

# Investigation of endemic serpentine wetland sedge *Carex klamathensis*

Stuart Osbrack, Botanist, Rogue River-Siskiyou National Forest

October 2020



*Carex klamathensis*

## Introduction

This project was designed to assimilate information on the newly described cyperaceae species *Carex klamathensis*. The goal was two tiered; the first to familiarize agency botanists on species identification, morphological characteristics, and suitable habitat attributes. The second to guide and design protection measures, impact prevention, conservation and restoration activities, and monitoring of the rare species and habitat. This was accomplished by relocating known occurrences and populations then using that acquired search image to survey for and locate new occurrences. Known and new population habitat conditions were assessed to determine if agency management and/or conservation actions would be desired.

The species is found only in California and Oregon serpentine wetlands. The perennial sedge *Carex klamathensis* for a long time was mistakenly identified as other similar carex species (*Carex livida* and others) in various serpentine wetlands. In 2007 Wilson and Janeway described the new species. The globally rare species had 12-15 occurrences in Josephine County, Oregon and 3 small, isolated occurrences located in Colusa, Lake, and Tehama counties, California. Although additional potential habitat area had been previously surveyed for *C. klamathensis*, the taxon was not located.

Forage, food for wildlife, production of below ground biomass, nutrient flow, and soil stabilization are a few of the relatively important attributes that rhizomatous sedges provide to

the health of wetlands. This serpentine-adapted sedge and other rare plants are vulnerable to potential negative impacts to their wetlands. Threats to Oregon's known occurrences include unchecked OHV use, mining, and fire suppression. Road creation, heavy equipment utilized for mining operations, and heavy equipment used for fire suppression activities can compromise or even obliterate entire occurrences. This is exemplified by one California mining operation that eliminated half of a *Carex klamathensis* population. Hydrologic alterations caused by off road vehicular travel, recreational OHV use, and mining can negatively impact wetlands and obligate species that occur there. Conifer and woody encroachment can also minimize suitable habitat and available water. The limited range and small population numbers combined with the potential threats to the species are a genuine concern. The assessment of the occupied wetlands conditions is critical to protecting and managing the species habitat.

Limited information about *Carex klamathensis* other than taxonomic attributes separating this taxon from other similar carex species is known. There is some speculation that this carex was once more abundantly widespread throughout Oregon and California. This project helped to understand the dynamics of the species, habitat requirements, and tools for conservation to prevent further decline.

Prior Interagency Special Status/Sensitive Species Program (ISSSSP) and Challenge Cost Share projects have monitored Darlingtonia wetlands implementing the Conservation Strategy for *Epilobium oregonum*, *Gentiana setigera*, *Hastingsia bracteosa* var. *bracteosa*, *H. bracteosa* var. *atropurpurea*, and *Viola primulifolia* ssp. *occidentalis* in Serpentine Darlingtonia Wetlands of Southwest Oregon and Northwest California. The known *Carex klamathensis* occurrences overlapped with some of the Conservation Strategy's essential wetlands visited in 2015 and 2017. This project surveyed other optimal *Darlingtonia californica* essential wetlands in southwestern Oregon on Forest Service and BLM lands that were not already monitored.

## Methods

*Carex klamathensis* is a 30-100 cm tall glaucous rhizomatous perennial with glabrous perigynia that have three stigmas. The styles are deciduous and not continuous with the trigonous achenes and the perigynia are not inflated. The papillose perigynia have short beaks that are bent and are up 2-3.6 mm long. Pistillate scales are brown with a lighter midrib less than 3 mm long and sometimes have a short awn. The inflorescences have 1-3 pistillate spikes that are 1.3-2.7 cm long and 1-5 mm wide and one terminal staminate spike that may be gynecandrous; but if staminate then 1.3-2.7 cm long and 1-5 mm wide with 50-200 flowers. The lowest inflorescence bract has a sheath greater than 4 mm long. Leaf blades are glaucous and glabrous from 18-50 cm long and 4-7mm wide. Inflorescences can be observed from May to July.

Vouchers were collected at Days Gulch Botanical Area Wetland and at the BLM Eight Dollar Mountain Board Walk Darlingtonia Wetland. The rhizomatous nature of the sedge was captured in the collections.

Once species and habitat characteristics became evident, it was uncomplicated to locate and identify individuals. The species habitat consists of Darlingtonia serpentine wetland areas.

