towards implementation and update viability, threats and strategies of the 2008 Conservation Action Plan (CAP) for the Pagosa Springs Important Plant Area, as well as to determine priorities and roles. The participants of the second workshop also developed a vision and goals for the area and addressed potential impacts of climate change.

Workshop dates: June 12, 2008 and August 19, 2010

Participants of June 12, 2008 Workshop:

Name	Affiliation
Attended	
Sara Brinton	USFS, Pagosa District
Tony Cady	Colorado Dept. of Transportation, Pagosa
Suzanne Coe	Contractor, LPEA
Karin Freeman	Southwest Land Alliance
Sandy Friedley	Colorado Native Plant Society
Susan Halabrin	Audubon Society, Weminuche Chapter
Chrissy Karas	Archuleta County, Planning Commissioner
Megan Kram (co-facilitator)	The Nature Conservancy
Peggy Lyon	Colorado Natural Heritage Program
Ellen Mayo	USFWS
Ann Oliver (RPCI contact)	The Nature Conservancy
Susan Panjabi (co-facilitator)	Colorado Natural Heritage Program
Other contacts	
Tamra Allen	Town of Pagosa
Lesli Allison	Archuleta County Planning Commissioner
Jim Behnken	Consultant for LPEA
Becky Gillette	Audubon Society, Weminuche Chapter
Ken Heil	Consultant
Charlie King	Colorado Native Plant Society
Julie Korb	Fort Lewis College
Jim Miller	Town of Pagosa
Dick Mosely	Colorado Native Plant Society
Joe Nigg	Town of Pagosa, Associate Director Planning
William Nobles	CSU Extension
Steve O'Kane	University of Northern Iowa
Jeff Peterson	Colorado Department of Transportation
Jeff Redders	USFS
Al Schneider	Colorado Native Plant Society
Michael Whiting	Southwest Land Alliance
Steve Whiteman	Southern Ute Tribe

Participants of August 19, 2010 Workshop:

Name	Affiliation
Attended	
Sara Brinton	USFS, Pagosa District
Tony Cady	Colorado Dept. of Transportation, Pagosa
Christy Clark	The Nature Conservancy Volunteer
Suzanne (Sue) Coe	Contractor, LPEA, CO NPS
Karin Freeman	Consultant
Sandy Friedley	Ecosphere, Colorado Native Plant Society
Susan Halabrin	Audubon Society, Weminuche Chapter
Chrissy Karas	Archuleta County
Bernadette Kuhn	Colorado Natural Heritage Program
Peggy Lyon (co-facilitator)	Colorado Natural Heritage Program
Ellen Mayo	US Fish and Wildlife Service
Jim Miller	Town of Pagosa
Betsy Neely (co-facilitator)	The Nature Conservancy
Alison Rohwer	Ecosphere
Other Contacts	
Tamra Allen	Town of Pagosa
Lesli Allison	Archuleta County Planning Commissioner
Jim Behnken	Consultant for LPEA
Becky Gillette	Audubon Society, Weminuche Chapter
Gina Glenne	US Fish and Wildlife Service
Amy Green	USFWS Partners for Wildlife Program
Ken Heil	Consultant
Charlie King	Colorado Native Plant Society
Brian Kurzel	Colorado Natural Areas Program
Dick Mosely	Colorado Native Plant Society
Joe Nigg	Town of Pagosa, Associate Director Planning
William Nobles	CSU Extension
Steve O'Kane	University of Northern Iowa
Susan Panjabi	Colorado Natural Heritage Program
Jeff Peterson	Colorado Department of Transportation
Jeff Redders	USFS
Katherine Roser	La Plata Open Space Conservancy
Al Schneider	Consultant/Photographer
Michael Whiting	Southwest Land Alliance
Steve Whiteman	Southern Ute Tribe

V. Workshop Results

A. Conservation Targets

Using The Nature Conservancy's (TNC) site conservation planning workshop methodology, "conservation targets" are a limited suite of species, communities, and/or ecological systems, or specific locations of these elements of biodiversity (e.g., occurrences, sub-occurrences, or other areas) that are the basis for setting goals, identifying conservation strategies, and measuring conservation effectiveness.

