Species: *Sedum flavidum* (Denton) B. L. Wilson & Zika
pale yellow stonecrop

Photo Source: CalPhotos 2022

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**Status**

Table 1 summarizes the current status of this species or subspecies/variety by various ranking entities and defines the meaning of the status.

<table>
<thead>
<tr>
<th>Entity</th>
<th>Status</th>
<th>Status Definition</th>
</tr>
</thead>
</table>
| NatureServe CA\(^a\)                   | G3, S3 | G3: Vulnerable — At moderate risk of extinction or elimination due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.  
S3: Vulnerable — Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation from the nation or state/province. |
| California Rare Plant Rank\(^b\)        | 4.3    | 4: Plants of limited distribution – a watch list.  
0.3: Not very threatened in California (less than 20% of occurrences threatened / low degree and immediacy of threat or no current threats known). This taxon was added to the *CNPS Inventory of Rare and Endangered Plants of California* in 1980 and has undergone no changes since 2001 (CNPS 2022). |
| California State Listing\(^c\)          | Not listed |                                                                                   |
| USDA Forest Service\(^d\)               | Not listed |                                                                                   |
| USDI FWS\(^e\)                         | Not listed |                                                                                   |
| USDI BLM\(^f\)                         | Not listed |                                                                                   |
| NatureServe OR\(^g\)                    | Not present |                                                                                  |
| Oregon State Listing\(^h\)              | Not present |                                                                                  |
| NatureServe NV\(^i\)                    | Not present |                                                                                  |
| Nevada State Listing\(^j\)              | Not present |                                                                                  |

\(^a\) California Natural Diversity Database, California Dept. of Fish & Wildlife [CNDDB 2022, 2022a]  
\(^b\) California Native Plant Society [CNPS 2022]  
\(^c\) California Department of Fish and Wildlife [CDFW 2022]  
\(^d\) US Forest Service Region 5 Forester’s List [USDA 2013] and Pacific NW Survey and Manage [USDA & BLM 2014]  
\(^e\) US Department of Interior Fish and Wildlife Service [USFWS 2022]  
\(^f\) US Department of Interior Bureau of Land Management [BLM 2020]  
\(^g\) Oregon Biodiversity Information Center [ORBIC 2019]  
\(^h\) Oregon Department of Agriculture [ODA 2018]  
\(^i\) Nevada Natural Heritage Program [NNHP 2022]  
\(^j\) Nevada Division of Forestry [NDF 2012]  

Note: Individual State Heritage Programs (CNDDB, ORBIC, NNHP) represent NatureServe and contain more up-to-date ranks for their state than NatureServe Explorer.
Distribution, abundance, and population trend on the planning unit

Table 2 summarizes the distribution and frequency of this species or subspecies/variety within National Forest System Lands in California. Table 4 in Appendix 1 lists all known occurrences of this species or subspecies/variety within California. Individual occurrences are defined as sites that contain an individual, population, or groups of populations of the plant that are located more than 1/4 (0.25) of a mile apart from each other as defined by the CNDDB.

<table>
<thead>
<tr>
<th>National Forest System (NFS) lands in California</th>
<th>Record #s (from Table 4</th>
<th>CNDDB EOs</th>
<th>Non-CNDDB Records</th>
<th>Recent (seen in past 20 years)</th>
<th>Historical (not seen in past 20 years)</th>
<th>Most Recent Obs. Date</th>
<th>Total Records on NFS lands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mendocino:</td>
<td>1, 2, 3, 4</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>12-Jun-2014</td>
<td>4</td>
</tr>
<tr>
<td>Shasta-Trinity:</td>
<td>32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83</td>
<td>26</td>
<td>25</td>
<td>15</td>
<td>36</td>
<td>12-Jun-2018</td>
<td>51</td>
</tr>
<tr>
<td>Six Rivers:</td>
<td>5, 6, 8, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 46</td>
<td>19</td>
<td>4</td>
<td>3</td>
<td>20</td>
<td>22-Jun-2014</td>
<td>23</td>
</tr>
<tr>
<td>Totals:</td>
<td>N/A</td>
<td>46</td>
<td>32</td>
<td>21</td>
<td>57</td>
<td>N/A</td>
<td>78</td>
</tr>
</tbody>
</table>