Individuals are not growing in the middle of dense *Darlingtonia* plant patches but found on the periphery. It was found in standing water but usually on saturated soils. *C. klamathensis* was located in open areas, areas with partial shade, and next to shrubs. The species is thought to be obligate to serpentine *Darlingtonia* Wetlands and was found in a variety of *Darlingtonia* Wetlands that had similar but different habitat attributes. Each site had varying degrees of tree and shrub canopy cover, saturation, vegetation competition, soil type, and plant species composition.

The species' glaucous appearance stands out from other cyperaceae family species. *Carex mendocinensis*, which is densely cespitose, and *Carex echinata*, which is rhizomatous, are commonly found in *Darlingtonia* Wetlands. Their habit is different than *C. klamathensis*, but it is the glaucous color of *C. klamathensis* that makes the species stand out amongst them and other wetland graminoids.

The species closely resembles and is related to *Carex hassii*. The two species are both glaucous. *C. hassii* flowers mostly have 2 stigmas, with some three stigma flowers, on a spike; compared to the three stigma flowers of *C. klamathensis* (except for aborted flowers which can have 2 stigmas). *C. hassii* occupies a larger range with different habits including wet meadows and serpentine wetlands. The two species can be found in the same general vicinity of a *Darlingtonia* Wetland. *C. hassii* taxonomy is contentious with multiple variants. It has been described as/or lumped with other *Carex* species. During surveys *C. hassii* was found in marginal habitat that did not fit *C. klamathensis* optimal suitable habitat.

## Results

The plant communities of the *Darlingtonia* Wetlands visited have many species in common. Eight Dollar Mountain and Days Gulch Botanical Areas are adjacent to each other and both have a wealth of *Darlingtonia* Wetlands interspersed throughout. Consequently, there is prime habitat for obligate sensitive plants including *Carex klamathensis* associated with the *Darlingtonia* Wetlands. We found quite a few areas with *Carex klamathensis*. The species was previously known from a couple of locations; one at the interpretive boardwalk area on BLM lands, Star Flat, and another in Days Gulch.

Star Flat is a known site with *Carex klamathensis* in the Eight Dollar Mountain Botanical Area. I had located that occurrence in 2011 while botanizing without knowing that it had previously been documented there. I also discovered another sensitive species *Carex lasiocarpa* close to some *Carex klamathensis* individuals at the same time, however the species was not added to our sensitive species list until 2015. Star Flat is an area that has received impacts from off road vehicles driving through the wetland. To prevent additional impacts, in 2012 a buck and rail fence was constructed surrounding the *Darlingtonia* Wetland. There are at least seven sensitive plants found in Star Flat, which is a wonderful section of the Eight Dollar Botanical Area. The time-released diversity of flowering plant species are outstanding in some years.

Along the Eight Dollar Mountain road, we found the species above the road along a wet ditch both below and within a *Darlingtonia* area. Also, *Carex klamathensis* was located way below the

road just above the Illinois River in a Darlingtonia area where we found quite of few individuals. We also found some in a small Darlingtonia area along the Little Falls trail while assisting a hydrology and soils workshop in 2018.

We found *Carex klamathensis* in Days Gulch Botanical Area in the known location and in a cluster of three essential Darlingtonia Wetlands that are within close proximity to each other. In the last Darlingtonia Wetland area we surprisingly found the species in standing water. There was a robust population at all areas with many individuals.

Individuals were located at the BLM Whiskey Creek Area of Critical Environmental Concern (ACEC) known site. Adjacent to the ACEC is Oregon Mountain Botanical Area where there are several Darlingtonia Wetland areas, but we only found *C. klamathensis* at the largest Darlingtonia Wetland area. There is an open section with no canopy cover below the Forest Service road 4402. We found the species with another sensitive species *Viola primulifolia* ssp, *occidentalis* there. Above the road is a huge Darlingtonia Wetland with diverse habitat sections including open grassy areas, open rocky areas, partial canopy areas, and closed canopy areas. The sloping wetland travels upslope and *Carex klamathensis* is present throughout the whole wetland from the bottom to the top with many thousands of individuals.

At the Rough and Ready Botanical Area, the species was found throughout the Darlingtonia Wetland, even in areas of standing water. This wetland seems to fulfill the definition of a true fen, having 40 centimeters of organic soils.

At the Elder essential wetland, we found less than 100 individuals in an area below Darlingtonia along and above an old wet road prism. When visiting the area, it was found that the species was previously misidentified as *Carex livida*. It has since been updated in the corporate database.

The TNC/BLM Essential Wetland has a very large occurrence with thousands of individuals in open grassy areas. It also had individuals dispersed in more canopied areas and surprisingly also in areas removed from Darlingtonia sections.