At the Pagosa Springs Priority Action Area, our targets are specific locations of the rare plants. Specifically, we organized the two occurrences of the Pagosa skyrocket, as identified by CNHP, into ten target locations based on landownership (Table 2). We initially considered using the two occurrences as a whole as targets, but decided that it would be more meaningful to identify the viability, threats, and strategies for sub-occurrences (target locations within the occurrence boundaries) of the two larger occurrences. The sub-occurrences were delineated for this purpose based primarily on patterns of landownership, since different patterns can lead to different strategies. For instance, voluntary conservation easements are more likely to be useful tools for conserving large private land parcels than for conserving small parcels.

The two occurrences of Pagosa skyrocket are included within two "Potential Conservation Areas" (PCA) as identified by the Colorado Natural Heritage Program (Table 2). A PCA represents CNHP biologists' best estimate of the primary area required to support the long-term survival of species or communities of interest or concern.

Table 2. Element occurrences and target locations for each occurrence of Pagosa skyrocket (note Mill Creek occurrence is now lumped with Pagosa Springs, updated from 2008).

Occurrence number and survey site name (PCA name in parentheses)	**Target locations based on occurrences or sub-occurrences**	**Land owner/manager**
EO#1 – Pagosa Springs (includes 2 occurrences, Mill Creek at Pagosa Springs PCA)	Ipomopsis 1a: Hwy 84	Private and CDOT
	Ipomopsis 1b: Road Tierro Del Oro	Private and right of way
	Ipomopsis 1c: County Road 119	Private and County Road
	Ipomopsis 1d: Fairgrounds	County and private
	Ipomopsis 1e: County Garage	County
	Ipomopsis 1f: 3 large parcels	Private
	Ipomopsis 1g: Holiday Acres	Private
	Ipomopsis #4: Mill Creek	Private
EO# 2 - Dyke (Stollsteimer Creek North PCA).	Ipomopsis 3a - Dyke (Stollsteimer Creek North) – larger polygon	BLM and private
	Ipomopsis 3b - Dyke (Stollsteimer Creek North) – smaller polygon	BLM and private

CNHP assigns each occurrence a unique element occurrence number. These numbers are not necessarily in consecutive order because as new locations of plants are found, some occurrences are lumped together, and locations previously documented as two or more occurrences may become one (e.g., if plants are found between two occurrences, they may all together be considered one occurrence because of the proximity and connectedness of the individual plants).

B. Vision and Goals

Vision

1. To protect the Pagosa skyrocket and one of the most threatened shale barren ecosystems in Colorado, a mosaic of Mancos Shale habitat within functioning lower-elevation ponderosa pine community, including a rich assemblage of rare plants and associated ecological processes.
2. A coalition of partners work together to ensure the long-term survival and stewardship of the Pagosa skyrocket and other imperiled species and their habitats.

Goals

1. Maintain the viability of all occurrences of the Pagosa skyrocket.
2. Increase our understanding of population dynamics of the Pagosa skyrocket.
3. Maintain/restore a mosaic of high-quality plant communities (ranked A-B) and associated species, including frosty bladderpod and Gray's Townsend daisy (ranked A-B)

C. Viability

"Viability" per TNC terminology is the "health" or "functionality" of the conservation targets. During the Workshop we attempted to answer two key questions through the viability assessment: *How do we define 'health' (viability) for each of our targets?* and *What is the current status of each of our targets?*

Table 3 shows the viability for each occurrence as a whole as previously identified by the Colorado Natural Heritage Program (CNHP). Table 5 shows a more detailed assessment of viability for the target locations. As Table 5 indicates, no target locations are ranked as *very good*, but several are ranked as *good*: Fairgrounds, county garage, 3 large parcels, and Dyke (Stollsteimer Creek North) – smaller polygon.

Table 3. Viability of the known occurrences of the Pagosa skyrocket (updated 2010).