1 1909.12 Chapter 10, Section 12.53, components 2, 3, and 4.
Pale yellow stonecrop was last updated in the CNDDB on October 9, 2008 (CNDDB 2022). Subsequently, pale yellow stonecrop was no longer tracked by the CNDDB. More recently, a research paper on *Sedum* section *Gormania* of western North America was published by members of the Carex Working Group and others; this paper redefined species and geographic limits for pale yellow stonecrop and changed the scientific name from *Sedum laxum* subsp. *flavidum* to *Sedum flavidum* (Zika et al. 2018). Location records included in this distribution analysis were assembled from five sources: CNDDB (2022) records for *Sedum flavidum*; records for *Sedum laxum* subsp. *flavidum* in NRIS (2017); the research article on the taxonomy of *Sedum* section *Gormania* (Zika et al. 2018); a spreadsheet of *Sedum* section *Gormania* species locations compiled by the Carex Working Group (CWG 2016); and online data for specimens cited in the CNDDB, Zika et al. paper, and the CWG spreadsheet (CCH2 2022, CPNWH 2022). Occurrences for pale yellow stonecrop were then estimated using GIS tools and methods described by Green and Sims (2018) (Table 4).

Endemic to northwestern California, there are approximately 83 estimated occurrence records of pale yellow stonecrop from Colusa, Glenn, Humboldt, and Trinity counties in the High North Coast Ranges (NCoRH), Outer North Coast Ranges (NCoRO), and Klamath Ranges (KR) bioregions. Seventy-eight of the records are located on national forest lands, with four on the Mendocino NF, 51 on the Shasta-Trinity NF, and 23 on the Six Rivers NF. Four of the five remaining records are on lands of unknown ownership, and the sixth is located within the Lacks Creek Area of Critical Environmental Concern managed by BLM. Of the 78 national forest records, four are located in Wilderness Areas: two records (#s 47 and 60) are in the Yolla Bolly-Middle Eel Wilderness, one record (# 26) is in the Lassic Wilderness, and one record (# 78) is in the Chancelula Wilderness. Most of the locations for pale yellow stonecrop are clustered in Trinity and southern Humboldt counties. The populations in Glenn and Colusa counties are disjunct from the main distribution and need more study (Zika et al. 2018).

Sixty of the 83 records are historical (not seen since 2002) and 24 are recent. Of the 60 historical records, 48 have not been visited in over 30 years. Twenty-three records have population size estimates. Most of the estimates (19) are historical, while the other four are recent. Only one location (# 42) has had its population counted over time, with one count from 1988 (200 plants in one polygon), one from 1993 (100 plants in a second polygon), and one from 2014 (50 plants). The other three recent population estimates (record #s 66, 72, 73) range from 150 to 350 plants. Historical population estimates mostly ranged from 50 to 300 plants, with only four locations with fewer than 50 plants. Approximately one-quarter of the locations (20) have had repeat visits over at least a five-year interval, indicating that those populations are persisting. However, population data are not complete enough to understand long-term population trends for this species. At one location, *S. flavidum* is believed to no longer be extant (# 83 at the mouth of Swede Creek); although this site was home to *S. flavidum* 40 years ago, it now just has hybrids thought to be crosses between *S. flavidum* and *S. paradisum* (Zika et al. 2018, Zika 2022 pers. comm.). In addition, some of the locations of pale yellow stonecrop were within the perimeters of the 2020 August Complex and 2021 McFarland fires (Kierstead 2022 pers. comm.), and the fate of those populations is unknown.
Unfortunately, many of the herbarium specimens and populations identified as *Sedum laxum* subsp. *flavidum* prior to the taxonomic revision of Zika et al. (2018) have not been re-examined and identified using the new descriptions and key. Since herbarium specimens of *Sedum* section *Gormania* tend to shed their cauline leaves and lose flower color, both of which are important for identification, not all specimens will have preserved the necessary features to determine their new identities. Until these specimens and populations are all examined and identified, the final distribution of pale yellow stonecrop will remain somewhat uncertain. In Table 4, rows with locations confirmed as *Sedum flavidum* by the Carex Working Group are identified by an asterisk after the record number. All other rows (with a record number but no asterisk) have not been confirmed to be pale yellow stonecrop but are within the range of the species. The pink rows at the bottom of the table have either been confirmed to be another stonecrop species or are out of range for pale yellow stonecrop. As stated in Zika et al. (2018), pale yellow stonecrop does not occur in Del Norte and Siskiyou counties, and populations in northern Humboldt County are likely to be *S. oregonense* or *S. laxum* subsp. *heckneri*.