*Carex hassii* was found in in two Darlingtonia areas, Mud Springs and Forest Service Road (FSR) 4906, that appeared to be sub-marginal suitable habitat. *Carex hassii*, however filled the niche that *Carex klamathensis* could not. At Mud Springs Darlingtonia was found being outcompeted by the shrub layer and disappearing. *C. hassii* was found in an opening of the shrub layer. Along FSR 4906 Darlingtonia is growing along a wet road ditch. *C hassii* was found along the ditch.

Although Cedar Log Research Natural Area (RNA) is a large Darlingtonia Wetland area, it did not seem right for *C. klamathensis* and none was found. Buckskin Peak road had suitable habitat however no plants were found. Six Rivers Botanical Trail had Darlingtonia growing with a shrub layer, but there was a lack of open areas.

Individuals of the sensitive plant *Prosartes parvifolia* were located incidentally adjacent to the Darlingtonia wetland along the Buckskin Peak Road. As indicated above *C. klamathensis* was not located in this area.

Recently in May 2020 a population of *Carex klamathensis* was located on the Illinois River Road. Individuals were found in a wetland area that supported many of the Darlingtonia Wetland obligate species, but Darlingtonia itself was not located. Perhaps a more thorough and expansive survey of the area may locate Darlingtonia. This raises the possibility that *C. klamathensis* may not be dependent on *Darlingtonia californica*, but rather serpentine wetland and other associated species. This would be similar to the TNC/BLM Essential Wetland, which has the species removed from areas of Darlingtonia.

## Management Recommendations

The large Oregon Mountain Darlingtonia Wetland is one wetland that could use management actions. There are some sections with small encroaching conifers interspersed with other habitats. Removal of encroaching conifers could create more suitable rare plant habitat and increase ground water to the wetland. Conifer reduction could also enhance the shrub layer necessary for *Epilobium oreganum*, one of the Darlingtonia Wetland sensitive plant species. Some of the Days Gulch Wetlands have signs of previous mining impacts, however, there do not seem to be active operations and no conservation actions are currently necessary. Star Flat off-road vehicle use has been mitigated with a fence barrier that eliminated illegal vehicle entry. The area has received prescribed burning in prior years. Currently there are no plans to repeat prescribed burning, however in the future this tool may be used to reduce the shrub layer.

Additional Darlingtonia Wetlands will be monitored in the future, and sensitive species and wetland conditions will continue to be monitored following the Conservation Strategy for *Epilobium oreganum*, *Gentiana setigera*, *Hastingsia bracteosa* var. *bracteosa*, *H. bracteosa* var. *atropurpurea*, and *Viola primulifolia* ssp. *occidentalis* in Serpentine Darlingtonia Wetlands of Southwest Oregon and Northwest California. Thus, wetlands will be continue to be searched for new populations of *Carex klamathensis* along with other sensitive species in Josephine County serpentine wetlands.

## Appendices

1. Site photos
2. *Carex klamathensis* description (from: Wilson, B.L., Brainerd, R.E., Janeway, L.P., Kuykendall, K., Lytjen, D., Newhouse, B., Otting, N., Meyers, S. and Zika, P.F., 2007. Description of *Carex klamathensis* (Cyperaceae), a rare sedge of the Klamath region of Oregon and California, USA. Journal of the Botanical Research Institute of Texas, pp.69-77.)
3. Project area maps
4. Obligate Species of Darlingtonia Wetlands (from: *Conservation Strategy for 5 Rare Taxa of Serpentine Darlingtonia Wetlands*)
5. Recorded species that were present in wetlands visited during the study

Appendix 1. All carex photos are *Carex klamathensis*, except for the two identified as *Carex hassii*. All photos by Stuart Osbrack.

**FS Road 4201 820 - Just west of the Days Gulch Botanical Area**



*Carex klamathensis*

**FS Road 4402 - Oregon Mountain Botanical Area**





Huge *Darlingtonia* wetland with varied habitat and a lot of *Carex klamathensis*



*Viola primulifolia* ssp. *occidentalis*



*Darlingtonia californica* (cobra lily)

**FS Road 4800 - Elder Darlingtonia Essential wetland**



*Carex klamathensis* in wet area along old road prism

**TNC Property**



Lot of *Carex klamathensis* individuals in open field as well as in more canopied areas

**FS Road 4201 - Days Gulch Botanical Area**



*Carex klamathensis*



*Carex klamathensis*

**FS Road 4103 011 - Star Flat**



*Gentiana setigera*



*Carex klamathensis* and *Carex lasiocarpa* both found in Wetland



Off Road Vehicular Impacts



Restoration Mitigation



Fence Construction to Prevent Impacts

### **Rough and Ready Botanical Area**



Darlingtonia wetland that could classify as a fen with deep organic matter and a lot of *Carex klamathensis*