Occurrence	Survey site name and PCA name	Viability Rank	Acres
1	Pagosa Springs (Mill Creek at Pagosa Springs and Mill Mill Creek)	AB = Very Good and B-Good	563
2	Dyke (Stollsteimer Creek North)	B = Good	58

* CNHP assigns a rank to each occurrence using the following codes: A = Very good; B = good; C = fair; D = poor; H = possibly extirpated/ possibly extinct; X presumed extirpated/presumed extinct

The viability ranking for each occurrence was based on a systematic assessment of the components of viability, or indicators and associated indicator ratings as shown in Table 4. These components of viability were "rolled up" into the overall viability rank.

Table 4. Basis for viability ratings.

		Indicator rating criteria			
Key Attribute	Indicator	**D** - Poor	**C** - Fair	**B** - Good	**A** - Very Good
LANDSCAPE CONTEXT: Intactness of occurrence and surrounding area	% fragmentation	Highly fragmented	Moderately fragmented	Limited fragmentation	Unfragmented
CONDITION: Population structure & recruitment	Evidence of reproduction	Little or no evidence of successful repro. (few seedlings and/or no flowering or fruiting)	Less productive, but still viable with evidence of flowering and/or fruiting and mixed age classes	Good likelihood of long-term viability as evidenced by flowering, fruiting, and mixed age classes.	Excellent viability as evidenced by high % flowering and fruiting, and mixed age classes
CONDITION: Species composition / dominance	Evidence of reproduction	>50% cover of exotic spp?	11-50% cover	1-10% cover	<1% cover
SIZE: Population size & dynamics	# individuals	<10	10-99	100-999	1,000 or more

Participants used the table above to rank each target location. The facilitators loaded participants' input into an Excel workbook, which summarized the input as shown below. The known occurrences vary in condition from very good to poor. The variation in condition is due in part to the number and severity of threats to the occurrences. For example, the occurrences are highly threatened by construction and maintenance of housing and urban development; road construction; and utility construction.

Table 5. Viability for target locations of Pagosa skyrocket (updated 2010).

	Inputs to the overall viability rank			
Conservation Targets	**Landscape Context (Setting)**	**Condition**	**Size**	**Overall viability rank**
P. Skyrocket 1 – Pagosa Springs (Mill Creek at Pagosa Springs), Overall occurrence	Poor	Fair	Very Good	**Fair = C**
P. Skyrocket 1a: Hwy 84	Poor	Poor	Very Good	**Fair = C**
P. Skyrocket 1b: Road Tierro Del Oro	Poor	Poor	Poor	**Poor = D**

	Inputs to the overall viability rank			
Conservation Targets	**Landscape Context (Setting)**	**Condition**	**Size**	**Overall viability rank**
P. Skyrocket 1c: County Road 119	Poor	Fair	Very Good	**Fair = C**
P. Skyrocket 1d: Fairgrounds	Good	Good	Very Good	**Good = B**
P. Skyrocket 1e: County Garage	Poor	Poor	?	**Poor = D**
P. Skyrocket 1f: 3 large parcels	Good	Good	Good	**Good = B**
P. Skyrocket 1g: Holiday Acres	Poor	Fair	Good	**Fair = C**
P. Skyrocket 4 - Mill Creek (Mill Creek at Pagosa Springs), small polygon in east arm of PCA	Fair	Fair	Good	**Fair = C**
P. Skyrocket 3a - Dyke (Stollsteimer Creek North) – larger polygon	Poor	Fair	Good	**Fair = C**
P. Skyrocket 3b - Dyke (Stollsteimer Creek North) – smaller polygon	Fair	Good	Good	**Good = B**

D. Threats

With the viability analysis complete, participants then identified and ranked the primary threats to each site based on their expertise, local knowledge, and sense of the key issues facing each target (Table 6). Identifying and ranking threats is an important input, along with understanding viability, to ultimately identifying efficient and effective strategies.

The variance in viability of the target locations in explained in part by the number and severity of threats to these locations. The locations are primarily threatened by construction and maintenance of housing and urban development; road construction and maintenance; and utility construction.

One of the major conservation issues is a lack of understanding of natural history of the Pagosa skyrocket.