**Brief description of natural history and key ecological functions**

Pale yellow stonecrop is a perennial leaf succulent with obtuse to notched basal leaves in dense rosettes (Zika et al. 2018); it blooms from May to July (CNNDDB 2022, CCH2 2022, CPNWH 2022). This species grows on rock outcrops, slopes, and scree in dry, sunny or partly shaded openings within broadleaved upland forest, lower and upper montane coniferous forest, and chaparral at elevations of (1,165) 1,950 to 7,070 ft ([355] 595 to 2155 m) (CNPS 2022, CNNDDB 2022, CCH2 2022, CPNWH 2022, Kierstead 2022 pers. comm., Zika 2022 pers. comm.). The rock substrate is often serpentine, but this species is also found on slate, schist, basalt, and metasedimentary rock. Associates include *Abies concolor*, *A. magnifica*, *Pseudotsuga menziesii*, *Pinus jeffreyi*, *P. ponderosa*, *P. sabiniana*, *Quercus chrysolepis*, *Q. vacciniifolia*, *Ceanothus cuneatus*, *Arctostaphylos* spp., *Eriogonum libertini*, *Phacelia* spp., and *Streptanthus* spp.

The cosmopolitan genus *Sedum* has approximately 420 species (Nikulin et al. 2016). Pale yellow stonecrop is part of section *Gormania*, a group of species found in Oregon and California that reaches greatest species diversity in the Klamath Ranges (Zika et al. 2018). Pale yellow stonecrop can be separated from the other members of section *Gormania* by its combination of usually dense rosettes with obtuse to notched leaves, short sepals (relative to the petals), white to pale yellow, usually ascending petals that senesce white or pink to red, and yellow anthers that senesce white, pink, or brown (Zika et al. 2018). Field observation of pale yellow stonecrop over several years at Dubakella Mountain, Trinity County revealed that stem leaf shape can change between years from suborbicular with clasping base to oblong with truncate base. The cause of this variability is unknown but could be water availability, frost timing, snowpack, or other environmental influences (Zika et al. 2018). Pale yellow stonecrop is most similar in morphology to *S. oregonense*; the two species share similar flowers, but *S. oregonense* differs in having looser basal rosettes with exposed internodes, even on sunny, exposed microsites. In addition,

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2 Basis for other 1909.12 Chapter 10, Section 12.53 components.
the two species do not overlap in distribution, with pale yellow stonecrop growing at lower elevations to the south of *S. oregonense* (Zika et al. 2018).

All species of *Sedum* section *Gormania* are drought-adapted succulents that reproduce both asexually (through the production of rhizomes, stolons, and leaf rosettes) and sexually through the production of flowers; their large inflorescences of bisexual flowers produce copious nectar to attract pollinators (Shahani 2007, Zika et al. 2018). Pollinators and floral visitors in *Sedum* include bees (bumblebees, mason bees, leaf-cutter bees, sweat bees), flies, and butterflies (Shahani 2007, CPC 2021). In the species of section *Gormania*, the first flowers that open in an inflorescence are protandrous, producing pollen before the stigmas are receptive, which promotes outcrossing (Denton 1982). As the season progresses, flowers produce pollen concurrent with stigma receptivity (Denton 1982). All tested taxa within section *Gormania* are more-or-less self-compatible, allowing for insect-mediated self-pollination (Denton 1982, Zika et al. 2018). However, field studies of one member of section *Gormania*, *Sedum laxum* subsp. *laxum*, found that the plants had low levels of self-compatibility, and the germination rate of seeds produced by outcrossed flowers was significantly higher than the germination rate of seeds produced by selfed flowers (Shahani 2007). In section *Gormania*, flowers that are produced later in the season are sometimes cleistogamous (i.e. they do not open, and self-pollination occurs without insect mediation); how much these flowers contribute to overall seed production is unknown (Zika et al. 2018). The fruits of all species of section *Gormania* are uniform with each flower producing five narrow follicles that dehisce on one side by a single suture; each follicle releases numerous, small, narrowly-winged seeds (Denton 1982). Seeds most likely are wind- or animal-dispersed. It is unknown whether nectar volume or production of cleistogamous flowers are affected by environmental factors such as drought or decreased snowpack (Zika et al. 2018).