*Castilleja miniata* ssp. *elata*

**FS Road 4906 *Carex hassii***



Found *Carex hassii* in Darlingtonia ditch alongside of Forest Service road but no *C. klamathensis*

**Mud Springs Hassii**



Darlingtonia area



*Carex hassii*



Darlingtonia being overtaken by *Ledum glandulosum* and others by the shrub layer



*Boschniakia strobilacea* along the travel route

### Cedar Log RNA



Darlingtonia but no *Carex klamathensis*

### Six Rivers Botanical Area



Darlingtonia area but no real habitat



*Cypripedium californicum*

DESCRIPTION OF *CAREX KLAMATHENSIS* (CYPERACEAE), A RARE SEDGE OF  
THE KLAMATH REGION OF OREGON AND CALIFORNIA, U.S.A.

Barbara L. Wilson<sup>1</sup>, Richard E. Brainerd<sup>1</sup>, Lawrence P. Janeway<sup>2</sup>,  
Keli Kuykendall<sup>1</sup>, Danna Lytjen<sup>1</sup>, Bruce Newhouse<sup>1</sup>,  
Nick Otting<sup>1</sup>, Stephen Meyers<sup>3</sup>, and Peter F. Zika<sup>4</sup>

<sup>1</sup>Carex Working Group, 2710 Emerald Street, Eugene, Oregon 97403, U.S.A.

<sup>2</sup>Biological Sciences Herbarium, California State University, Chico, California 95929, U.S.A.

<sup>3</sup>Department of Botany and Plant Pathology, 2082 Cordley Hall, Oregon State University, Corvallis, Oregon 97331, U.S.A.

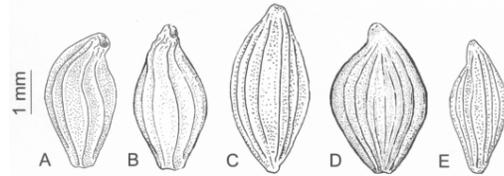
<sup>4</sup>Herbarium, Box 355325, University of Washington, Seattle, Washington 98195, U.S.A.

Contact author: Barbara L. Wilson, [bwilson@peak.org](mailto:bwilson@peak.org)

72

Journal of the Botanical Research Institute of Texas 1(1)

