

5-YEAR REVIEW

Yellow larkspur (*Delphinium luteum*)

GENERAL INFORMATION:

Species: Yellow larkspur (*Delphinium luteum*)

Date listed: January 26, 2000

FR citation(s): 65 FR 4156

Classification: Endangered

BACKGROUND:

Most recent status review:

The most recent status review of yellow larkspur was a 5-year review completed by the Sacramento Fish and Wildlife Office in 2011 (USFWS 2011). [[CLICK HERE TO VIEW DOCUMENT](#)].

FR Notice citation announcing this status review:

A notice announcing initiation of the 5-year review for this taxon and the opening of a 60-day period to receive information from the public was published in the Federal Register on June 18, 2018 (83 FR 28251-28254).

We did not receive any information from the public in response to our Federal Register Notice announcing this 5-year review.

ASSESSMENT:

Information acquired since the last status review:

This 5-year review was conducted by the U.S. Fish and Wildlife Service's (USFWS) Sacramento Fish and Wildlife Office (SFWO). Data for this review were solicited from interested parties through a Federal Register notice announcing this review on June 18, 2018. We also contacted species experts and the California Department of Fish and Wildlife (CDFW) to request data or information we should consider in our review. Additionally, we obtained data from the California Natural Diversity Database (CNDDDB; maintained by CDFW) and other online databases; conducted a literature search; and reviewed information in our files. Personal communications with species experts and annual reports submitted by partners were our primary sources of information.

Population Status and Abundance

The status of yellow larkspur populations and occurrences has not changed since 2011. Larkspur Rock (type location, CNDDDB occurrence #5) supports the only extant population of yellow larkspur that is known to be stable. The Larkspur Rock population is protected as a conservation easement and is annually monitored by University of California (UC) Botanical Garden at

Berkeley staff. Since a population high of 130 plants in 1985, the number of plants has been stable at approximately 60 individuals (**Table 1, Table 2**).

Aside from Larkspur Rock, only two other CNDDDB occurrences (#11 and #14), one of which may be extirpated, have records of yellow larkspur since 1993. The Larkspur Hill location (CNDDDB occurrence #11) has not been visited since 1987 but 5-10 plants were observed from the road in 1999 (J. Koontz, Augustana College, *in litt.* 2018b; **Table 1, Table 2**). The yellow larkspur at Larkspur Hill is presumed extirpated because blooming plants have not been visible from the highway since before 2011 (H. Forbes, UC Botanical Garden at Berkeley, *in litt.* 2011, 2018) and the property’s management practices are incompatible with yellow larkspur persistence (USFWS 2011).

CNDDDB occurrence #14, a roadside population near Walker Creek in Marin County, is visited and photographed by local botanists and rare-plant enthusiasts. While there were no yellow larkspur observed at this occurrence in 2011 (USFWS 2011), two yellow larkspur were observed in 2016 (H. Breck, amateur botanist, *in litt.* 2018; R. Raiche, Planet Horticulture, *in litt.* 2018) and one yellow larkspur was observed in 2018 (D. Smith, California Native Plant Society, *in litt.* 2018a) (**Table 1, Table 2**). Yellow larkspur at this location co-occur with red larkspur (*Delphinium nudicaule*) and, at one time, a presumed hybrid between yellow larkspur and coast larkspur (*Delphinium decorum*) (USFWS 2011). It has been posited that these yellow-flowered larkspurs are hybrids or a yellow form of red larkspur (CNDDDB 2018; H. Breck, *in litt.* 2018; D. Smith, *in litt.* 2010a, 2018b). Based on genetic research (Koontz *et al.* 2004) and J. Koontz’s examination of 2016 photographs taken at this location, we believe that there are true yellow larkspurs growing alongside red larkspurs at this location (*in litt.* 2018a).

Table 1. Counts/estimates of yellow larkspur at three CNDDDB occurrences (CNDDDB 2018; Forbes 2015a, 2015b; H. Forbes, *in litt.* 2011, 2013, 2018; H. Forbes, unpubl. data 2018; Koontz, *in litt.* 2018b; R. Raiche, *in litt.* 2018; D. Smith, *in litt.* 2018a; USFWS 2011).