Table 6. Primary threats to each target location. Updated August 2010. Red = high, orange = medium; yellow = low (ROW=right of way).

Targets	Commercial, residential & municipal development & associated infrastructure	Maintenance /use/grazing associated w/ development	Invasive non-natives	Road & trail construction	Road maintenance	Utility construction/ maintenance	Climate Change	Notes
Pagosa								
ROW US Highway 84	L		H	H	H	M	M	Invasive species
ROW Private Road Tierra del Oro			?	?	M		M	Need info
ROW Co Road 119	L		M	M	M	L	M	watched by Frank Ratliff - County weed specialist
Private Large development properties > 40 acres	H	H	?	M	M	M	M	High magnitude / don't know about immi-nence
Private-small parcels (<40 acres)	L	H	L	L	M	L	M	Don't want infill develop-ment, horses, mowing
Private lots < 5 acres	M	H	M	L	L	L	M	
County Garage	L	H	L	L	L	L	M	Parking lot maintenance under 2nd column
Reser-voir Hill-Town Park	L	L	L	M	L	L	M	IP on 2 of 156 acres, potential for ski lift, recreational impacts, e.g., parking

Targets	Commercial, residential & municipal development & associated infrastructure	Maintenance /use/grazing associated w/ development	Invasive non-natives	Road & trail construction	Road main-tenance	Utility con-struction/ main-tenance	Climate Change	Notes
								lot
Dyke								
BLM (40 acres total)		L	L		M	L	M	20 acres occupied, elk migration corridor, utility corridor took out plants
Private	?	M	M	M	M		M	Grazing an issue, road for utility
Highway Right-of-Way			M	H	H	M	M	Trampling by elk and deer

Notes on Threats/Conservation Issues:

Pagosa population:
Road maintenance: Magnesium chloride is applied to snowy roads along high traffic areas during winter as it is less expensive than plowing. CDOT is conducting annual training for maintenance crews and marking sensitive areas. Ranked as a medium threat.

Road construction: Three projects are slated for CDOT, all on US Highway160, replacement of intersection at West Cat Creek, Keyah Grande turn lane (500 ft east of main entrance), and replacement of intersection at Hurt Drive (next 5 years).

Invasives: Primary non-native species is Canada thistle (known) and there is potential for Toadflax *(Linaria vulgaris)*. Other invasives found with the species include musk thistle *(Carduus nutans)*, houndstongue *(Cynoglossum officinale)*,redstem stork's bill *(Erodium cicutarium)*,oxeye daisy *(Leucanthemum vulgare)*, and cheatgrass *(Bromus tectorum)*.

Recreation: Town Park is 150 acres, occurrence is about 2 acres. Just took out mountain bike jumps that were made in Pagosa skyrocket occupied habitat (Jim Miller). If ski lift was constructed on Reservoir Hill, it would be in a place where Pagosa skyrocket is known to exist,

on the north side of the hill (Miller). Access and infrastructure could eliminate habitat or individuals.

Development: The RPCI group decided to divide parcels into Private Land Development properties > 40 acres, Private small parcels (<40 acres), and Private subdivided lots (<5 acres). Update: Archuleta County purchased a 95 acre parcel in early 2011. Initial plans are to develop the property as a County government campus. Town master plan has been developed. Many versions have been challenged, modified, and loosened in hopes of attracting development. County and city are working very hard to attract development due to lack of strong economy in area. Big box stores are more likely outside of town, not in Pagosa skyrocket occurrence, but it is still possible.

Dyke population: 40 acres of BLM land and 20 acres of private lands are occupied by Pagosa skyrocket. There is a utility line on BLM land and they may need to maintain a gas line. A private-gravel pit is proposed on private lands adjacent to the BLM parcel, but the access is from an existing road and the pit footprint location is not within identified Pagosa skyrocket habitat A new turn lane on US Highway 160 will be constructed west of the known population to provide access for the proposed gravel pit operations. ATV use is occurring on the 20-acre private land, and two tracks on the property show regular use. Toadflax currently occurs on the south side of the highway.