1. Stigmas prevailingly 2: 0–10% (–67% in *C. hassei*) of pistillate flowers with 3 stigmas \_\_\_\_\_ **Carex** section **Bicolores**
2. Perigynia at maturity succulent throughout, orange to whitish, drying dark brown \_\_\_\_\_ **C. aurea**
2. Perigynia at maturity dry throughout or succulent only at base, green, whitish, or tan.
3. Pistillate scales black with green midrib \_\_\_\_\_ **C. bicolor**
3. Pistillate scales gold to dark brown.
4. Lateral spikes crowded, overlapping; terminal spike usually gynecandrous, perigynia usually crowded with internodes between them 0.2–0.7 mm; proximal staminate scales (2–)2.5–3.7 mm, awnless; scales rounded or obtuse; 90–100% of pistillate flowers with two stigmas each \_\_\_\_\_ **C. garberi**
4. Lateral spikes often less crowded; terminal spike usually staminate; perigynia crowded or more distant with internodes between them 0.2–1.5 mm; proximal staminate scales 3–6(–15) mm, acute to awned; scales obtuse to acute, often awned; 33–100% of pistillate flowers with two stigmas each \_\_\_\_\_ **C. hassei**
1. Stigmas prevailingly 3; (80%–)90–100% of pistillate flowers with 3 stigmas \_\_\_\_\_ **Carex** section **Paniceae**
5. Perigynium apex contracted to a cylindrical beak (0.4–)0.6–1.8(–2.2) mm long.
6. Bladeless basal sheaths and proximal leaf sheaths pale brown; culms, leaves, and perigynia not or very sparsely papillose \_\_\_\_\_ **C. vaginata**
6. Bladeless basal sheaths and proximal leaf sheaths strongly tinged with reddish purple; culms, leaves, and perigynia heavily papillose.
7. Perigynia 4.2–6.8 mm long; beak 0.8–1.8(–2.2) mm long; range eastern \_\_\_\_\_ **C. polymorpha**
7. Perigynia 3.4–4.2 mm long; beak 0.5–1 mm long; range western \_\_\_\_\_ **C. californica**
5. Perigynium apex tapering and beakless, indistinctly beaked, or contracted to a beak less than 0.5 mm long.
8. Lateral spikes nodding on flexible peduncles \_\_\_\_\_ **C. laxa**
8. Lateral spikes erect or ascending on stiff peduncles.
9. Perigynia beak straight, cuneately tapering; leaves channeled, glaucous \_\_\_\_\_ **C. livida**
9. Perigynia beak curved, concavely tapering (at least on one side); leaves flat or folded, glaucous or not.
10. Bladeless basal sheaths and proximal leaf sheaths strongly tinged with reddish purple plants forming loose clumps to extensive closed colonies of vegetative shoots from superficial rhizomes.
11. Widest leaves 1.8–3(–4) mm wide; plants colonial with longest rhizomes 2.5–18 cm; habitat woodlands \_\_\_\_\_ **C. woodii**
11. Widest leaves 3.5–6 mm wide; leaves loosely cespitose with longest rhizomes to 2 cm; habitat granite balds and cliffs \_\_\_\_\_ **C. biltmoreana**
10. Bladeless basal sheaths and proximal leaf sheaths brownish or faintly, irregularly tinged with reddish purple; plants usually with vegetative shoots widely scattered and inconspicuous from deep rhizomes.
12. Inflorescences usually 1.7–3.5(–4.3) times as long as bract (measured from node of proximal nonbasal spike).
13. Perigynia 0.6–1.4(–1.8) mm wide; achenes 0.7–1.7 mm wide; range Oregon and California \_\_\_\_\_ **C. klamathensis**
13. Perigynia 1.4–2.4 mm wide; achenes 1.8–2.9 mm wide; range Eurasia, introduced to northeastern North America \_\_\_\_\_ **C. panicea**
12. Inflorescence usually 0.9–1.6 times as long as bract (measured from node of proximal nonbasal spike).
14. Achenes (1.5–)1.7–2.2(–2.5) mm wide \_\_\_\_\_ **C. meadii**
14. Achenes 0.7–1.7(–1.9) mm wide.
15. Achene surface reticulate with a papilla filling each compartment outlined by the ridges; terminal spike narrow (1.8–3 mm wide); range east of the Rocky Mountains \_\_\_\_\_ **C. tetanica**
15. Achene surface reticulate but flat between ridges (or with a tiny papilla in the center of each compartment); terminal spike wide, (2–5 mm wide); range in Oregon and California \_\_\_\_\_ **C. klamathensis**

FIG. 3. *Carex klamathensis*, habit.FIG. 4. Perigynia of *C. klamathensis* and similar taxa. A. *Carex hassei*. B. *Carex klamathensis*. C. *Carex livida*. D. *Carex meadii*. E. *Carex tetanica*. Scale at left is 1 mm.Table 1. Traits distinguishing *C. klamathensis* from *C. livida*.

