U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY
ASSIGNMENT FORM

SCIENTIFIC NAME: *Rorippa subumbellata*

COMMON NAME: Tahoe yellow cress

LEAD REGION: Pacific Southwest Region (Region 8)

INFORMATION CURRENT AS OF: April 2015

STATUS/ACTION

___ Species Assessment - determined either we do not have sufficient information on threats or the information on the threats does not support a proposal to list the species and, therefore, it was not elevated to Candidate status

___ Listed species petitioned for uplisting for which we have made a warranted-but-precluded finding for uplisting (this is part of the annual resubmitted petition finding)

___ Candidate that received funding for a proposed listing determination; Assessment not updated

___ New candidate

___ Continuing candidate

___ Listing priority number change
Former LPN: ___
New LPN: ___

_X_ Candidate removal:

_X_ Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

_X_ Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ Range is no longer a U.S. territory.

___ Insufficient information exists on biological vulnerability and threats to support listing.

___ Taxon mistakenly included in past notice of review.

___ Taxon does not meet the Act's definition of "species."

___ Taxon believed to be extinct.

_X_ Conservation efforts have removed or reduced threats

_X_ More abundant than believed, diminished threats, or threats eliminated.

Date when the species first became a Candidate (as currently defined): October 25, 1999

PETITION INFORMATION:
___ Non-petitioned
_X_ Petitioned;
Date initial petition received: **December 15, 1974**
Date repetition received: **December 27, 2000**
Date of 12-month Finding: **December 27, 2004 (69 FR 77167)**

FOR PETITIONED CANDIDATE SPECIES:
a. Is listing warranted (if yes, see summary of threats below)? **No**
b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? **N/A**
c. Why has listing been precluded? **N/A**

PLANT GROUP AND FAMILY: Flowering Plants, Brassicaceae (Mustard Family)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE:
Nevada and California

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE:
Nevada: Carson, Douglas, and Washoe Counties
California: El Dorado and Placer Counties

LAND OWNERSHIP: Populations occur on lands under management by the U.S. Forest Service (USFS) (27 percent); California Tahoe Conservancy (CTC), California Department of Parks and Recreation (CDPR), Nevada Division of State Parks (NDSP), and other county and city parks (31 percent); and private landowners (42 percent). The actual acreage of occupied sites varies with water surface elevation of Lake Tahoe.

LEAD REGION CONTACT: Pacific Southwest Regional Office, Arnold Roessler, 916–414–6613, Arnold_Roessler@fws.gov

LEAD FIELD OFFICE CONTACT: Reno Fish and Wildlife Office, Sarah Kulpa, 775–861–6340, Sarah_Kulpa@fws.gov

PREVIOUS SERVICE ACTION

In the 1970s, increasing impacts from development and recreation in the shorezone of Lake Tahoe and a petition from the Secretary of the Smithsonian Institution (Smithsonian 1975, entire) prompted the Service in 1980 to identify *Rorippa subumbellata* as a category 1 candidate species under the Endangered Species Act of 1973 as amended (Act) (45 FR 82480; December 15, 1980). A drought from 1988 to 1994 resulted in sustained low lake levels that exposed large areas of shorezone habitat; surveys demonstrated that the species had recolonized many of these

areas (Pavlik *et al*. 2002, p. 42). Therefore, in February 1996, the Service published a Candidate Notice of Review (61 FR 7597; February 28, 1996) removing *R. subumbellata* from the candidate list, because the species was more abundant and widespread than previously believed. However, when the drought ended in 1995, a prolonged period of high lake levels from 1995–1999 inundated many occurrences of the species, and in October 1999, the Service again identified *R. subumbellata* as a candidate with a Listing Priority Number (LPN) of 2 (threats are of high magnitude and imminent), due to the threat of sustained high lake elevation and increased human use of lakeshore habitats (64 FR 57533; October 25, 1999).

On December 11, 2000, the Service received a second petition to list *Rorippa subumbellata* as endangered from the League to Save Lake Tahoe and the Center for Biological Diversity (League to Save Lake Tahoe and Center for Biological Diversity, 2000). In the May 4, 2004 Candidate Notice of Review (69 FR 24876), the Service again made a warranted, but precluded, determination for *R. subumbellata*. However, on June 21, 2004, the United States District Court for the District of Oregon [*Center for Biological Diversity* v. *Norton*, Civ. No. 03-1111-AA] found that the warranted, but precluded, determination the Service made for *R. subumbellata* was not sufficient. The Service once again reviewed the status of *R. subumbellata*, and on December 27, 2004, published in the **Federal Register** a 12-month finding (69 FR 77167) on the species, in which we determined that it continued to be warranted for listing, but precluded by other higher priority listing actions. However, the LPN was changed to an 8 in 2004 (69 FR 77167; December 27, 2004), indicating the threat level was reduced to moderate to low in magnitude, but still imminent. Since 2004, *Rorippa subumbellata* has been considered a candidate with a LPN of 8, and has been included in all subsequent annual Candidate Notice of Reviews (2005–2014) (70 FR 24870, 71 FR 53756, 72 FR 69034, 73 FR 75176, 74 FR 57804, 75 FR 69222, 76 FR 66370, 77 FR 69993, 78 FR 70103, 79 FR 72449).

BIOLOGICAL INFORMATION

Species Description

Rorippa subumbellata Rollins (Tahoe yellow cress) is a member of the mustard family (Brassicaceae) known only from the shores of Lake Tahoe (Stuckey 1972, p. 297). The species is a low-growing, herbaceous perennial that branches profusely (Figure 1). An underground system of horizontal roots results in clonal growth (Stuckey 1972, pp. 296–297). Leaves are fleshy, generally oblong shaped, and deeply pinnately lobed. Flowers are yellow, and the fruits, called siliques, are small with a plump, round shape. Flowering and fruiting occurs between late May and late October.

Figure 1. *Rorippa subumbellata* (Tahoe yellow cress) in flower.
Photo credit: J. Fraser, U.S. Fish and Wildlife Service (Service).

Taxonomy

Numerous collections of *Rorippa subumbellata* were identified as *R. sinuata* (Nutt.) Hitchc. (spreading yellow cress) or its synonyms until it was recognized as a distinct species restricted to the shores of Lake Tahoe by Rollins in 1941 (pp. 177–178; Stuckey 1972, pp. 296–297). The earliest collection of what was later to be known as *R. subumbellata* was by E.L. Greene sometime prior to 1891 (Stuckey 1972, p. 297). Rollins (1993a, p. 767; 1993b, p. 435), in a treatment included in the 1993 Jepson Manual (Rollins 1993b, p.435), maintained *R. subumbellata* as a distinct species. Updated information on taxonomic validity was reviewed on the Jepson Flora Project website; and the species *R. subumbellata* is still the accepted name of this species (Al-Shehbaz 2013, *http://ucjeps.berkeley.edu/interchange.html*, accessed on April 22, 2015).

Habitat/Life History

Rorippa subumbellata occurs only in the shorezone of Lake Tahoe where other vegetation is often limited or may be absent (CSLC 1994, p. 28; Pavlik *et al.* 2002, p. 23). This species is found on sandy substrates, in silty soils among boulders, along the lake margin, near stream mouths, in organically enriched dune slacks, and in back-beach depressions in naturally dynamic environments (Knapp 1979a, p. 4; Ferreira 1987, p. 22; Pavlik *et al.* 2002, pp. 21–23). Physical processes, such as wave action, lake level fluctuations, and the erosive forces of the wind, heavily influence substrate characteristics. *Rorippa subumbellata* is also often associated with sand beaches near the mouths of streams, likely due to the relatively greater availability of sediment and soil moisture due to a shallow water table in these locations (Pavlik *et al.* 2002, p. 22).