### Overview of ecological conditions for recovery, conservation, and viability

Pale yellow stonecrop ranges from Trinity and Humboldt counties in the north to Glenn and Colusa counties in the south. Of the 83 location records, only two have occurrence rankings in the CNDDB with one rated Excellent and the other rated Good. The habitat quality of the remaining 81 locations has not been recorded. Threats listed for this species include road construction and maintenance, logging, rock excavation, pipeline construction, and grazing (CNDDB 2022). The flat serpentine barrens it inhabits in southern Trinity County continue to be threatened by road building, parking/staging of equipment, quarrying, and construction of dozer lines during wildfires (Kierstead 2022 pers. comm.). These areas, to the untrained eye, look like parking lots already, and so they are selected for easy access and mechanical disturbance. Once the serpentine pavement is disturbed, serpentine barrens do not recover (Kierstead 2022 pers. comm.). Other general threats to all stonecrops are horticultural collecting and increased fire frequency due to climate change (Zika et al. 2018, Kierstead 2022 pers. comm.). *Sedum* species likely do not respond well to fire, and the heat of fire has the potential to kill entire populations

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3. 1909.12 Chapter 10, Section 12.53, components 7, 9, 10, 11 and 12, as appropriate.
(Kierstead 2022 pers. comm.). Where this species occurs in chaparral openings, it is vulnerable to fuels treatments, e.g. shrub mastication and pile burning. In addition, fire retardant drop would likely be detrimental, as pale yellow stonecrop is adapted to low-nutrient soils.

Other adverse effects on this species due to climate change are difficult to predict but would most likely involve response to changes in temperature and rainfall patterns, which could affect seed germination and plant longevity and have adverse effects on pollinator services (Scaven and Rafferty 2013, Gremer et al. 2020). All stonecrops are drought-adapted succulents that produce copious nectar to attract pollinators, and the effect of drought on nectar production in stonecrops is not yet understood; monitoring is recommended (Zika et al. 2018). Seed collection for ex situ seed banking of this species has been carried out (CPC 2021).

Taxonomy

Table 3 summarizes this species or subspecies/variety’s name status in key literature.

<table>
<thead>
<tr>
<th>Entity</th>
<th>Name Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNDDDB and CNPS</td>
<td><em>Sedum flavidum</em> (Denton) B. L. Wilson &amp; Zika</td>
</tr>
<tr>
<td>Jepson eFlora</td>
<td><em>Sedum flavidum</em> (Denton) B. L. Wilson &amp; Zika</td>
</tr>
<tr>
<td>Flora of North America</td>
<td><em>Sedum laxum</em> (Britton) A. Berger var. <em>flavidum</em> (Denton) H. Ohba</td>
</tr>
<tr>
<td>USDA NRCS® PLANTS</td>
<td><em>Sedum laxum</em> (Britton) A. Berger subsp. <em>flavidum</em> Denton</td>
</tr>
</tbody>
</table>

Synonymy: *Sedum laxum* (Britton) A. Berger subsp. *flavidum* Denton was published in 1978 (Denton 1978). In 2007, H. Ohba recombined this taxon as *S. laxum* var. *flavidum* (Denton) H. Ohba in order to meet nomenclatural requirements of the *Flora of North America North of Mexico* (Ohba 2007). Both versions of the name may be encountered in the literature. Subspecies *flavidum* was elevated to the rank of species by Zika et al. (2018). No other synonyms have been published (Tropicos 2022).

Jepson eFlora link (JEPS 2022): At the time of writing this account, *Sedum flavidum* is not yet updated in the Jepson eFlora. The species description given below is from the forthcoming *Jepson eFlora* update 10 (Zika et al. 2022 in press).

Habit: Perennial herb, rhizomes stout. Stem: 9–20 cm; glabrous, slightly glaucous, lacking thick granular wax; rosettes dense in sunny sites, internodes obscured. Leaf: strongly flattened, green, blue-green, pink, orange, red, purple, or flat gray; rosette leaves > stem leaves, 12–40 mm, 7–18 mm wide, glaucous, lacking thick granular wax, obovate, broadly obovate or oblanceolate, tip truncate to rounded or obtuse, often notched; stem leaves alternate, 4–15 mm, upper stem leaves reduced, suborbicular to elliptic, oblong, obovate or oblanceolate, > 2× as long as wide or not.

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4 1909.12, Chapter 10, Section 12.53, component 1.
Species Account: *Sedum flavidum*  

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spreading to ascending, rarely reflexed, bases truncate or slightly clasping when the leaf is suborbicular. Inflorescence: variable, dense or loose, cylindrical or flat-topped, lacking thick granular wax, 12--80-flowered, nodding or arching in bud, straightening at anthesis. Flower: calyx lobes lacking thick granular wax, 20--46% as long as petals; petals 8-13 mm, white to light yellow (orange), sometimes with reddish midvein or base, often aging red (pink), ascending, tips broadly acute or blunt, sometimes hooded; filaments white to greenish-white or yellow; anthers yellow, aging white, pink or red-brown. Fruit: follicles free, erect. Seed: 1--1.4 mm, striate.