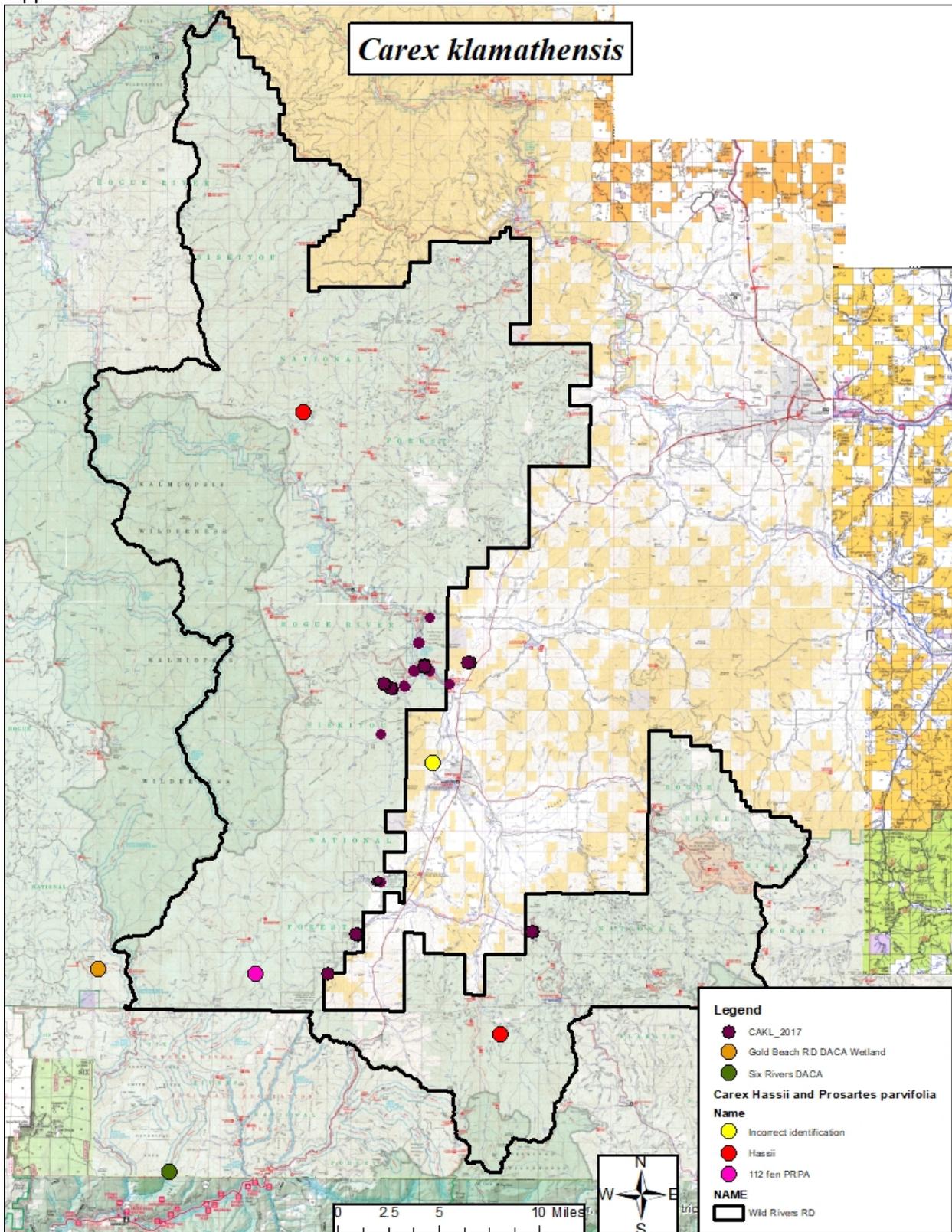
Trait	<i>Carex klamathensis</i>	<i>Carex livida</i>
Substrate	serpentine	non-serpentine
Leaf width (mm)	wider; average 3.7, (range 1.9–6 mm)	narrower; average 2.2 (range 1.5–3.2)
Terminal staminate spike width (mm)	wider; average 3.5 mm (range 2–5)	narrower; average 2.2 (range 1.4–4.8)
Flowers, terminal staminate spike	average 112 (range 40–190)	average 50 (range 8–71)
Number of lateral spikes 3 or more	average 2.2 (range 1–4, 40% with 3 or more)	average 1.7 (range 1–3 but only 1% with 3)
Perigynium length (mm)	average 2.9 (range 1.7–3.6)	average 3.8 (range 3.1–4.8)
Perigynium shape some perigynia)	obovate to elliptic (rarely fusiform on some perigynia)	fusiform
Perigynium beak the perigynia)	bent (rarely straight on some of the perigynia)	straight

TABLE 2. Traits distinguishing *C. klamathensis* from *C. meadii* and *C. tetanica*. Measurements are average and, in parentheses, range.

Trait	<i>Carex klamathensis</i>	<i>Carex meadii</i>	<i>Carex tetanica</i>
Range	Pacific coast states	Midwest	Midwest and east
Substrate	serpentine	not serpentine	not serpentine
Habitat	fens	mesic meadows	wet sites
Leaf width (mm)	3.8(2–6)	2.8(2.4–3.3)	2.5(1.8–3.3)
Terminal spike width (mm)	3.6(2–5)	3.5(2.2–5.7)	2.4(1.8–3.1)
Staminate flowers	112(40–190)	112(48–174)	70(40–120)
Height (cm)	57(30–100)	32(23–47)	26(12–34)
Perigynium length (mm)	2.9(1.7–3.6)	3.6(3.3–4)	2.9(2.4–3.6)
Perigynium width (mm)	1.4(1.2–1.6)	2.0(1.6–2.5)	1.6(1.2–1.9)
Achene surface	reticulate	papillose	papillose