Due to this, *Rorippa subumbellata* habitat is confined to a narrow elevation range between the natural rim of Lake Tahoe, which occurs at 6,223.0 feet (ft; 1,896.8 meters (m)) above mean sea level, Lake Tahoe Datum (LTD), and the high water line at 6,229.1 ft (1,898.6 m) LTD (Stanton 2015, p. 12) (see Figure 2). Data collected over the last 35 years (1979–2014) indicate a statistically significant relationship between lake level and site occupancy by *R. subumbellata* (Pavlik *et al.* 2002, pp. 42–46; Service 2004, p. 9; Stanton 2015, p. 15). New, unoccupied sites can be colonized, and old occupied sites can be extirpated or recolonized, based on habitat availability directly influenced by lake level.

Figure 2. Habitat of *Rorippa subumbellata*. Photo: Aaron Sims 2011

Observations amassed since the species was last elevated to candidate status (in 1999) have revealed that *Rorippa subumbellata* is a prolific seeder and exhibits vigorous clonal growth (Stanton 2015, p. 11). Fruit and seed development are continuous during the growing period from May through October, and the high proportion of flowers that produce fruits suggests that the species can self-fertilize (Pavlik *et al.* 2002, p. 18; Stanton 2015, p. 11); however, flowers are also visited by a variety of generalist flies and bees (Gordeev *et al.* 1997, entire; Pavlik *et al.* 2002, p. 18). In the summer, large accumulations of seeds have been observed in and around *R. subumbellata* plants, likely transported by both wind and water (Pavlik *et al.* 2002, p. 19; Stanton 2015, p. 11).

Vegetative reproduction of *Rorippa subumbellata* results from a complex network of underground roots that segment and give rise to aerial stems (Pavlik *et al.* 2002, p. 18; Stanton 2015, p. 11). On the soil surface, these stems appear as individuals; however, they are connected below the surface by an extensive system of lateral and vertical roots (BMP Ecosciences 2010, p. 9). During the winter, aboveground stems of *R. subumbellata* die back, and the underground roots go dormant until conditions allow them to re-sprout. Underground roots are also able to tolerate flooded conditions for an unknown period of time (Stanton 2015, p. 11).

Historical and Current Range/Distribution

Rorippa subumbellata is endemic to the shores of Lake Tahoe in California and Nevada (see Figure 4). Complete, rangewide surveys for *R. subumbellata* populations were not conducted prior to 1979; thus, definitive information on the historical distribution of *R. subumbellata* is lacking. Survey efforts were undertaken periodically from1979 to 2001 to determine rangewide distribution, status, and population trends (Knapp 1979a, pp. 1–10; 1979b, pp. 1–7; 1980, pp. 1–10; Ferreira 1987, pp. 1–336; Pavlik *et al.* 2002, pp. 23–24; Stanton 2015, pp. 19–21). Counting methods varied among early surveyors, and seasonal timing of surveys was found to influence plant numbers observed, so in 2001 a standardized survey method was implemented (Pavlik *et al.* 2002, p. A–45). In the 35-year period from 1979 to 2014, each site has been surveyed between 10–28 times; surveys were not conducted in 1984, 1985, 1987, 1989, 2010, and 2013 (See Description of Monitoring below; Stanton 2015, pp. 12–13; Appendix C). Since 2001, surveys for *R. subumbellata* have been conducted during the first week of September (Pavlik *et al.* 2002, p. A–45; Stanton 2015, p. 12).

Survey data demonstrate that *Rorippa subumbellata* distribution fluctuates yearly in response to lake level, which determines the amount of exposed habitat. When the lake level is high, 6,227 ft (1,898.0 m) or above, many sites are inundated and unavailable for that year's plant growth; when the lake level is low, below 6,224 ft (1,897.1 m), more habitat is exposed and available for colonization (Figure 3). Lake levels between 6,225 and 6,226 ft (1,897.4 –1,897.7 m) are considered to be transitional between high and low lake levels (Stanton 2015, p. 12). This pattern in quantified in the following paragraphs.

In the first survey conducted in 1979, *Rorippa subumbellata* was recorded at 25 of the 34 surveyed sites around Lake Tahoe (Knapp 1980, p. 6; Stanton 2015, p. 8, Appendix C). Lake Tahoe filled to capacity after a record snowfall in 1982 and created subsequent years of high lake levels. A prolonged regional drought from 1988 to 1994 resulted in sustained low lake levels which exposed large expanses of the shorezone (CSLC 1996, p. 39; Pavlik *et al*. 2002, p. 42; Stanton 2015, Appendix C). In 1993, lake elevation averaged 6,223 ft (1,897 m) and plants were documented at 37 of 43 surveyed sites (CSLC 1994, pp. 36–37; Stanton 2015, p. 8; Appendix C). The drought ended in 1995 and Lake Tahoe once again filled and inundated most *R. subumbellata* occurrences. During the period of high lake levels from 1995–2000, the species was present at only 7 to 15 of the 34 to 46 surveyed sites (Stanton 2015, Appendix C).

By 2001 the lake elevation again began to decline, exposing hundreds of acres of habitat. In 2001, *Rorippa subumbellata* was present at 26 of 47 surveyed sites; 7 of these occupied sites were in areas that had been submerged during annual surveys dating back to 1997 (CSLC 2002, p. 3; Stanton 2015, Appendix C). In 2002, as the lake level declined further (to the lowest elevation since 1994), *R. subumbellata* was present at 35 of the 49 surveyed sites (Stanton 2015, Appendix C). Site occupancy by the species remained high in 2003 and 2004, with the species present at 39 and 42 out of 51 surveyed sites each year, respectively, due to continued low lake-elevation (Service 2004, p. 4; Stanton 2015, Appendix C).

In 2005, the lake level rose nearly 2 ft (0.6 m), inundating many survey sites that had been exposed in previous years. However, site occupancy remained reasonably high, with *Rorippa subumbellata* present at 40 of 49 surveyed sites (BMP Ecosciences 2006, p. 4; 2011, unpubl.

data). The following year (2006), the lake level was 3 ft (0.9 m) higher than the previous year and site occupancy dropped to 24 of 52 surveyed sites (BMP Ecosciences 2007, p. 8; Stanton 2015, Appendix C). From 2007 to 2009, lake elevation declined again, dropping back to the 2005 level in 2007, and continuing to fall in 2008 and 2009, when it was at an elevation of 6,224.1 ft (1,897.1 m) and 6,223.5 ft (1,896.9 m), during the plant survey periods. Consistent with prior patterns, site occupancy by *R. subumbellata* again increased with declining lake levels, with the species present at 26 of 53 surveyed sites in 2007 (BMP Ecosciences 2008, p. 11), 38 of 52 surveyed sites in 2008 (BMP Ecosciences 2009, p. 10), and 40 of 54 surveyed sites in 2009 (BMP Ecosciences 2010, p. 21; Stanton 2015, Appendix C). Another consecutive low water-year in 2010 kept the lake level at an elevation of 6,224.6 ft (1,897.3 m); thus, surveys were not conducted (see Description of Monitoring section below). Site occupancy declined with rising lake levels in 2011 (elevation of 6,228.4 ft (1,898.4 m)—3.8 ft (1.2 m) higher than in 2010), with the species present at only 25 of the 53 surveyed sites. However, site occupancy again increased in 2012, when the lake level was 1.6 ft (0.49 m) lower (elevation of 6,226.8 ft (1,897.9 m)) than in 2011, with plants present at 29 of 52 surveyed sites (Stanton 2015, Appendix C). A consecutive low water year in 2013 kept the lake level low at an elevation of 6225.1 ft (1897.4 m), and surveys were not conducted that year, because the survey protocol established by Pavlik *et al.* 2002 (pp. 71–72, 95–96) is to survey every other year when lake level is below a specified level (see **DESCRIPTION OF MONITORING**, below). Lake level dropped again in 2014 to 6223.4 ft (1,896.9 m), and plants were present at 36 of the 49 surveyed sites (Figure 3; Stanton 2015, Appendix C).

