Plant Species Evaluation Form

Riella americana M. Howe & Underw.

AMERICAN RIELLA

Family: Riellaceae (CNPS 2017) | **PLANTS Symbol:** RIAM6 (USDA 2017) | **Calif. Endemic:** No (CNPS 2017)

Synonyms/Other Names: *Riella americana* H. Howe & Underwd. was described in 1903 from a type locality in Jeff Davis Co., Texas. No other names have been used to refer to this taxon (Tropicos 2017).

Identification Issues: Locating *Riella* specimens is difficult given its ephemeral life cycle and submerged habit. Populations of *Riella* have been discovered after spores germinated from samples of mud that were collected for research unrelated to bryology. Vegetative characters are rarely useful for the identification of *Riella* taxa. Differentiation among taxa is largely based on involucre (structure that protects archegonia) and spore morphology. There are two species of *Riella* in North America. *Riella americana* is distinguished from *R. affinis* in being dioicous (monoicous in *R. affinis*) and by involucres that lack ribs (Bartholomew-Began 2004).

Taxonomy:

Species In Genus: Species 17 (2 in the North America). Genus Description Plants 0.6-10 cm, branched sparingly, bright green. Shoot apex falciform to circinate. Oil cells reduced, with 1 oil body per cell. Leaf scales dimorphic, in 2 lateral and 2 ventral rows along the axis. Specialized asexual reproduction frequent, gemmae multicellular, ventral on the axis. Antheridia marginal along the wing, sunken, single in involucres. Archegonia alternating left and right along the wing axis, single, in subglobose, pyriform to flask-like involucres. Sporophyte seta abbreviated, not elongating; capsule wall 1-stratose; elaters absent but with nurse cells interspersed with immature tetrads. Spores large, dissociated at maturity. (Bartholomew-Began 2004.)

Species Description Plants 1.0-3 cm, caespitose, unbranched or dichotomously branched 1 to 4 times; shoot apex circinate. Axis elliptic, 0.2-0.8 mm diam. Dorsal wing 1.5-5 mm wide, margin entire, lacerate or erose with age, with wing cells near the axis 70-100 x 30-50 µm, with the marginal cells 30-50 x 22-40 µm. Oil cells 21-23 x 17-25 µm; oil bodies 15-17 µm diam. Lateral leaf scales remote, oriented obliquely, 1-stratose with a multistratose base, ovate to oblong (obovate to lingulate), 355-800 x 125-400 µm. Ventral leaf scales 1-stratose, irregular, often panduriform with a broad isthmus and equal or unequal lobes or oblong (obovate-ovate), 165-540 ´ 100-350 µm. Specialized asexual reproduction by gemmae, ventral from the youngest axis portions, intermixed apically with the scales, panduriform with two rounded lobes, 730-1050 x 450-775 µm, multicellular. Sexual condition dioicous. Antheridia up to 75 in a single series; antheridial body ca. 210-235 ´ 160-185 µm. Archegonial involucre subglobose to ovoid, 1.4-1.8 x 0.8-1.2 mm, with the mouth truncate or slightly pointed, subpapillose; lamellae absent. Sporophyte foot broadly ovate, ca. 130- 250 x 150-200 µm; seta 100-200 µm; capsule globose, 0.5-1.3 mm. Spores spherical, 100-130 µm, with the distal face spinose, the spines 10-24 µm,

occasionally curved, the apices somewhat truncate, dilated, acute, the basal membranes irregularly radiating, with the proximal face spinose, the spines conical, 3-6 µm, basal membranes rare or absent. FNA Treatment Author: Sharon E. Bartholomew-Began. (Bartholomew-Began 2004.)

Status:

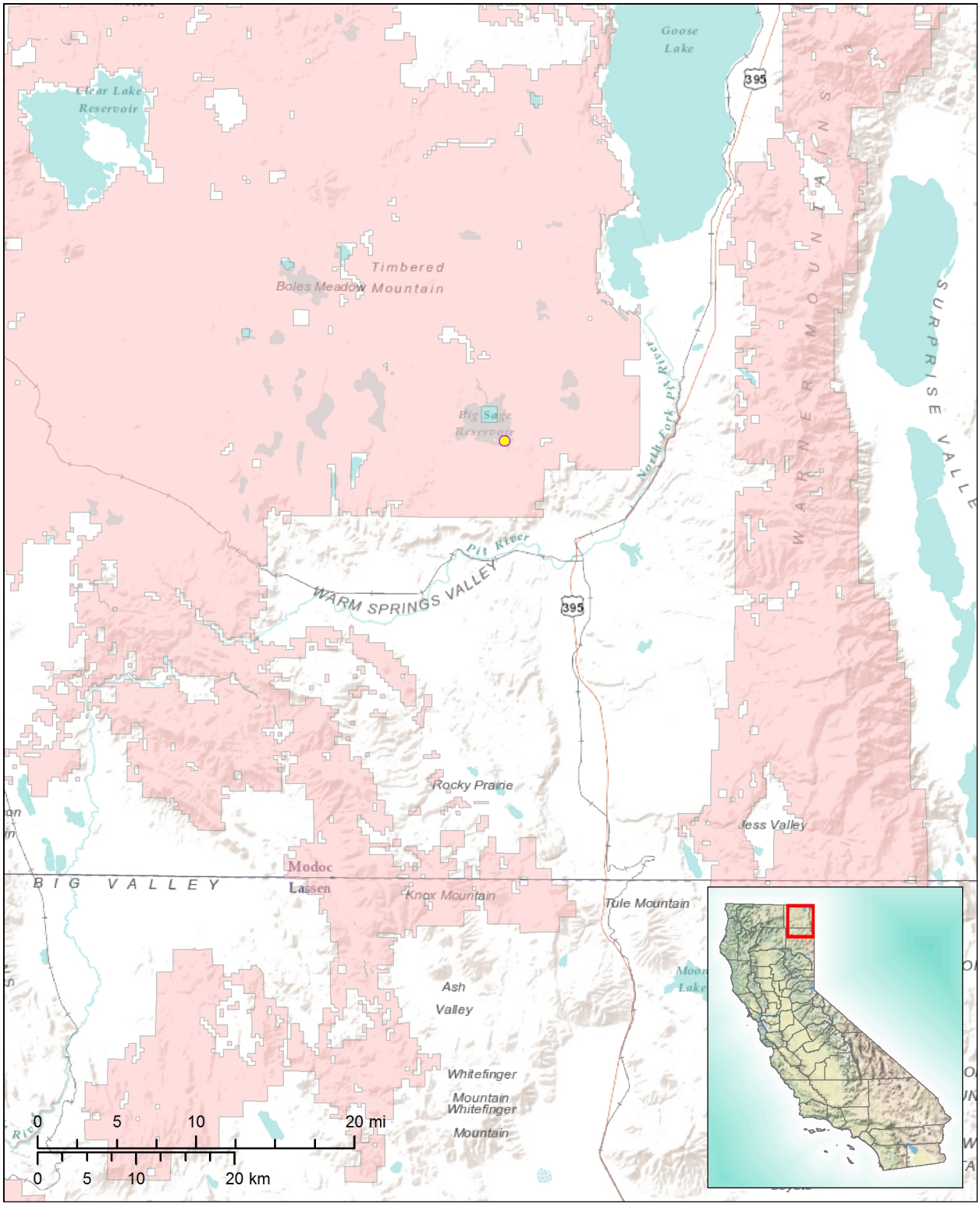
Note: Federally recognized Endangered, Threatened, Proposed, or Candidate species under the Endangered Species Act are omitted as they do not meet the definition of a Species of Conservation Concern (FSH 1909.12 § 12.52).

State Listing	G-rank	S-rank	CRPR	R5 FSS	NFP SM	CA BLM
CA: Not listed NV: Not listed OR: Not listed	G3?	CA: S1 NV: Not listed OR: Not listed	2B.2	Not listed	Not listed	Not listed

SWAP:	NNHP:	NNPS:	ORBIC:	OCS:	IUCN:
Not listed	Not listed	Not listed	Not listed	Not listed	Not listed

Expanded abbreviations and citations: State Listing=California Endangered Species Act Listing (CDFW 2017b), Nevada Division of Forestry Fully Protected Plant Species (NAC 527) (NDF 2012), Oregon Department of Agriculture Listed Plants (ODA 2014); G-rank=Global Conservation Status (CDFW 2017a; NatureServe 2017); S-rank=Subnational (state or province-level) Conservation Status (CDFW 2017a; NatureServe 2017; NNHP 2017; ORBIC 2016); CRPR=California Rare Plant Rank (CNPS 2017); R5 FSS=USDA Forest Service Region 5 Regional Forester Sensitive Plant Species List (USDA 2013); NFP SM=Forest Service and Bureau of Land Management Northwest Forest Plan Survey and Manage Species (USDA 2001); CA BLM=California Bureau of Land Management Designated Sensitive Species (BLM 2010); SWAP=California State Wildlife Action Plan Status (CDFW 2015); NNHP=Nevada Natural Heritage Program Status (NNHP 2017); NNPS=Nevada Native Plant Society Status (NNHP 2017); ORBIC=Oregon Biological Information Center Status (ORBIC 2016); OCS=Oregon Conservation Strategy Species (ODFW 2016); IUCN=International Union for Conservation of Nature Red List Status (IUCN 2017).

Distribution: Sporadically distributed and found in Texas, New Mexico, California, South Dakota, Mexico, and Argentina (NatureServe 2017). Plants within California are represented by a single occurrence in Modoc County, along the shoreline at the southern end of Big Sage Reservoir within the Modoc NF (CNDDB 2017).



Basemap Sources: Main map: Esri, DeLorme, USGS, NOAA, NPS. California inset map: ©2013 National Geographic Society, i-cubed.