**Type locality:** California. Trinity County. 4.5 mi NE of Forest Glen along Post Creek, or 1.5 mi NE of intersection of highway 36 and Post Creek Road, narrow canyon with small creek and metabasaltic slopes (*Denton 3953*, WTU) (*Denton 1978*).

**Key literature**


**Literature cited**


Species Account: *Sedum flavidum* 2022-04-07


Species Account: *Sedum flavidum*

2022-04-07


Persons Contacted

Zika, Peter. 2022. Research Botanist, University of Washington. Email correspondence with Julie Kierstead and Ellen Dean regarding elevational range of Sedum flavidum. Personal communication 22 March 2022.

Author(s) and Date:
Ellen A. Dean, California Native Plant Society, Associate Rare Plant Botanist, and Molly Wiebush, Rare Plant Coordinator, 22 March 2022.

Reviewer(s) and Date:
Aaron E. Sims, California Native Plant Society, Rare Plant Program Director, 30 March 2022; Julie Ann Kierstead, USDA Forest Service Region 5, Ecosystem Planning, 7 April 2022

Formatting: Form is set up as 508 compliant. Please use the “styles” if further formatting is necessary.

Purpose: This is to maintain the best available science on a species that could be used by the Forest Service in a variety of functions. Specifically, there would be additional steps and evaluations to determine whether or not this species would be considered a Species of Conservation Concern under the 2012 Planning Rule or a Sensitive Species under the 1982 Planning Rule.
Appendix 1: Known Occurrences

Table 4. Known Occurrences of pale yellow stonecrop within California (NRIS, CNDDB, CCH databases).

TABLE 4 REDACTED FOR CONSERVATION PURPOSES
Appendix 2: Additional Considerations at the Forest Level

This section, including the next 5 subheadings, would be filled out by Forest Service botanists.

<Forest Name>

Geographic distribution within the Forest
A. Scarce or isolated
B. Patchy or gaps
C. Contiguous

Select a geographic distribution rank and provide references or cite ‘specialist expertise, <name>’ where appropriate.

Abundance of the species on the Forest
A. Rare – current abundance is low enough that stochastic and other factors could lead to potential imperilment.
B. Uncommon – current abundance is large enough that demographic stochasticity is not likely to lead to rapid local extinction, but, in combination with highly variable environmental factors, could pose a threat.
C. Common – current abundance is large enough that species persistence is not threatened by demographic stochasticity in combination with environmental variation.
D. Insufficient information to draw inferences about criterion.

Select a species abundance rank and provide references or cite ‘specialist expertise, <name>’ where appropriate.

Population trend on the Forest
A. Significant downward or suspected downward population trend.
B. Stable population.
C. Upward population trend.
D. Insufficient information to draw inferences about criterion.

Select a population trend rank and provide references or cite ‘specialist expertise, <name>’ where appropriate.

Habitat trend on the Forest
A. Decline in habitat quality or quantity.
B. Stable amounts of suitable or potential habitat, relatively unchanged habitat quality.
C. Improving habitat quality or increasing amounts of suitable or potential habitat.
D. Insufficient information to draw inferences about criterion.

Select a habitat trend rank and provide references or cite ‘specialist expertise, <name>’ where appropriate.
Vulnerability of habitat on the Forest

A. Substantial modification of habitat has occurred or is anticipated with conditions departing from expectations based on NRV, and/or habitat is impacted by modern stressors such as drought, climate change, high intensity wildfire and wildfire suppression disturbances, loss of natural openings due to historical wildfire suppression, nonnative invasive species, water impoundments and diversions, and recreation, etc.

B. Habitat modification is likely to result in ecological patterns similar to the range of historical conditions, but is being impacted by modern stressors.

C. Habitat resilient, changes are similar in frequency and intensity to those expected from NRV, and modern stressors not significant.

D. Insufficient information to draw inferences about criterion.

<Select a habitat vulnerability rank and provide references or cite ‘specialist expertise, <name>’, where appropriate.>

Additional Forest specific information related to the SCC determination

<This section is provided for Forest botanists to add additional Forest specific information that is not captured in the section above, if necessary. Provide a narrative description here of the additional relevant information. State “No additional information” if this section is not used.>