E. Strategies

Based on an understanding of viability and threats, participants identified strategies (a) across all target locations for Pagosa skyrocket and (b) for specific target locations (see Table 7). After brainstorming strategies, participants prioritized them as high, medium, or low based on their anticipated effectiveness. Specific to private land protection efforts, the RPCI is also evaluating opportunities to work with willing private landowners and local land trusts to conserve these species and their habitats using voluntary tools such as conservation easements. Additionally, the planning team recommends working with state and local governments to encourage development of tax incentives for doing small-scale biodiversity conservation on private lands that may not otherwise qualify for existing programs. This would help address one of the key threats (development) to the Pagosa skyrocket and other imperiled plant species occurring across Colorado.

Table 7. Strategies for conserving Pagosa skyrocket (updated August 2010; 1=High, 2=Medium, 3=Low Priority):

Threat	Target Occurrence	Strategy	Priority	Lead	Notes
Strategies across all occurrences					
All	All	Conduct inventories to increase knowledge of location and status of Pagosa skyrocket (need landowner permission and better soil and geology maps)	1	Sandy, Peggy, Ellen. Sue willing to help.	Challenge - obtaining landowner permissions or knowing who the landowners are. As time available for Sandy.

Threat	Target Occurrence	Strategy	Priority	Lead	Notes
Right of Way maintenance (mowing/ spraying invasive/ de-icers-mag chloride-salt)	Highway ROW	Training of CDOT maintenance crews & contractors; identify mile markers, install delineators with 3 blue dots, develop map of sensitive areas/plant locations; invite maintenance foreman to next mtg., educational brochure	1	Tony	Most maintenance staff have seen the plants, all projects with federal nexus undergo NEPA, get info to contractors; has 3 projects ongoing.
Right on Way maintenance (mowing/ spraying invasive/ de-icers-mag chloride-salt)		Develop BMPs & share with CDOT and private landowners, county, etc. Identify appropriate native plant seed; mixtures for roadsides. Keep eye on roads & notify Tony about issues; don't use other soil/biosol organic fertilizer.	1	RPCI	If we don't want areas reseeded, we need to let them know. Explore erosivity waver. Most work is reactive, try to educate; make sure short and sweet.
Maintenance associated with development	All	Develop general BMPs targeting landowners to reduce disturbance of Pagosa skyrocket on all lands, reclamation seed mix, information	1	Sandy	In coordination with others.
All	All	Increase awareness within the community, e.g., interpretive sign, brochure, postcard, booth at other events, Wenimuche festival side trip to see plants	1	Sandy, Sue	Talk w/Jim Miller; Sue talked to Mountain High garden club-about getting plants into garden and maintaining plants; Becky Gillette, county fair, folk festival, Christa Munro-Folk West.
All	All	Keep in communication with town and county, e.g., provide map overlays and presentations about rare plant resources and particularly the Pagosa skyrocket.	1	Jim	FWS and Ecosphere gave a presentation to county commissioners.
All	All	Education: Informational brochure for landowners	1		
Development	All	Work with counties to obtain agricultural tax status for protecting rare plants	1	RPCI	Develop at state level? County implements a state law; look at Mesa Co. where they have to make money on ag and disincentives.
Development	All private	Pursue conservation easements	1	RPCI partners, land trusts	Prioritize parcels and pursue opportunities with willing landowners.