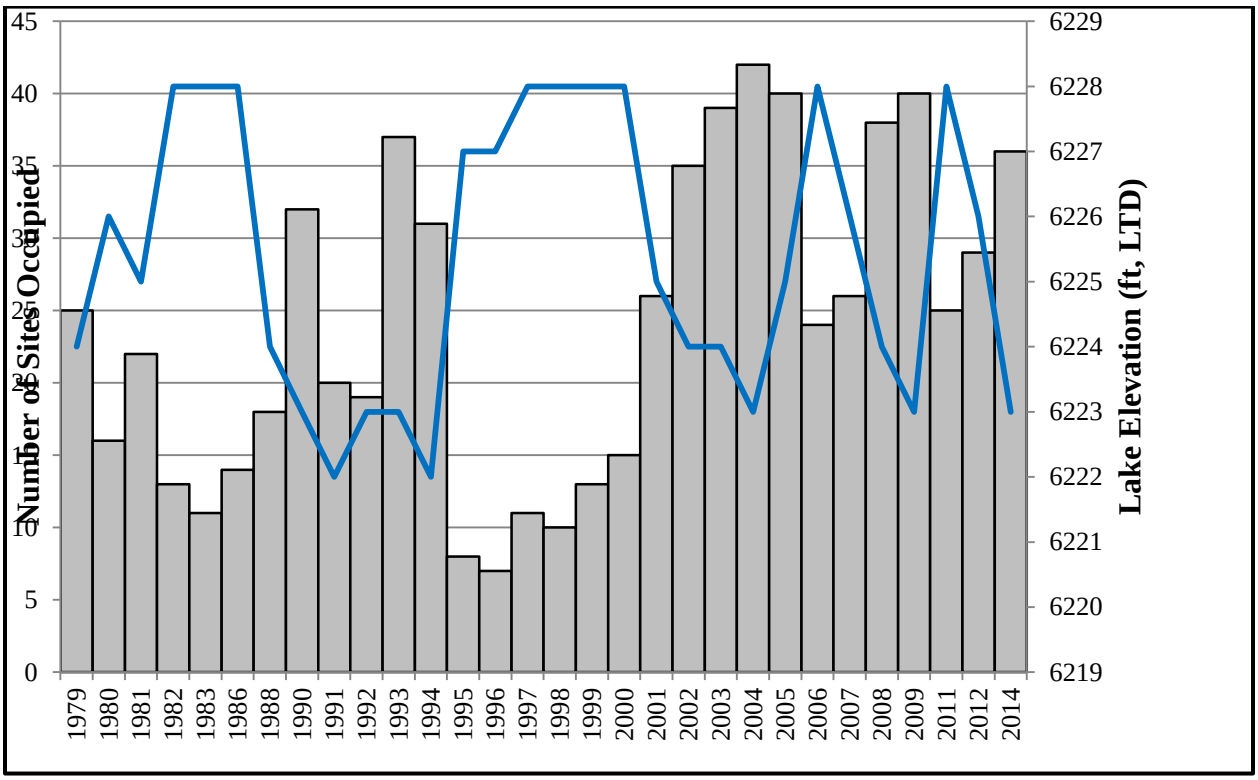

Figure 3. Surface elevation of Lake Tahoe and number of *Rorippa subumbellata* sites occupied by survey year (Stanton 2015, Appendix C) (solid blue line = lake surface elevation in feet Lake Tahoe Datum (ft LTD)). The number of sites occupied is based on site name reconciliation, and some annual totals may not match numbers in earlier reports.

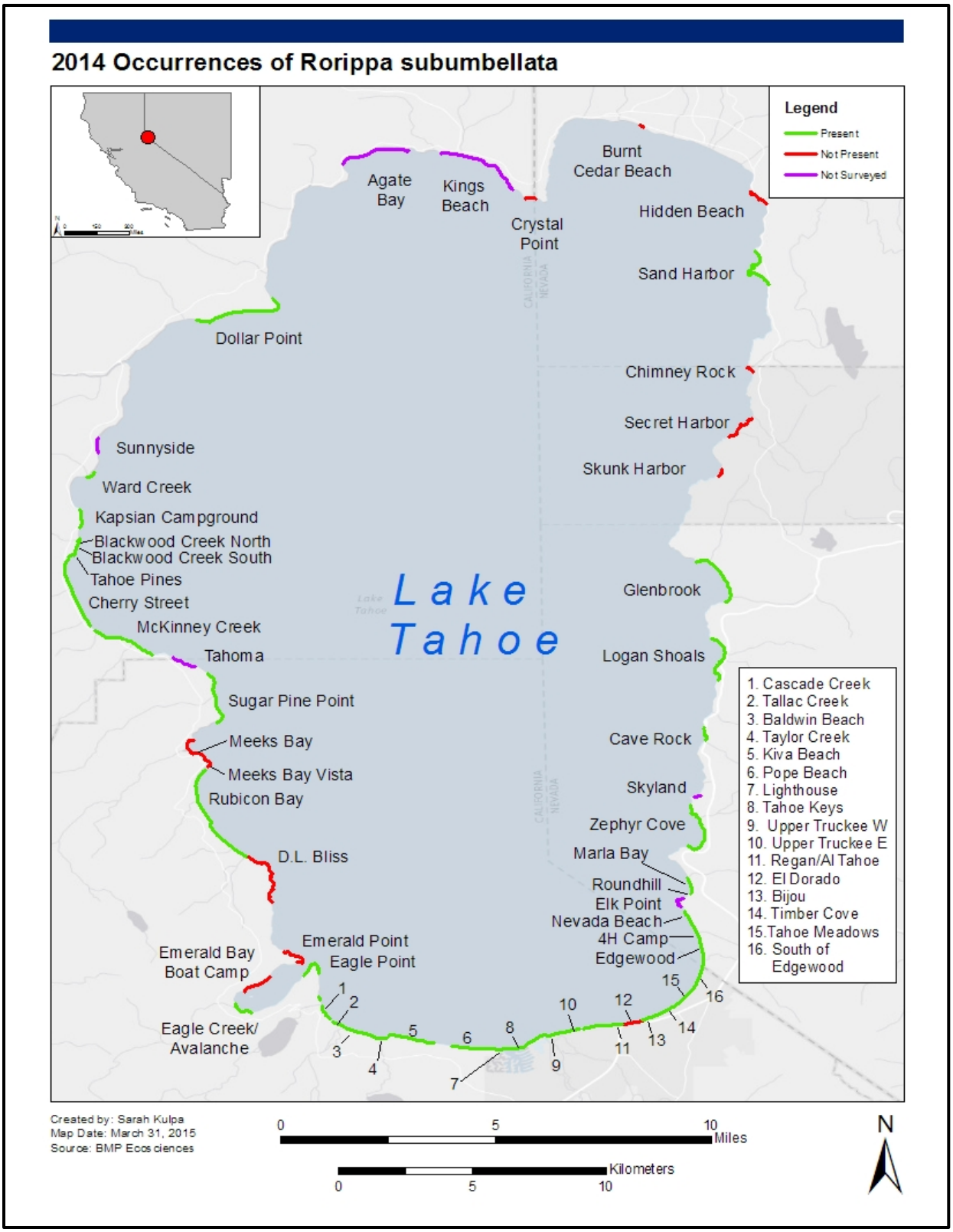

Figure 4. ***Rorippa subumbellata*** **survey sites and occurrences in 2014, Lake Tahoe, California and Nevada.**