Year	Larkspur Rock (#5)	Larkspur Hill (#11)	Marin County (#14)
1982			2-3
1983	≥60		
1984	≥60	50	0
1985	130	13	0
1986	50	8	0
1987	40	12	0
1997	83		
1998	51-100		
1999		5-10	1
2000	55		1
2010			1
2011	48-52		0

Year	Larkspur Rock (#5)	Larkspur Hill (#11)	Marin County (#14)
2012	15*		
2013	55		
2014	63		
2015			
2016	97†		2
2017	62		
2018	60		1

* Count is likely low because of poor survey conditions.

† H. Forbes suspects that the count in 2016 was artificially high because clumps were counted as multiple plants (unpubl. data 2018).

In addition to the aforementioned three, there are eight additional yellow larkspur occurrences described in the CNDDDB (**Table 2**). One of the occurrences (CNDDDB occurrence #7) is likely the same as the Larkspur Hill occurrence (J. Koontz, *in litt.* 2018b). Of the seven remaining occurrences, two are probably extirpated and five require fieldwork and/or genetic study to determine status (**Table 2**).

Like CNDDDB occurrence #14, the species identities of plants/specimens from other occurrences have been questioned, especially those from locations where red larkspurs are prevalent. J. Koontz examined specimen images for occurrences #1, #3, and #8; and examined live-plant photographs taken at occurrence #17. Koontz confirmed that plants vouchered/observed at occurrences #1, #3, and #17 appear to be true yellow larkspurs, not hybrids or other species. The specimens collected from CNDDDB occurrence #8 appear to be red forms of yellow larkspur, but could potentially be hybrids between yellow larkspur and red larkspur (J. Koontz, *in litt.* 2018b; see additional information in **Table 2**).

Table 2. Status of each yellow larkspur CNDDDB occurrence as described in the 2011 5-year review, as described in the 2018 CNDDDB report, and after collecting information for this 2018 status review.

CNDDDB occurrence #	Location	2011 Status (5-year review, USFWS 2011)	CNDDDB (2018) Status	Additional 2018 Updates	Conclusion After 2018 Status Review
1	Stemple Creek, Marin County	Unsubstantiated; "based entirely on unsupported and undated information found on a 1979 map" (p. 5)	Presumed extant; first and last recorded visit in 1918; general location from CNPS map; location could be based on an anonymous 1918 collection	The identity of the voucher specimen (JEPS23519) on which this occurrence is based has been confirmed as yellow larkspur by species expert, J. Koontz (<i>in litt.</i> 2018b; identification via herbarium e-loan). The "anonymous" collection was submitted by Rose Linebaugh with a letter dated March 29, 1918. Rose Linebaugh explained that the specimen was collected by her brother (unnamed) from along Stemple Creek in Marin County near the coast (JEPS23519 E-loan No. UCE380). Fieldwork is needed (no recorded visits since 1918); access would need to be arranged with landowner. The current land use is agriculture/grazing.	<ul style="list-style-type: none"> ▪ True historical occurrence ▪ Fieldwork needed to determine status
2	Petaluma, south Sonoma County	Unsubstantiated; "questionable identification never confirmed by a second sighting" (p. 5)	Presumed extant; first and last recorded visit in 1962; based on 1962 collection; species ID questioned by C. Quibell	J. Koontz requested digital photographs of the 1962 voucher specimen (HSC25040) from the herbarium at Humboldt State University. The herbarium has not yet responded to his request. Although the identification of the specimen collected at this occurrence was questioned by C. Quibell (CNDDDB 2018), it is plausible that yellow larkspur populations existed at this location, based on the species' presumed historical range (J. Koontz, <i>in litt.</i> 2018b). The occurrence is along a roadway that is bordered by agriculture/grazing.	<ul style="list-style-type: none"> ▪ If species ID is correct, probably extirpated (the roadside location would likely have been rediscovered if extant) ▪ Voucher ID unconfirmed
3	Graton, Sonoma County	Not documented since "1935 or earlier;" grouped in "unreliable reports or locations that have not had plants for many years" (p. 5)	Presumed extant; last recorded visit in 1927; based on 1925 and 1927 collections	The identities of the 1925 and 1927 voucher specimens (CAS128249 and CAS145637), on which this occurrence is based, have been confirmed as yellow larkspur by species expert, J. Koontz (<i>in litt.</i> 2018b; identification via digital photographs). The landscape at this	<ul style="list-style-type: none"> ▪ True historical occurrence ▪ Probably extirpated