Threat	Target Occurrence	Strategy	Priority	Lead	Notes
Development	All	Conduct research on transplanting	1	DBG?	Is it effective?
All	All	Develop a postcard promoting skyrocket with educational information-exists in Pagosa and no place else in world	2	Jim	Jeff Laydon, local photographer
All	All	Include plant info in the visitors guide to Pagosa	2	Jim	
	All	Utilize NRCS Web Soil Survey info to help focus surveys and identify potential habitat; update status of soil surveys to help map potential habitat for assessing new projects	2	Jerry	Important tool to help inform proposed projects, NRCS has draft digital map; contact Jerry Archuleta.
Climate Change	All	Collect seed and store in seed bank, grow	2	DBG	Check with DBG and Seed Lab if they have seed.
Climate change and lack of understanding of life history	All	Contact Universities -get the word out on need to set up monitoring project and need to study life history- research projects for students	2	RPCI	
Development	All	Provide financial incentives to private landowners thru NRCS programs, funding for fencing, livestock rotation, owners receive payment for following plan	2	RPCI	Can do now, according to Jerry; check funding for T and E species for conservation easements.
Climate Change and lack of understanding of life history	All	Identify locations and set up long-term monitoring project to study climate and understand natural history and life history; are populations increasing, decreasing or stable, track individual plants	2	Jim	Track trends over long term; consider east side of Reservoir Hill as a monitoring site; along Hwy 84; Contact Brian Kurzel and DBG.
Development	All	Create a monetary benefit or special recognition for smaller landowners who protect biological values - involve CNAP, talk with County.	3	RPCI	Landowner recognition or compensation: NRCS might be able to tweak incentives to help provide support to landowners (fences). Check programs or funds for helping protect endangered species. State level might be most

Threat	Target Occurrence	Strategy	Priority	Lead	Notes
					appropriate to contact to help put together a program. Properties < 40 acres with easements still get taxed.
Lack of understanding of life history	All	Develop research protocol	3	DBG FWS	
	All	Discuss possibility of town and/or county holding open space and maintaining open space priorities if not already identified.	3		
	All	Education: Rare plant talk for Audubon & others	3		
	All	Education: Schools (field trips help with surveys, etc.)	3		
	All	Recognition to owners for special protection of the rare plants.	3		
	All	Work with FWS to move forward with listing of the species	3		
Strategies for specific occurrences					
Development	Parcels 40 acres (and larger parcels)	Investigate conservation options: Compensation for management agreement requires outside funding source; access easement model; purchase conservation easement-GOCO; sale by willing landowner/purchase by county or land trust.	1	Sandy, Karin	No property tax advantage to doing an easement if land does not already have ag status. County assessor not a supporter of conservation easements. Update: New assessor in 2011. Trend may be getting strengthened. Also, are the 3 parcels subdividable? Already platted?
All	Pagosa, County Garage	Talk to county facility mgr (Roads and Bridges dept) - start with Greg Schulte, Cty Manager (@ Courthouse) about the plants on this property	1	Peggy	Protect the site and set up monitoring plots.
Development	Large parcels	Talk with landowner representative. Our goals: keep eye out, think outside box, and negotiate monitoring? Design parking lot for rodeo and conserve plants too, and obtain access	1	Sandy and Sue-keep eye on it	May be more receptive to collect seed or similar task, monitoring; if listed & if developed, federal nexus.

Threat	Target Occurrence	Strategy	Priority	Lead	Notes
		easement. Make the plant area something special, a special interest area. Management lease? Ideally design development that is win-win.			
Development	Large parcels	Keep an eye on it	1	Sandy, RPCI	Ownership change; development plan includes keeping rural character. Update: County purchased private parcel in early 2011; initial plans are to create a County government campus on property.
Development	Private parcels	Meet with landowner re development; seek open space to protect plant; investigate potential protection ideas with La Plata Open Space Conservancy	1	Jim / Ecosphere	Jerry will share information
Utility & road	Dyke	Long-term monitoring - one of few places in natural condition.	1	Sara	BLM will monitor Dyke population for effects from utility and road projects (Sara).
Utility & road	Dyke	Assess need for fencing	2	Sara	

2010 Notes on Strategies:

1. Pagosa skyrocket was proposed for listing as endangered by FWS in June 2010 and was listed in July 2011. Critical habitat was also proposed for Pagosa skyrocket. Critical habitat does not change anything on private land, unless there is a federal nexus. The recovery plan will be developed after critical habitat is defined.
2. Development: Blue Sky Ranch development plan included keeping rural character. Blue Sky Village is proposed mix of townhomes, condos, and houses. No plans are immediate for these developments. Levine (Reservoir River Ranch) might be more amenable to talking with our group. No Open Space plan exists for Archuleta County.

August 2011 Update:

1. The final rule listing Pagosa skyrocket as endangered was published on July 27, 2011, with the rule becoming effective on August 26, 2011 (USFWS 2011a).
2. Critical habitat has been proposed for Pagosa skyrocket (USFWS 2011b).
3. The County purchased land in early 2011 with the initial idea of developing the property as the new County government campus.