Population Estimates/Status

Vegetative reproduction in *Rorippa subumbellata* prevents a count of the actual number of individuals; therefore, the aboveground portion of the plant (referred to as "stems") is counted (CSLC 1998, p. 38; Pavlik *et al.* 2002, p. 18; Stanton 2015, pp. 11–12). Over time, the number of stems at each site has ranged from one into the thousands. While some sites consistently support hundreds of stems, depending upon lake level, many sites typically support very few plants. For example, approximately 27,535 stems were counted or estimated at 46 sites in 2009 during low lake level (BMP Ecosciences 2010, pp. 10–23), whereas during 2006 when lake levels were high, the total estimated number of stems was 4,547 at 24 sites (BMP Ecosciences 2007, pp. 8–13). These data (Table 1) demonstrate the natural fluctuations in the number of individual stems of *R. subumbellata* are a function, in part, of lake elevation and available habitat (Pavlik *et al.* 2002, p. 49; Stanton 2015, p. 15).

Table 1. Population estimates of *Rorippa subumbellata* (2001–2014) (Stanton 2015, Appendix C**).**

Year	Lake Tahoe Water Elevation (ft / m)	Number of Sites Surveyed	Number of Occupied Sites	Number of Stems
2001	6,225 / 1,897.4	47	26	6,136
2002	6,224 / 1,897.1	49	35	20,301
2003	6,224 / 1,897.1	51	39	25,181
2004	6,223.3 / 1,896.9	51	42	13,497*
2005	6,224.8 / 1,897.3	49	40	16,384
2006	6,228.2 / 1,898.4	52	24	4,547
2007	6,226.3 / 1,897.8	53	26	11,751
2008	6,224.1 / 1,897.1	52	38	17,125
2009	6,223.5 / 1,896.9	54	40	27,535
2010	6,224.6 / 1,897.3	NA	NA	NA**
2011	6,228.4 / 1,898.4	53	25	6,494
2012	6,226.8 / 1,897.9	52	29	12,610
2013	6,225.1 / 1,897.4	NA	NA	NA**
2014	6,223.4 / 1,896.9	49	36	30,301

* The stem counting methodology changed in 2004, when all plants within 6 inches (15 centimeters) of any other plant were considered to be 1 individual. This resulted in a total number of fewer individuals at most sites. This methodology was discontinued for 2005 and subsequent surveys.
** Lake levels remained low in these years; therefore, sites were not surveyed (see Description of Monitoring below).

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

Rorippa subumbellata occurs in a dynamic environment influenced by both natural processes and human activities. Habitat occurrence and suitability are shaped by physical processes, such as fluctuations in lake elevation, wave-induced beach erosion, and changes in stream-channel

orientation, all of which may eliminate or create suitable substrates for plant growth (CSLC 1998, p. 32; Pavlik *et al.* 2002, pp. 20–23). Substrate moisture also influences the occurrence of *R. subumbellata*, as well as competition with other plant species for space, light, nutrients, and other plant requirements (Ferreira 1987, pp. 31–35). Under natural conditions, *R. subumbellata* is tolerant of the dynamic nature of its habitat and adapted for survival in a disturbance regime. Management of Lake Tahoe for water supply purposes (CSLC 1998, p. 32) and use of sites for commercial and public purposes such as recreation, erosion control, marina developments, and pier construction (CSLC 1998, pp. 32–33; Pavlik *et al.* 2002, pp. 42–43) have historically been identified as potential threats to the species.

Water Management

Operation of the Lake Tahoe Dam controls the water level in Lake Tahoe, as well as stream flows in the Truckee River downstream, and is in accordance with water rights and prior court decrees. The 1915 Truckee River General Electric Decree gave the Bureau of Reclamation (BOR) the right to operate the Lake Tahoe Dam and control the top 6.1 ft (1.9 m) of water storage in Lake Tahoe (U.S. Department of the Interior and State of California (USDI/CA) 2004, p. 1-9). Operation of the Lake Tahoe Dam must satisfy 1944 Orr Ditch Decree, maintain minimum Floriston flow rates (the rate of flow in the Truckee River at the head of the diversion penstock at Floriston, California) in the Truckee River, and comply with flood control and dam safety requirements (USDI/CA 2004, pp. 3–41 to 3–44). Releases from the dam are in accordance with the 1935 Truckee River Agreement, which prevents the lake from exceeding an elevation of 6,229.1 ft (1,898.6 m) above mean sea level (USDI/CA 2004, p. 1-9). A Federal action to modify operations of the Truckee River reservoirs through implementation of the Truckee River Operating Agreement (TROA) has been negotiated by the Secretary of the Interior in accordance with subsection 205(a) of the Truckee-Carson-Pyramid Lake Water Rights Settlement Act of 1990 (Public Law 101–618). TROA is intended to supersede the 1935 Truckee River Agreement, and would allow for additional storage, exchange, and trade of water in the upstream reservoirs of California (*United States of America* v. *Orr Water Ditch Co. et al*. 2011, p. 4).

The Department of the Interior (DOI) produced a Final Environmental Impact Statement (EIS) addressing the implementation of TROA. The effects to *Rorippa subumbellata* were examined in detail, and deemed insignificant (USDI/CA 2008, pp. 3–284 to 3–291). A Federal final rule on TROA was promulgated and published in the **Federal Register** (73 FR 74031, December 5, 2008) and took effect on January 5, 2009; however, actual implementation of TROA has not taken place due to several pending court cases (Service 2009, pp. 38–39; *United States of America* v. *Orr Water Ditch Co. et al*. 2011, p. 4; Service 2012, pp. 19–20). In light of this analysis, and 25 years of surveys illustrating the species' ability to persist amidst fluctuating lake levels (Figure 3), management of Lake Tahoe for water supply purposes is no longer regarded as a substantial threat to the species.

Recreation

Recreational use of the public beaches at Lake Tahoe constitutes the greatest manageable potential threat to *Rorippa subumbellata* and its habitat. Foot traffic and trampling by dogs may

directly destroy plants, roots, and/or seeds, and inhibit germination and recruitment of seedlings. Some beaches (mainly on private property) are maintained by regular raking by hand or machinery to keep the sand free of pine needles, rocks, wood, vegetation, and other debris. Storing boats and beach furniture on the beach reduces the amount of habitat for *R. subumbellata;* however, *R. subumbellata* has been observed growing under chairs, picnic tables, and other furniture that may provide a refuge from trampling. The impacts from these activities intensify when the lake level is high, 6,226 ft (1,897.7 m) LTD or greater, because less beach is exposed and, therefore, recreational use is concentrated (Stanton 2015, p. 23).

However, *Rorippa subumbellata* has continued to persist on beaches managed by public agencies because of actions and policy implemented by these agencies (see Factor D, Inadequacy of Existing Regulatory Mechanisms, below). For example, *R. subumbellata* cannot persist on beaches that are regularly raked. TRPA has developed beach-raking guidelines, which discourage beach raking within known habitats of *R. subumbellata* (University of Nevada Cooperative Extension 2002, p. 64). However, TRPA may issue permits to public entities on a case-by-case basis to carry out beach raking for public health and safety purposes and for continued access by the public to public recreational facilities.