Locations within California:

(Note: Record numbers indicate sites that contain an individual, population, or groups of populations located within ¼ mile of each other (per the California Natural Diversity Database (CNDDB) definition of Element Occurrences in California). Official Element Occurrence (EO) numbers for plants in California are determined solely by the CNDDB and are included within the Reference (Source) column for CNDDB data. Duplicate records from the same site are given the same record number and included in red. The Population Info column includes total number of individuals and total number and size of populations/sub-populations when provided. Elevations in meters from source were converted to feet. If not provided in original source, Land Manager information was obtained using the California Protected Areas Database (CPAD 2016) and Quad information was obtained using 24K Quads, SDE Feature Class (CDFG 2013). All other information is directly from the Reference (Source) column unless additional citation is given.)

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
1	S END OF BIG SAGE RESERVOIR, MODOC NATIONAL FOREST.	Modoc	Big Sage Reservoir (4112056)	CNDDB, May 2017 (EO 1)	2007	SITE MAPPED ALL ALONG SHORELINE BUT ACTUAL LOCATION OF LIVERWORT WAS LIKELY TOWARDS THE MIDDLE OF THE RESERVOIR WITH PIECES AND PARTS WASHING UP ON THE MUD ALONG THE EDGE OF THE LAKE. SEEN ALONG SHORELINE IN 2005, 2006, & 2007.		Modoc NF	4900

Distribution on National Forest System (NFS) Lands:

(Please see Reference column of Locations table above for references pertaining to Record Numbers indicated on NFS lands.)

National Forest System (NFS) lands	Record #s (from Locations table above)	CNDDB EOs	Non-CNDDB Records	Recent (seen in past 20 yrs.)	Historic (not seen in past 20 yrs.)	Most Recent Obs.	EOs/ Recs. (5 mile buffer)	Total Records on NFS lands
Angeles:								
Cleveland:								
Eldorado:								
Inyo:								
Klamath:								
Lake Tahoe Basin MU:								
Lassen:								
Los Padres:								
Mendocino:								
Modoc:	1	1	-	1	-	2007	-	1
Plumas:								
San Bernardino:								
Sequoia:								
Shasta-Trinity:								
Sierra:								
Six Rivers:								
Stanislaus:								
Tahoe:								
Totals:	N/A	1	0	1	0	N/A	0	1

Demographic and Population Trends: An unknown number of plants occur at the site of element occurrence one (EO 1). Plants were last observed in 2005, 2006, and 2007. Fragments of plant tissue were seen in mud and washed up along the shoreline. The remainder of the colony is possibly restricted to the center of the reservoir, as suspected by observers. (CNDDB 2017).

Life History: *Riella americana* is a dioicous (gametangia on separate individuals) aquatic thalloid liverwort. It has rarely been observed in permanent bodies of water. It is short-lived, only surviving for short periods of time after water levels subside. Spores are capable of remaining dormant for up to three years. It is considered an annual hydrophyte, and is able to complete its lifecycle in as little as three months (Bartholomew-Began 2004). Despite this short life cycle, spores are slow to initially germinate and develop thallus tissue. Gemmae are an important aspect of this plant's life history. The ability to produce propagules from vegetative tissue allows this ephemeral plant to colonize habitats and rapidly increase in numbers (Studhalter 1933; Studhalter and Enna Cox 1940). Adult plants develop a thickened stem with rhizoids that develop at the base. Along one side of the stem is a leaf-like thallus wing that is one

cell thick. Gametangia develop along the stem of archegoniate individuals. Antheridia are produced along the margin of the wing (Studhalter 1931). Its growth phase is during December and January. During this time, it is often entirely submerged and found attached to loose and sandy substrates where it can form matted colonies of plants (Studhalter 1933; NatureServe 2017).

Diversity: *Riella americana* is one of 17 species in the genus *Riella* (Riellaceae). Only two species are known in North America, both of which occur in California. Species in this genus have distributions that are sporadic, disjunct, and occur throughout western and southwestern North America (incl. Mexico), South America, Eurasia, Africa, and Australia (Bartholomew-Began 2004).

Habitat: *Riella americana* is most often found in arid and semiarid regions as a submerged aquatic in mud flats. It is also found in temporary pools, streams, reservoirs, and stock ponds. Habitats are often associated with lower montane coniferous forests or pinyon and juniper woodlands (CNPS 2017). This single California occurrence is found on a fully exposed volcanic mud flat on a lake margin that entirely lacks vegetation (CNDDB 2017).

Habitat Status or Trend: The status and trend associated with the single occurrence of *Riella americana* is unknown. Repeated visits and ongoing documentation is needed in order to determine considerable trends.

Capacity for the Species to Disperse: In a single study, researchers fed mature spore-forming *Riella americana* plants to domesticated mallard ducks in an effort to determine germination success after complete digestion of plant matter. Researchers demonstrated that *R. americana* spores pass through the digestive tract of waterfowl and successfully germinate. It is likely that migrating birds disperse spores into new habitat. The low abundance of this taxon in regions where it occurs may be due to the specific habitat that is required for colonization and reproductive success (Proctor 1961).

Threats: Flooding events have the potential to dislodge plants given its delicate thalli and its slender rhizoids that are generally anchored in loose substrate. Severe drought and the drying of substrate is also a threat to these aquatic liverworts (Studhalter 1933).

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Persons Contacted:

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10 January 2018

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10 January 2018

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.

Additional Considerations at the Forest Level: Habitat amount and juxtaposition of both the species and habitat locations.