VI. Next Steps

The group plans to meet again on an annual or biannual basis to gauge progress toward implementation of strategies. Future meetings will be a good opportunity to delve into strategies for conserving high-ranked occurrences of the other two key rare plant species in the area – *Townsendia glabella* and *Lesquerella pruinosa.*

At the August 2010 meeting, Ellen Mayo, FWS, informed the participants that she was working on a listing package proposing the Pagosa skyrocket as Endangered. The final rule listing Pagosa skyrocket as endangered was published on July 27, 2011, with the rule becoming effective on August 26, 2011 (USFWS 2011a).

VII. References

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Attachment 1. Additional key species and plant communities in the Pagosa Springs area

Although the focus of the workshop was on the Pagosa skyrocket and to a lesser degree on the other globally imperiled plants (frosty bladderpod, Gray's Townsend daisy), other key species and plant communities are known from the Pagosa Springs area as shown in the table below (Colorado Natural Heritage Program, http://www.cnhp.colostate.edu/). Specifically, the table identifies rare species and rare and/or high quality examples of plant communities in the Pagosa Springs area. These and other biodiversity values should be considered with more detailed planning efforts for this area.

Scientific name	**Common name**	**Global rank**	**State rank**	**Major group**
Bufo boreas	Boreal Toad (Southern Rocky Mountain Population)	G4T1Q	S1	Amphibians
Cypseloides niger	Black Swift	G4	S3B	Birds
Dendroica graciae	Grace's Warbler	G5	S3B	Birds
Falco peregrinus anatum	American Peregrine Falcon	G4T4	S2B	Birds
Haliaeetus leucocephalus	Bald Eagle	G5	S1B,S3N	Birds
Melanerpes lewis	Lewis's Woodpecker	G4	S4	Birds
Speyeria nokomis nokomis	Great Basin Silverspot Butterfly	G3T1	S1	Insects
Cynomys gunnisoni	Gunnison's Prairie Dog	G5	S5	Mammals
Abies concolor - Picea pungens - Populus angustifolia / Acer glabrum Forest	Montane Riparian Forests	G2	S2	Natural Communities
Abies lasiocarpa / Alnus incana Forest	Montane Riparian Forests	G5	S5	Natural Communities
Abies lasiocarpa / Erigeron eximius Forest	Subalpine Forests	G5	S4	Natural Communities
Abies lasiocarpa / Mertensia ciliata Forest	Montane Riparian Forests	G5	S5	Natural Communities
Abies lasiocarpa / Vaccinium myrtillus Forest	Subalpine Forests	G5	S5	Natural Communities
Acer negundo - Populus angustifolia / Cornus sericea Forest	Narrowleaf Cottonwood Riparian Forests	G2	S2	Natural Communities
Alnus incana - Salix (monticola, lucida, ligulifolia) Shrubland	Thinleaf Alder-Mixed Willow Species	G3	S3	Natural Communities
Alnus incana - Salix drummondiana Shrubland	Montane Riparian Shrubland	G3	S3	Natural Communities
Alnus incana / Mesic Forbs Shrubland	Thinleaf Alder/Mesic Forb Riparian Shrubland	G3	S3	Natural Communities