Further, beaches that receive the heaviest recreational use continue to support *Rorippa subumbellata*, due to protection provided from fencing. The USFS installed the first fence to protect *R. subumbellata* from recreation impacts at Meeks Bay in 1981, with subsequent fencing following on other USFS beaches. CSP and CTC also have fences installed on their beaches to protect *R. subumbellata* from trampling (Stanton 2015, p. 23). Public outreach and education on the impacts of recreation to *R. subumbellata* and conservation of the species are central parts of the Stewardship Program which are described below in Conservation Measures Planned or Implemented.

Development

Human-created disturbances in the shorezone of Lake Tahoe can contribute to the loss and degradation of *Rorippa subumbellata* and its habitat. Structures that extend into the water, such as boat launches, piers, and marinas, are a possible impediment to the natural transport of sand along the shoreline, which may decrease beach habitat. In addition, new construction and the ongoing maintenance of these structures also poses a direct threat to the habitat of the species (CSLC 1998, p. 33; Pavlik *et al.* 2002, p. 11). Lakeshore structures may also affect propagule transport, which is important to the colonization of new sites and the recolonization of extirpated sites.

TRPA regulations, described in detail in Factor D, Inadequacy of Existing Regulatory Mechanisms, below, limit the type and amount of development that can occur in the shorezone of Lake Tahoe. Up until 1987 and the adoption of the TRPA Regional Plan, a significant amount of development occurred in the shorezone (*i.e.*, boat ramps, jetties, fences, marinas, piers, retaining walls, etc.). Since 1987, projects to maintain, expand, or modify existing structures in the shorezone have not been permitted by TRPA if they could adversely impact *Rorippa subumbellata*. As a consequence, it has been possible to avoid impacts to *R. subumbellata* in projects occurring lakeward of the high water line. TRPA is currently operating a partial

permitting program that prevents the permitting of new boat launch facilities, but allows for limited permitting of other types of shorezone development above the high water line (Stanton 2015, p. 24). The full permitting program is unlikely to be implemented until new Shorezone Ordinances are adopted by TRPA. When these new Shorezone Ordinances are adopted, protection for *R. subumbellata* will be equal to current regulations (Stanton 2015, pp. 24–25).

Environmental Improvement Projects (EIPs) are another type of development project that may occur in the shorezone to improve environmental thresholds, such as water quality or forest health. For example, the Bijou Area Erosion Control Project was implemented by the City of South Lake Tahoe in 2013 and 2014. *Rorippa subumbellata* was found on a lakefront parcel within the project area, such that impacts could not be avoided. The plants were growing in an atypical location and were being maintained by irrigation of a neighboring lawn that was to be removed as part of the project. California Department of Fish and Wildlife (CDFW; formerly California Department of Fish and Game) determined that the project could have a potentially significant adverse impact on *R. subumbellata*, and required on-site mitigation (Nevada Tahoe Conservation District (NTCD), 2011). The City of South Lake Tahoe salvaged the plants and placed them in a greenhouse, where additional container grown plants were grown to meet a 3:1 mitigation ratio required by the CDFW incidental take permit. After the salvage, a culvert system with an open rock lined outfall to Lake Tahoe was installed in the same location, but further lakeward by about 30 ft (9.1 m). In 2014, 30 naturally occurring *R. subumbellata* stems were observed among the rocks in the outfall (Stanton 2015, p. 25; S. Roll, pers. comm. 2015).

Summary of Factor A

Rorippa subumbellata is well adapted to its dynamic shorezone environment and is capable of recolonizing sites after periods of inundation, temporary habitat loss, and minor degradation of habitat by recreation or development activities. Ongoing and potential scenarios for alternate management of lake elevations under TROA no longer appear to be a threat to the species' continued existence. Impacts from recreation and development are of less concern than previously identified, given the species' inherent prolific capacities for reproduction, in combination with ongoing management via fencing, signage, effective implementation of shorezone ordinances, and adherence to beach raking guidelines.

B. <u>Overutilization for commercial, recreational, scientific, or educational purposes</u>.

There is no evidence of threats to *Rorippa subumbellata* from commercial, recreational, scientific, or educational overutilization.

C. <u>Disease or predation</u>.

There are no known threats to *Rorippa subumbellata* from disease or predation.

D. <u>The inadequacy of existing regulatory mechanisms</u>.

Activities in the Lake Tahoe basin, including use of the shorezone on both public and private lands, are regulated under various Federal and State laws, as well as agency policies and

management direction, many of which include provisions with varying levels of protection for *Rorippa subumbellata*.

Federal Protections

National Environmental Policy Act (NEPA)

NEPA (42 U.S.C. 4371 *et seq*.) requires all Federal agencies to formally document and publicly disclose the environmental impacts of Federal undertakings and their alternatives. Such NEPA documentation is provided in an environmental impact statement, environmental assessment, or categorical exclusion and may be subject to administrative appeal or litigation. The USFS complies with NEPA for actions requiring an environmental assessment, including many projects in or near *Rorippa subumbellata* habitat. Federal agencies are not required to select the NEPA alternative (*e.g.*, beach management and development activities) having the least significant environmental impacts, and may select an action that will adversely affect sensitive species, provided that these effects were known and identified in a NEPA document. However, we are unaware of this precedent having occurred with regard to *R. subumbellata*; therefore, ongoing administration of NEPA by Federal entities at Lake Tahoe is not regarded as a threat to the species.

Clean Water Act (CWA)

Under section 404 of the CWA, the U.S. Army Corps of Engineers (ACOE) regulates the discharge of fill material into waters of the United States, which include navigable and isolated waters, headwaters, and adjacent wetlands (33 U.S.C. 1344). In general, the term "wetland" refers to areas meeting the ACOE's criteria of hydric soils, hydrology (either sufficient annual flooding or water on the soil surface), and hydrophytic vegetation (plants specifically adapted for growing in wetlands). Any action with the potential to impact waters of the United States must be reviewed under the CWA and NEPA. These reviews require consideration of impacts to listed species and their habitats, and recommendations for mitigation of significant impacts. Since *Rorippa subumbellata* is a candidate species, the ACOE does not analyze effects to this species under these laws. However, for all shorezone permitting (*e.g.*, boat launch, pier, and marina development) involving *R. subumbellata* at Lake Tahoe, TRPA has established guidelines which the ACOE may include in some of their CWA permitting processes. These TRPA guidelines are discussed below (see subsection TRPA).

National Forest Management Act (NFMA)

Under the NFWA, as amended (NFMA) (16 U.S.C. 1600 *et seq*.), the USFS is tasked to manage National Forest lands based on multiple-use, sustained-yield principles, and implement land and resource management plans (LRMP) on each National Forest to provide for a diversity of plant and animal communities. The purpose of an LRMP is to guide and set standards for all natural resource management activities for the life of the plan (10 to 15 years). NFMA requires the USFS to incorporate standards and guidelines into LRMPs. The 1982 planning regulations for implementing NFMA (47 FR 43026; September 30, 1982), under which all existing forest plans in the Sierra Nevada were prepared until recently, guided management of National Forests and

require that management practices shall preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species on National Forest system lands. Reduction in diversity of plant and animal communities may be prescribed only where needed to meet overall multiple-use objectives.

On April 9, 2012, the USFS published a final rule (77 FR 21162) amending 36 CFR 219 to adopt new National Forest System land management regulations to guide the development, amendment, and revision of LRMPs for all Forest System lands. These revised regulations, which became effective on May 9, 2012, replace the 1982 planning rule.