CNDDDB occurrence #	Location	2011 Status (5-year review, USFWS 2011)	CNDDDB (2018) Status	Additional 2018 Updates	Conclusion After 2018 Status Review
				occurrence has been extensively altered so the historical population is probably extirpated.	
5	Larkspur Rock, Sonoma County	Approximately 52 plants in 2011	Presumed extant; last recorded visit in 2000	There were 60 plants censused in 2018.	<ul style="list-style-type: none"> ▪ Extant ▪ Appears stable
7	Bodega, Sonoma County (west of Bodega on Highway 1)	Not documented since "1935 or earlier;" grouped in "unreliable reports or locations that have not had plants for many years" (p. 5)	Presumed extant; last recorded visit in 1983 when B. Lovell documented "no habitat exists here;" location is based on historical collections that may be referencing occurrence #5 or #11; vague collections from "Bodega" and "W of Bodega" are also attributed here	J. Koontz (<i>in litt.</i> 2018b) believes this occurrence is the same as occurrence #11 (Larkspur Hill).	<ul style="list-style-type: none"> ▪ Probably same occurrence as #11
8	Salmon Creek, Sonoma County	Not documented since 1935; grouped in "unreliable reports or locations that have not had plants for many years"	Presumed extant; last recorded visit in 1982 (not found); based on 1935 Baker collection (#8080, NCC 1935-04-xx) but could be a misidentification or hybrid	There are two specimens in the Baker #8080 collection that were originally annotated as <i>Delphinium luteum</i> var. <i>roseum</i> (yellow larkspur, <i>roseum</i> variety). In 1946, J. Ewan annotated the CAS228475 specimen as <i>D. nudicaule</i> (red larkspur) "or hybrid." In 1991, K. Tarp annotated the NCC000639 specimen as <i>D. nudicaule</i> . Upon review of herbarium specimen images, J. Koontz determined that the floral morphology of both specimens more closely resembles yellow larkspur than red larkspur. Koontz concluded that both of the specimens from Baker #8080 either are red forms of yellow larkspur or are hybrids between yellow larkspur and red larkspur (<i>in litt.</i> 2018b). Koontz also noted, "These red forms of [yellow larkspur] might resemble the	<ul style="list-style-type: none"> ▪ Specimens are yellow larkspur (red form, possible hybrid with red larkspur); new specimen annotations are pending (J. Koontz, <i>in litt.</i> 2018c; E. Magnaghi, California Academy of Sciences, <i>in litt.</i> 2018) ▪ Fieldwork and genetic study