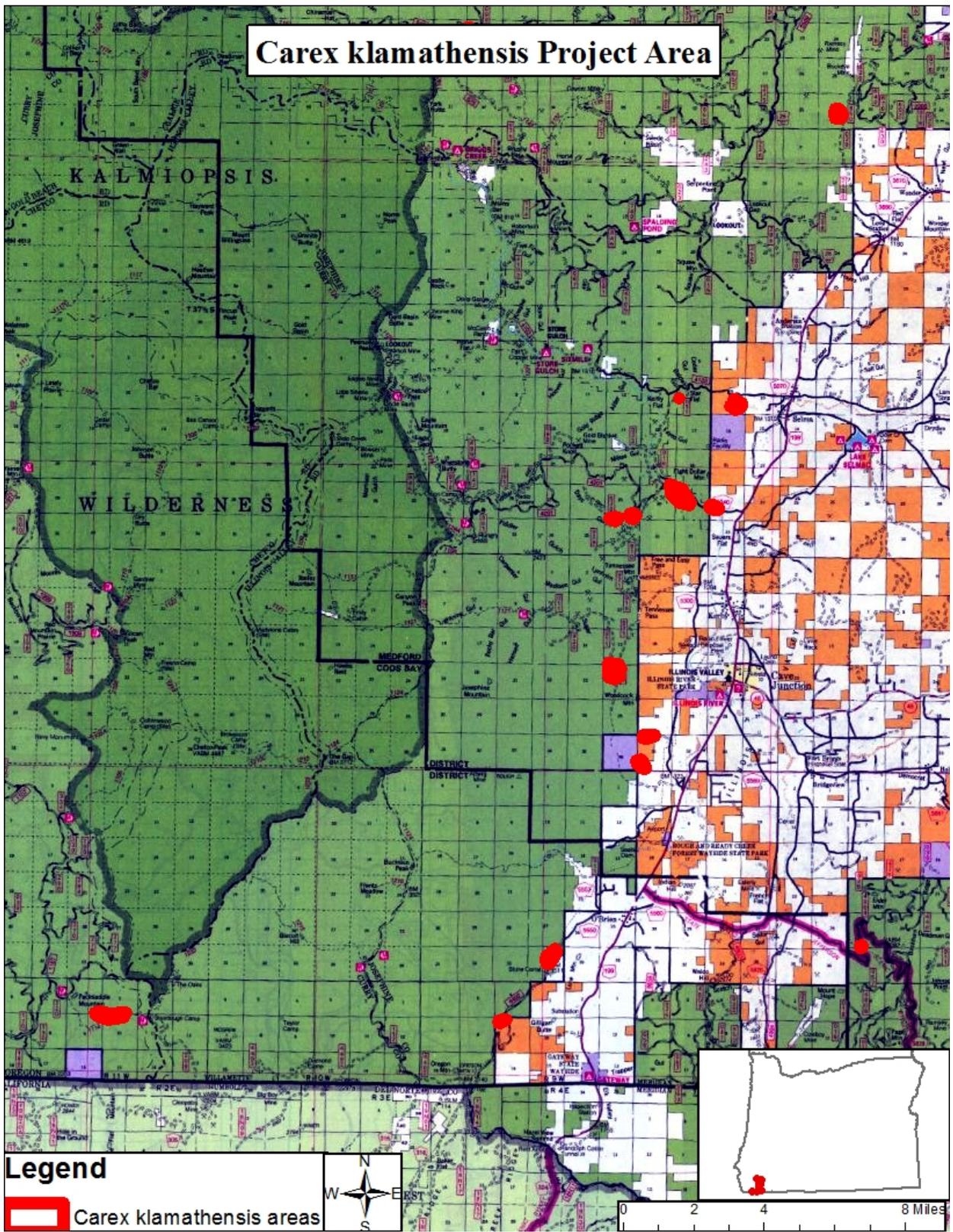
TABLE 3. Selected statistically significant ( $p < 0.05$ ) traits distinguishing *C. klamathensis* from the form of *C. hassei* that grows in serpentine fens in northwest California. Measurements are average and, in parentheses, range.

Trait	<i>C. klamathensis</i> Average (range)	<i>C. hassei</i> Average (range)
Culm length (cm)	57(30–100)	33.3(15.2–45.3)
Leaf width (mm)	3.8(2–6)	2.8(1.8–3.7)
Inflorescence length (cm)	14.4(5.1–23.3)	10.0(3.9–17.8)
Inflorescence bract length (cm)	9.1(3.3–14.0)	6.9(3.2–15.2)
Terminal Spike Length (cm)	1.8(1.3–2.7)	1.4(1.1–2.3)
Terminal Spike Width (mm)	3.6(2–5)	2.8(1.4–4.5)
Staminate flowers in terminal spike	112(40–186)	81(57–152)
Lowest staminate scale, length (mm)	4.3(2.2–5.1)	3.2(1.9–5.7)
Perigynia (% with 3 stigmas)	97%(85–100%)	37%(0–62%)
Perigynium length (mm)	2.9(1.9–3.5)	2.5(2.2–2.9)
Perigynium length/width ratio	0.48(0.37–0.58)	0.54(0.46–0.63)
Achene width/length ratio	0.67(0.44–0.88)	0.74(0.48–0.93)