Under this new planning rule, the USFS is proposing to revise the 1988 LRMP for the Lake Tahoe Basin Management Unit (LTBMU). Plan revision would provide an updated Forest Plan for the LTBMU that would guide management of the USFS lands in the Lake Tahoe Basin for approximately the next 15 years (LTBMU 2013a, p. ES-1). The current Forest Plan (alternative A) addresses species conservation through a threshold concept—mandating that a minimum number of sites be preserved for *Rorippa subumbellata*. In all action alternatives (B, C, D) and the preferred alternative (E), *R. subumbellata* conservation is managed through a species conservation area (SCA) concept—conserving and enhancing suitable habitat for species, whether currently occupied or not. For a species like *R. subumbellata*, in which the extirpation of certain occurrences and creation of new occurrences is expected as a result of population dynamics associated with lake level, the establishment of SCAs provides the ability to adapt with changing conditions (LTBMU 2013a, pp. 3-140 to 3-141).

Under alternatives B, C, D and the preferred alternative E, Species Refuge Areas (SRAs) would also be established for *Rorippa subumbellata*. SRAs are defined as areas of quality habitat for federally threatened, endangered, candidate, or proposed species that are currently providing habitat or may provide habitat needed for future recovery for a species (LTBMU 2013a, pp. 2-3, 2-7, and 2-40). SRA strategies for *R. subumbellata* include: (1) Work collaboratively with partners to implement a public-private *R. subumbellata* adaptive framework, including (but not limited to): continued participation in the Executive Committee and Adaptive Management Working Group; continued monitoring of *R. subumbellata* occurrences; encouragement of *R. subumbellata* stewardship on private lands; and site-specific conservation and restoration efforts; (2) continue *R. subumbellata* public outreach and education efforts; (3) balance conservation of known *R. subumbellata* occurrences and high quality habitat with development and use of recreational facilities and access; and (4) revise site-specific *R. subumbellata* management plans to allow for adaptive management of known occurrences and high quality habitat that addresses both the annual shifts in habitat and threat level associated with lake level changes, and the provision of adequate beach access for recreational users (LTBMU 2013b, pp. 60–61). Therefore, ongoing administration of NFMA by the USFS at Lake Tahoe is working as intended to conserve the species, and should improve under the new LRMP for the LTBMU.

USFS Manual 2670 et seq.

Rorippa subumbellata is included on the list of USFS Sensitive Species for the LTBMU (USFS 2011, p. 12). Sensitive Species are managed under Forest Service Manual 2670 *et seq*., and are defined as any species of plant or animal that has been recognized by the Regional Forester to

need special management in order to prevent them from becoming threatened or endangered. The USFS, which manages about 27 percent of the known *R. subumbellata* sites, develops and implements management practices that ensure species do not become threatened or endangered as a result of their actions. Management activities for *R. subumbellata* on USFS lands have included annual surveys, construction of a number of protective enclosure fences around major occurrences, placement of informative signs on the enclosures and elsewhere to educate the public about the species, and transplanting programs. As with any similarly-designated sensitive species, the commitment to continue such activities for *R. subumbellata* is dependent upon annual funding, staffing and other USFS priorities in the Lake Tahoe basin. However, the agency has an excellent track record of effectively implementing conservation actions for the species amidst such ongoing constraints.

Tahoe Regional Planning Agency (TRPA)

The Tahoe Regional Planning Compact of 1969 (Public Law 96–551), as revised, established the TRPA, a bi-State entity authorized to develop environmental threshold carrying capacities for the Lake Tahoe basin, which are to be achieved through the development of a regional plan and implementing ordinances. All applications for shorezone development are reviewed by TRPA to ensure that *Rorippa subumbellata* populations and habitats are not disturbed. Shorezone activities regulated by TRPA include construction of new structures (*e.g.*, piers, jetties, breakwaters, boat ramps, boat houses, fences, buoys, shoreline protective structures, and marinas), modifications (major structural repair, reconfiguration, and expansions), and other activities, including salvage operations, tour boat operations, waterborne transit, and seaplane operations.

Historically, shorezone ordinances at Lake Tahoe were managed under the 1987 TRPA Regional Plan. In 2006, TRPA released a Final EIS on a proposed shorezone program that would amend the 1987 Regional Plan (TRPA 2006, entire). Amended ordinances were adopted on October 26, 2008, and took effect on December 22, 2008 (TRPA 2008, pp. 2–3). The new ordinances allowed an additional 138 piers, 1,862 buoys, 6 boat ramps, and 235 boat slips to be constructed by 2027 (TRPA 2008, pp. 2–3); new piers had previously been prohibited in prime fish habitat (TRPA 2008, p. 1). In the case *League to Save Lake Tahoe and Sierra Club* v. *TRPA* (No. 2:08-cv-02828-LKK-GGH), the plaintiffs filed a Complaint alleging that the adoption of TRPA's 2008 shorezone ordinances violated the Tahoe Regional Planning Compact and the implementing Code of Ordinances. In September 2010, TRPA's 2008 shorezone amendments were vacated (*League to Save Lake Tahoe and Sierra Club* v. *TRPA* 2010, pp. 65–66), and TRPA reverted to operating under the 1987 Regional Plan. Since the ruling, TRPA has worked to update the 1987 Regional Plan. In 2012, the existing Lake Tahoe Regional Plan Goals and Policies and the Code of Ordinances were amended. The amendments came into effect on February 9, 2013.

The 2013 TRPA Regional Plan includes an entirely new set of Goals and Policies that specifically address *Rorippa subumbellata* in the Vegetation and Forest Health chapter of the amended Code of Ordinances. Under the 2013 Code of Ordinances, all projects and activities that are likely to harm, destroy, or otherwise jeopardize *R. subumbellata* and its associated habitat must mitigate their significant adverse effects. Projects and activities that cannot fully

mitigate their significant adverse effects are prohibited. Measures to protect *R. subumbellata* and its habitat include: (1) Fencing to enclose individual populations or habitat; (2) restrictions on access or intensity of use; (3) modifications to project design as necessary to avoid adverse impacts; (4) dedication of open space to include entire areas of suitable habitat; and (5) restoration of disturbed habitat (TRPA 2012, pp. 61-22). In addition, the TRPA has developed beach-raking guidelines, which discourage beach raking within known habitats of *R. subumbellata* (University of Nevada Cooperative Extension 2002, p. 64).

State Protections in California

California Endangered Species Act (CESA)

Rorippa subumbellata is listed as an endangered species by the State of California. The CESA of 1984 (California Fish and Game Code, section 2080 *et seq*.) prohibits the unauthorized take of State-listed threatened or endangered species. State agencies are required to consult with the CDFW) on activities that may affect a State-listed species and mitigate for any adverse impacts to the species or its habitat. Pursuant to CESA, it is unlawful to import or export, take, possess, purchase, or sell any species or part or product of any species listed as endangered or threatened. The State may authorize permits for scientific, educational, or management purposes and to allow take that is incidental to otherwise lawful activities.

The California State Lands Commission (CSLC) administers the State's fee ownership to the bed of Lake Tahoe from 6,223 ft (1,896.7 m) elevation lakeward and a public trust easement between 6,223 ft (1,896.7 m) and 6,228.8 ft (1,898.5 m) elevation. Public and private entities must apply to CSLC for permits to construct marinas and other structures on State lands or waters. In consultation with CDFW, CSLC provides review under CEQA and CESA for discretionary projects in the shorezone and requires mitigation for all projects under their jurisdiction.