CNDDDB occurrence #	Location	2011 Status (5-year review, USFWS 2011)	CNDDDB (2018) Status	Additional 2018 Updates	Conclusion After 2018 Status Review
				color morphs seen in [CNDDDB occurrence] #16. I have never seen the red morph as collected by Baker with these two specimens. His variety was never formally published, so the most conservative way to handle these records is to call them a reddish form of [yellow larkspur] with the possibility that they are actually hybrids with <i>D. nudicaule</i> . It would be helpful to ground truth the area extensively in the early spring 2019 in an attempt to see which larkspurs are present, if any" (<i>in litt.</i> 2018b, p. 2 of email attachment). Fieldwork (no recorded visits since 1982) and genetic study would be prudent; access would need to be arranged with landowners.	needed to determine status
11	Larkspur Hill, Sonoma County	"May be extirpated given that the management of the property was not compatible with [yellow larkspur's] continued existence" (pp. 5-6)	Presumed extant; last recorded visit in 1987 (access not allowed since); since 1987, presence occasionally confirmed with binoculars	Occurrence is probably extirpated because blooming plants have not been visible from the highway since before 2011 (H. Forbes, <i>in litt.</i> 2011, 2018).	<ul style="list-style-type: none"> ▪ True historical occurrence ▪ Probably extirpated
13	Southwest of Tomales, Marin County	Grouped in "unreliable reports or locations that have not had plants for many years" (p. 5)	Possibly extirpated; last recorded visit in 1987 but not observed since 1983; plant possibly a hybrid	The last known visit to this location was on April 28, 1999 by J. Koontz, B. Guggolz, and J. Guggolz. Koontz noted that there was a population of red larkspur and possible hybrids, but no yellow larkspur. Koontz believes that this occurrence represents a historical yellow larkspur site that should continue to be monitored (<i>in litt.</i> 2018b).	<ul style="list-style-type: none"> ▪ True historical occurrence ▪ Possibly extirpated or hybridized ▪ Fieldwork and genetic study needed to determine status

CNDDDB occurrence #	Location	2011 Status (5-year review, USFWS 2011)	CNDDDB (2018) Status	Additional 2018 Updates	Conclusion After 2018 Status Review
14	Walker Creek, Marin County	May or may not be extirpated; survey in 2011 found red larkspur but no yellow larkspur (H. Forbes, <i>in litt.</i> 2011); location is threatened by increasing erosion and disturbance due to its roadside location	Presumed extant; last recorded visit in 2000 (1 yellow larkspur observed); growing with red larkspur; genetic analysis confirms yellow larkspur, as opposed to a hybrid	Although genetic analysis confirmed species as yellow larkspur ("Marin Co. sample" in Koontz <i>et al.</i> 2004; J. Koontz, <i>in litt.</i> 2018a), members of the Marin rare plant community question the hybridization status of the larkspurs at this location (H. Breck, <i>in litt.</i> 2018; D. Smith, <i>in litt.</i> 2010a, 2018b). Based on J. Koontz's examination of recent photographs taken at this location, we believe that there are true yellow larkspurs growing alongside red larkspurs at this location (<i>in litt.</i> 2018a). One yellow larkspur was observed in 2010 (D. Smith, <i>in litt.</i> 2010b; CalPhoto IDs: 0000 0000 0711 1401-1403). In 2016, 2 yellow larkspurs were observed at this location [photographs taken on April 8 (A. Arthur, CalPhoto IDs: 0000 0000 0416 1771-1775), April 10 (R. Raiche, <i>in litt.</i> 2018), April 14 (H. Breck, <i>in litt.</i> 2018; Calflora po23503), and April 17 (V. Smith, CalPhoto ID: 0000 0000 0416 2149)]. In 2018, only one yellow larkspur was observed (D. Smith, <i>in litt.</i> 2018a; V. Smith, CalPhoto ID: 0000 0000 0418 0406).	<ul style="list-style-type: none"> ▪ True historical occurrence ▪ Extant but only 1-2 individuals
16	North of the mouth of Estero San Antonio, Marin County	No surveys recorded since 1993.	Presumed extant; first and last recorded visit in 1993 (134 plants observed); several flower colors at this site, needs genetic work	No known surveys since 1993. J. Koontz (<i>in litt.</i> 2018b) is confident in D. Hickson's identification of yellow larkspur but he also has slides taken by B. Guggolz (April 23, 1993) at this location showing several flower colors (red, orange, and yellow, as described by R. Bittman, California Department of Fish and Game, <i>in litt.</i> 2002). The variety of flower colors presumably led to B. Guggolz suggesting hybridization (J. Koontz, <i>in litt.</i> 2018b). D. Hickson explained that when she discovered the 134 larkspurs on April 7, 1993, 70% of the plants were vegetative only and	<ul style="list-style-type: none"> ▪ Probably true historical occurrence ▪ Possible yellow larkspur with hybrids and/or reddish variety of yellow larkspur ▪ Probably extant ▪ Fieldwork and genetic study needed to determine status