Scientific name	Common name	Global rank	State rank	Major group
Caltha leptosepala Herbaceous Vegetation	Montane Wet Meadows	G4	S4	Natural Communities
Cardamine cordifolia - Mertensia ciliata Herbaceous Vegetation	Alpine Wetlands	G4	S4	Natural Communities
Carex aquatilis - Carex utriculata Herbaceous Vegetation	Montane Wet Meadows	G4	S4	Natural Communities
Carex atherodes Herbaceous Vegetation		G3G5	S2?	Natural Communities
Carex pellita Herbaceous Vegetation	Montane Wet Meadows	G3	S3	Natural Communities
Carex utriculata Herbaceous Vegetation	Beaked Sedge Montane Wet Meadows	G5	S4	Natural Communities
Danthonia parryi Herbaceous Vegetation	Montane Grasslands	G3	S3	Natural Communities
Eleocharis quinqueflora Herbaceous Vegetation	Alpine Wetlands	G4	S3S4	Natural Communities
Festuca arizonica - Muhlenbergia montana Herbaceous Vegetation	Montane Grasslands	G3	S2	Natural Communities
Picea pungens / Alnus incana Woodland	Montane Riparian Forests	G3	S3	Natural Communities
Populus angustifolia - Juniperus scopulorum Woodland	Montane Riparian Forest	G2G3	S2S3	Natural Communities
Populus angustifolia - Picea pungens / Alnus incana Woodland	Montane Riparian Forests	G3	S3	Natural Communities
Populus angustifolia - Pseudotsuga menziesii Woodland	Montane Riparian Forest	G3	S2	Natural Communities
Populus angustifolia / Alnus incana Woodland	Montane Riparian Forest	G3	S3	Natural Communities
Populus angustifolia / Salix (monticola, drummondiana, lucida) Woodland	Narrowleaf Cottonwood/Mixed Willows Montane Riparian Forest	G3	S3	Natural Communities
Populus angustifolia / Salix exigua Woodland	Narrowleaf Cottonwood Riparian Forests	G4	S4	Natural Communities
Populus angustifolia / Salix irrorata Woodland	Foothills Riparian Woodland	G2	S2	Natural Communities
Populus angustifolia / Salix ligulifolia - Shepherdia argentea Woodland	Narrowleaf Cottonwood Riparian Forests	G1	S3	Natural Communities
Pseudotsuga menziesii / Cornus sericea Woodland	Lower Montane Riparian Forests	G4	S2	Natural Communities
Salix bebbiana Shrubland	Montane Willow Carrs	G3?	S2	Natural

Scientific name	Common name	Global rank	State rank	Major group
				Communities
Salix drummondiana / Mesic Forbs Shrubland	Drummonds Willow/Mesic Forb	G4	S4	Natural Communities
Salix monticola / Mesic Forbs Shrubland	Montane Riparian Willow Carr	G4	S3	Natural Communities
Shepherdia argentea Shrubland	Foothills Riparian Shrubland	G3G4	S1	Natural Communities
Astragalus missouriensis var. *humistratus*	Missouri milkvetch	G5T1	S1	Vascular Plants
Astragalus proximus	Aztec milkvetch	G4	S2	Vascular Plants
Botrychium echo	reflected moonwort	G3	S3	Vascular Plants
Carex retrorsa	retrorse sedge	G5	S1	Vascular Plants
Castilleja lineata	marsh-meadow indian-paintbrush	G4?	S1	Vascular Plants
Cryptogramma stelleri	slender rock-brake	G5	S2	Vascular Plants
Draba smithii	Smith whitlow-grass	G2	S2	Vascular Plants
Hippochaete variegata	variegated scouringrush	G5	S1	Vascular Plants
Lesquerella pruinosa	Pagosa bladderpod	G2	S2	Vascular Plants
Phlox caryophylla	Pagosa phlox	G4	S3	Vascular Plants
Polypodium hesperium	western polypody	G5	S1S2	Vascular Plants
Polypodium saximontanum	Rocky Mountain Polypody	G3?	S3?	Vascular Plants
Townsendia glabella	Gray's townsend-daisy	G2	S2	Vascular Plants
Viola pedatifida	prairie violet	G5	S2	Vascular Plants
Woodsia neomexicana	New Mexico cliff fern	G4?	S2	Vascular Plants

For more information about these and other biodiversity values, see reports including but not limited to the following:

1. Colorado Wildlife Action Plan http://wildlife.state.co.us/WildlifeSpecies/ColoradoWildlifeActionPlan/
2. The Nature Conservancy Ecoregional Assessments. http://conserveonline.org/workspaces/cbdgateway/era/reports/index_html The Southern Rocky Mountains Ecoregional Assessment pertains to the Pagosa Springs Priority Action Area.
3. Southern Rockies Ecosystem Project: http://restoretherockies.wordpress.com