Native Plant Protection Act (NPPA)

The NPPA of 1977 (California Fish and Game Code, sections 1900–1913) allows the CDFW to designate plants as rare or endangered. The NPPA prohibits take of endangered or rare native plants, but includes some exceptions for agricultural and nursery operations, emergencies, vegetation removal from canals, roads, and other sites, changes in land use, and in certain other situations (Division 2, Chapter 10, section 1908). A landowner wishing to exercise an exception must notify CDFW 10 days before beginning work, and CDFW has 10 days to salvage affected listed plants.

California Environmental Quality Act (CEQA)

The CEQA of 1970 (California Public Resources Code § 21000 *et seq*.) requires review of any project that is undertaken, funded, or permitted by the State or a local governmental agency. If significant effects are identified, the lead agency has the option of requiring mitigation through changes in the project or to decide that overriding considerations make mitigation infeasible (CEQA section 21002).

California Code of Regulations Title 14 §4306

California State Park laws were established to protect the park resources, to administer the parks, and to maintain the park atmosphere. Under California Code of Regulations Title 14 §4306, no person shall pick, dig up, mutilate, destroy, injure, disturb, move, molest, burn, or carry away any tree or plant, or any portion of a tree or plant within California State Park boundaries. Violation is considered a misdemeanor (Cal. Code Regs. Tit. 14 §4306). In addition, CDPR is required, under CEQA and CESA, to manage populations of *Rorippa subumbellata* on California State Park lands so as to ensure that their actions do not jeopardize the species. *R. subumbellata* occurs at California State Parks (Emerald Bay, D.L. Bliss, and Sugar Pine Point) along Lake Tahoe in California.

State Protections in Nevada

Nevada Revised Statutes (N.R.S.) 527.260–.300 and Nevada Administrative Code (N.A.C) 527.010

Rorippa subumbellata has been declared by the Nevada Division of Forestry (NDF) to be threatened with extinction pursuant to N.R.S. 527.260–.300, and it was added to the State list of fully protected species of native flora (N.A.C. 527.010) in 1983. Removing or destroying plants on the State's fully protected list is prohibited except under special permit issued by NDF (N.R.S. 527.270).

N.R.S. 407.013 and 527.050

The Nevada Division of State Parks (NDSP) acquires, protects, develops, and interprets a well-balanced system of areas of outstanding scenic, recreational, scientific, and historical importance for the inspiration, use, and enjoyment of the people of the State of Nevada which are held in trust as irreplaceable portions of Nevada's natural and historical heritage (N.R.S. 407.013). It is unlawful to cut, destroy, mutilate, pick, or remove any flora on State lands. Violation is considered a public offense (N.R.S. 527-050). *Rorippa subumbellata* occurs at Lake Tahoe Nevada State Park (Hidden Beach, Cave Rock, and Sand Harbor areas) along Lake Tahoe in Nevada. The NDSP follows TRPA's Code of Ordinances to manage their shorezone areas (NDSP 2010, p. I–5).

Summary of Factor D

Approximately 27 percent of the species' habitat is managed by the USFS; available information suggests that existing regulatory mechanisms implemented by that agency are adequate to ensure the species' conservation. The remaining habitat is regulated under prior and recently revised shorezone ordinances promulgated by the TRPA; these ordinances also appear to be working as intended to conserve the species. The States of California and Nevada provide some regulatory protection to *Rorippa subumbellata* through their endangered species statutes; and various agencies in each State have management programs for *R. subumbellata* and its habitat on lands under their management. As a result, we have determined that the existing regulatory mechanisms are working as intended to help conserve *R. subumbellata* and its habitat and are not inadequate.

E. Other natural or manmade factors affecting its continued existence.

Stochastic Events

Small populations like those of *Rorippa subumbellata* have a higher risk of extinction due to demographic and environmental uncertainty and natural catastrophes (Shaffer 1987, pp. 69–75; Lande 1993, pp. 911–927). An analysis of 693 *R. subumbellata* individuals from 28 sites revealed low levels of genetic variation (DeWoody and Hipkins 2004, entire), suggesting that a single environmental or disease anomaly could eradicate the entire population, since individuals are so genetically similar. However, although *R. subumbellata* is certainly a narrow-ranging endemic confined to one location (Lake Tahoe), the species has persisted for decades amidst sustained fluctuations in lake level, accompanied by various intensities and types of human use of public and private shorelines. Over this time period, there has been no evidence of stochastic events having appreciably affected the status or distribution of the species.

Climate Change

Our analyses under the Act includes consideration of ongoing and projected changes in climate. The terms "climate" and "climate change" are defined by the Intergovernmental Panel on Climate Change (IPCC). The term "climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements (IPCC 2013, p. 1450). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, whether the change is due to natural variability or human activity (IPCC 2013, p. 1450).

Various changes in climate may have direct or indirect effects on species. These effects may be positive, neutral, or negative, and they may change over time, depending on the species and other relevant considerations, such as threats in combination and interactions of climate with other variables (*e.g.*, habitat fragmentation) (IPCC 2014, pp. 4–11). Identifying likely effects often involves aspects of climate change vulnerability analysis. Vulnerability refers to the degree to which a species (or system) is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the type, magnitude, and rate of climate change and variation to which a species is exposed, its sensitivity, and its adaptive capacity (Glick *et al*. 2011, pp. 19–22; IPCC 2014, p. 5). There is no single method for conducting such analyses that applies to all situations (Glick *et al*. 2011, p. 3). We use our expert judgment and appropriate analytical approaches to weigh relevant information, including uncertainty, in our consideration of the best scientific information available regarding various aspects of climate change.

Over the last 100 years at Lake Tahoe, the daily minimum temperature increased by 4.2 degrees Fahrenheit (°F) (2.3 (degrees Celsius (°C)) and daily maximum temperature rose by 1.7 °F (0.9 °C) (Tahoe Environmental Research Center (TERC) 2014, p. 7.1). The number of days per year with an average temperature at or below freezing declined by 27 days since 1911 (TERC 2014, p. 7.2). The amount of precipitation that falls as snow has already declined from 51 percent to 35 percent, and snowmelt now begins an average of 2 weeks earlier than it did in 1960 (TERC

2014, pp. 7.6–7.7). Additionally, there is a gradient in precipitation from west to east across Lake Tahoe, with almost twice as much precipitation falling on the west side of the lake (TERC 2014, p. 7.4).

Various changes in climate may have direct or indirect effects on *Rorippa subumbellata.* An earlier snowmelt could release this species from dormancy earlier, which may alter phenology and extend its growing season (Stanton 2015, p. 25). An increase in dry conditions on the eastern side of the lake could affect the establishment and growth of *R. subumbellata* in Nevada. A sustained low lake level does create more habitat for *R. subumbellata*; however, sustained low lake levels could also lead to increased competition with other beach vegetation. Less precipitation would also reduce flows in the streams that feed into Lake Tahoe which could alter the quality of habitat at stream mounts and affect the stream channel forming processes that create and maintain swales and berms where *R. subumbellata* thrives (Stanton 2015, p. 26). However, whether viewed individually or collectively, these effects are speculative, and cannot be confidently characterized as generating a risk of extinction in the near future.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

Conservation Strategy

When the Service reinstated *Rorippa subumbellata* as a candidate for Federal listing in 1999, the Tahoe Yellow Cress Technical Advisory Group (TAG) (comprised of public agencies, private landowners, and environmental groups), convened late that year to develop a species-specific Conservation Strategy (CS) coupled with a Memorandum of Understanding/Conservation Agreement (MOU/CA). Through the participation of academicians and scientists with expertise in rare plant conservation, this effort combined all of the data previously collected on *R. subumbellata* through the 2000 annual survey. This information was translated into goals and objectives for the strategy, along with a research and monitoring agenda, and provided a foundation for an adaptive management program that remains in operation to this day. The *Conservation Strategy for Tahoe Yellow Cress* was finalized in August 2002 (Pavlik *et al.* 2002).