CNDDDB occurrence #	Location	2011 Status (5-year review, USFWS 2011)	CNDDDB (2018) Status	Additional 2018 Updates	Conclusion After 2018 Status Review
				30% had yellow flowers and/or flower buds (California Department of Fish and Wildlife, pers. comm. 2018). Hickson did not observe any of the orange- or red-flowered larkspurs that Guggolz observed at the same location later that month, April 23, 1993 (pers. comm. 2018; date from J. Koontz, <i>in litt.</i> 2018b). One of the slides taken by Guggolz appears to be a hybrid between yellow larkspur and red larkspur, or possibly a red form of yellow larkspur (J. Koontz, <i>in litt.</i> 2018d). Also, see Koontz quote in this table under "Additional 2018 Updates" for occurrence #8.	
17	North of Dillon Beach, Marin County	No surveys recorded since 1993.	Presumed extant; first and last recorded visit in 1993 (3 plants observed); possible hybrid or yellowish-flowered form of red larkspur	No known surveys since 1993. D. Amme was uncertain that the 3 plants were true yellow larkspur because the flowers were pale yellow. However, J. Koontz (<i>in litt.</i> 2018b) wrote that the larkspurs in two photographs taken at this location in 1993 (C. Patterson, CalPhotos IDs: 0000 0000 0510 1641 and 0510 1850) appear to be true yellow larkspurs.	<ul style="list-style-type: none"> ▪ True historical occurrence ▪ Fieldwork needed to determine status

Threats

Threats to yellow larkspur remain the same as in the 2011 status review (USFWS 2011). Habitat loss from development, incompatible land-use, and/or incompatible land-management threatens all but the Larkspur Rock occurrence, which is protected in a conservation easement. Invasive plant species and herbivory (by wildlife and/or livestock) are threats to all known occurrences of yellow larkspur. Signs of wildlife herbivory are observed every year in the Larkspur Rock population, but the effects have not been severe to date (H. Forbes, *in litt.* 2018). Hybridization is a threat to the conservation of unique yellow larkspur genotypes, especially where yellow larkspur are known to occur with the similar, interfertile red larkspur (CNDDDB occurrences #13, #14, and #16). CNDDDB occurrence #14 is also threatened by erosion and disturbance related to its roadside location. There being only two known, extant yellow larkspur populations (totaling 61 individuals in 2018), the yellow larkspur is especially susceptible to extinction from ordinary events (e.g., grazing, herbivory, erosion, trampling), catastrophic events (e.g., fires, floods, earthquakes), and factors associated with climate change (e.g., drought).

Conservation

The UC Botanical Garden at Berkeley and U.S. Fish and Wildlife Service are currently pursuing a yellow larkspur introduction at the Jenner Headlands, a Wildland Conservancy property. A site identified as having good potential for supporting yellow larkspur was selected in 2014 (Forbes 2015a). As of 2018, approximately 100 greenhouse-raised plants are ready for outplanting; the introduction could occur as early as December 2018 (H. Forbes, *in litt.* 2018).

Conclusion:

After reviewing the best available scientific information, we conclude that yellow larkspur remains an endangered species. The evaluation of threats affecting the species under the factors in 4(a)(1) of the Act and analysis of the status of the species in the 2011 status review (USFWS 2011) remains an accurate reflection of the species current status.

RECOMMENDATIONS FOR FUTURE ACTIONS:

Recommendations remain essentially the same as in the 2011 status review (USFWS 2011). In particular, focus should be on establishment of new yellow larkspur populations. We recommend the implementation of an adaptive introduction strategy, whereby detailed observations of successes and failures are recorded and used to evaluate and adapt methods on a regular basis. Additionally, field surveys and/or genetic research are needed to determine the statuses of several yellow larkspur occurrences (CNDDDB occurrences #1, #8, #13, #16, and #17). Field surveys should also be conducted to locate additional yellow larkspur occurrences.

Lead Field Supervisor, Fish and Wildlife Service

Approve 

Date 5/2/2019

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