Wild Rivers Ranger District and *Carex klamathensis* findings

# Carex klamathensis Project Area



Appendix 4. Obligate Species of Darlingtonia Wetlands (Conservation Strategy for 5 Rare Taxa of Serpentine Darlingtonia Wetlands)

Species	Common Name	Constancy (% occurrence)	Mean Cover (%)
<b>Trees</b>			
<i>Chamaecyparis lawsoniana</i>	Port Orford cedar	91.7	5.4
<i>Pseudotsuga menziesii</i>	Douglas-fir	86.1	2.5
<i>Pinus monticola</i>	Western white pine	80.6	3.1
<b>Shrubs</b>			
<i>Rhododendron occidentale</i>	Western azalea	100	16.7
<i>Rhamnus californica</i>	California coffeeberry	97.2	3.5
<i>Ledum glandulosum</i>	Labrador tea	55.6	5.3
<b>Herbs</b>			
<i>Darlingtonia californica</i>	California pitcher plant	100	39.6
<i>Helenium bigelovii</i>	Bigelow's sneezeweed	100	2.8
<i>Rudbeckia californica</i>	California cone-flower	97.2	3.4
<i>Cypripedium californicum</i>	California lady-slipper	91.7	<1
<i>Tofieldia glutinosa</i>	Sticky Tofieldia	88.9	1
<i>Narthecium californica</i>	Bog asphodel	88.9	11.6
<i>Castilleja miniata ssp. elata</i>	Siskiyou Indian paintbrush	88.9	<1
<i>Platanthera sparsiflora</i>	Short-flowered bog orchid	86.1	<1
<i>Parnassia californica</i>	Grass-of-Parnassus	83.3	<1
<i>Sanguisorba officinalis</i>	Great burnet	80.6	5
<b>Graminoids</b>			
<i>Eriophorum crinigerum</i>	Cotton-grass	100	13.3
<i>Carex echinata</i>	Star sedge	94.4	7.2
<i>Carex aurea</i>	Golden sedge	86.1	3

Appendix 5. Recorded species that were present in wetlands visited during the study. Because we did not revisit the Darlingtonia Wetlands throughout the year, our species list is not comprehensive.

**Graminoids:**

*Calamagrostis nutkaensis*  
*Carex mendocinensis*  
*Carex echinida*  
*Carex klamathensis*  
*Carex lasiocarpa*  
*Carex scabriuscula*  
*Deschampsia cespitosa*  
*Eriophorum criniger*  
*Eleocharis* sp.  
*Juncus ensifolius*  
*Juncus oxymers*  
*Juncus effusus*  
*Panicum acuminatum*  
*Scirpus pendulus*

**Forbs:**

*Aster occidentalis*  
*Castilleja miniata* ssp. *elata*  
*Cyrtopodium californicum*  
*Darlingtonia californica*  
*Dodecatheon hendersonii*  
*Gentiana setigera*  
*Epilobium munitum*  
*Epilobium oregonum*  
*Epilobium ridgidum*  
*Epipactis gigantea*  
*Helenium bigelovii*  
*Hastingia alba*  
*Hastingia bracteosa*  
*Horkelia sericata*  
*Hypericum anagalliodes*  
*Hypericum scouleri*  
*Lathyrus delnorticus*  
*Lilium pardalinum* ssp. *vollmeri*  
*Narthecium californicum*  
*Orbanche uniflora*  
*Parnassia palustris*  
*Pinguicula macrceras* var. *macrocerus*  
*Platanthera dilalata* ssp. *leucostachys*  
*Platanthera sparsiflora*  
*Rudbeckia glaucescens*  
*Sanguisorba officinalis* ssp. *microcephala*

*Triantha occidentalis*  
*Viola primulifoliolulga ssp. occidentalis*

**Trees:**

*Calocedrus decurrens*  
*Chamaecyparis lawsoniana*  
*Pinus jefferii*  
*Pinus monticola*  
*Pseudotsuga menziesii*

**Shrubs:**

*Frangula californica*  
*Quercus garryana var. breweri*  
*Rhododendron occidentale*  
*Rhododendron columbianum*  
*Rosa pisocarpa*

**Ferns:**

*Adiantum aleuticum*