Since 1999, representatives that helped establish the CS have since been meeting quarterly as the Tahoe Yellow Cress Adaptive Management Working Group (AMWG), under the oversight of the Tahoe Yellow Cress Executive Committee (Executives). In January 2003, a total of 13 Executive entities signed a MOU/CA (MOU 2003, entire) to cooperatively and voluntarily implement the CS for a period of 10 years. These entities included:

- California Department of Fish and Wildlife (CDFW),
- California State Lands Commission (CSLC),
- California State Parks (CSP),
- California Tahoe Conservancy (CTC),
- League to Save Lake Tahoe (LTSLT),
- Nevada Division of Forestry (NDF),
- Nevada Division of State Lands (NDSL),
- Nevada Division of State Parks (NDSP),

- Nevada Natural Heritage Program (NNHP),
- Tahoe Lakefront Owners' Association (TLOA),
- Tahoe Regional Planning Agency (TRPA),
- U.S. Fish and Wildlife Service (Service)
- U.S. Forest Service (USFS)

In June 2013, a new MOU/CA was signed by all of these original signatories, extending agency commitments in protecting *Rorippa subumbellata* for another 10 years (MOU 2013, entire). A substantive update to the CS is in draft and is anticipated to be finalized in 2015 (Stanton 2015, entire). This revision synthesizes the management and mitigation actions that have been undertaken over the past 10 years, and describes the relative effectiveness of these actions in conserving *R. subumbellata*.

Pavlik *et al*. (2002, pp. 65–72) identified six primary goals for *Rorippa subumbellata:* (1) Protect occupied habitat and potentially suitable habitat that does/could support natural populations; (2) improve *R. subumbellata* populations; (3) promote conditions that favor a positive metapopulation dynamic; (4) conduct research that directly supports management and restoration; (5) revise and continue the monitoring program for *R. subumbellata*; and (6) implement an interagency adaptive management framework. Stanton (2015, p. 32) has modified these goals to improve relevancy and reflect research and management actions conducted since Pavlik *et al*. (2002). The new goals for *R. subumbellata* management are as follows: (1) Protect *R. subumbellata* stems and habitat on public lands; (2) promote stewardship, protection, and awareness of *R. subumbellata* on private lands; (3) manage *R. subumbellata* occurrences to promote persistence; (4) utilize key management questions to direct research that supports management and conservation; (5) continue the adaptive survey strategy; and (6) continue the adaptive management process (Stanton 2015, p. 31).

Independent of the AMWG, the USFS, CTC, and CDPR have implemented management programs for *Rorippa subumbellata*, which include monitoring, fenced enclosures, and transplanting efforts when funds and staff are available. For example, the CTC purchased the Barton property (Upper Truckee East) in 2001 which supports one of the largest occurrences of *R. subumbellata* (Pavlik *et al*. 2002, p. 6), and CDPR reestablished an extirpated population on Lester Beach at D.L. Bliss State Park through a program of outplanting, fencing, and monitoring (Pavlik *et al.* 2002, p. 5).

USFS has eight *Rorippa subumbellata* enclosures at various beaches around Lake Tahoe (LTBMU 2013a, p. 3-414). Funding for *R. subumbellata* conservation has been secured in recent years through the Service, BOR, and the Southern Nevada Public Lands Management Act (SNPLMA) of 1998 (P.L. 105–263, as amended), as well as appropriated money from various other Federal, State, and local agencies.

Several rounds of funding from SNPLMA have been awarded to support *Rorippa subumbellata* conservation. The Round 6 award of $350,000 to the USFS allocated $200,000 for contracting and $150,000 to support USFS staff time and other products. The USFS awarded a contract for $109,950 of the Round 6 funds to BMP Ecosciences in April 2007 to support research and

AMWG participation that was completed in early 2009. A second contract for $81,000 in remaining Round 6 funds was awarded to BMP Ecosciences in April 2008 to continue with research and additional AMWG-specified tasks. A Round 7 SNPLMA award of $150,000 to the USFS specified $50,000 for contracting with the remainder for USFS use. The USFS awarded $50,000 of Round 7 funds to the University of Nevada Reno, to conduct microsatellite DNA analysis. The Natural Resources Conservation Service (NRCS) received two awards of $45,000 each in Rounds 8 and 9 to provide technical support to private property owners and help to develop site-specific plans for *R. subumbellata* conservation. The USFS received a Round 9 award of $120,000, of which $20,000 was awarded to BMP Ecosciences to continue AMWG participation, coordinate the annual survey, and report on *R. subumbellata* data from late 2010 through 2011 (BMP Ecosciences 2011, p. 6). Finally, in 2012, BMP Ecosciences was awarded $81,964 for renewing and refining the *R. subumbellata* Conservation Strategy through incorporation of new science and management tools (BLM 2012; *http://www.blm.gov/nv/st/en/snplma/snplma_prephase_1.html*, accessed April 22, 2015).

Management Tools

Many management tools for *Rorippa subumbellata* have been developed and implemented since adoption of the Conservation Strategy for the Tahoe Yellow Cress. Many of the tools have emerged directly from field research that developed or refined methodology for *R. subumbellata* seed collection, greenhouse propagation, outplantings, and translocation. Other tools, like habitat restoration and fencing, have not changed significantly, but the education and outreach materials have evolved with the development of the Stewardship Program (Stanton 2015, p. 55).

The Stewardship Program was developed in 2007 as a cooperative effort between NRCS, NTCD, Tahoe Resource Conservation District (Tahoe RCD), and the AMWG. The program provides private landowners an opportunity to choose from a range of conservation measures to create a customizable conservation plan for *Rorippa subumbellata* on their property (Stanton 2015, p. 77). To date, 47 Stewardship Plans have been completed in cooperation with private landowners around the lake (Stanton 2015, pp. 76–77). Additionally, the Stewardship Program has conducted container-grown outplantings of *R. subumbellata* as part of private land Stewardship Plans and on public lands around the lake (Stanton 2015, p. 77).

Fencing is one of the most important tools for protecting *Rorippa subumbellata* at heavily used public sites. Fencing protects *R. subumbellata* from trampling, especially when the water level of Lake Tahoe is high. All fencing is required to meet TRPA design standards (TRPA Code 84.12.2). USFS has eight *R. subumbellata* enclosures at various beaches around Lake Tahoe (LTBMU 2013a, p. 3-414). In addition, CTC has a fence at Upper Truckee East, CSP has a fence at Sugar Pine State Park, and there is a private fence at Tahoe Meadows (Stanton 2015, p. 55).

The AMWG has created and distributed education materials on *Rorippa subumbellata* since the formation of the Stewardship Program (Stanton 2015, p. 60). The AMWG and NRCS collaborated on the production of a tri-fold brochure called “Tahoe Yellow Cress, a Unique Piece of Tahoe.” Brochures are available at a number of public beaches (Stanton 2015, p. 60). The AMWG has also developed a website to serve as a comprehensive source of information about

R. subumbellata conservation. Educational signage accompanies public fencing and private landowners have the option of adding an educational sign with their Stewardship Plan (Stanton 2015, pp. 56, 63).

A general *Rorippa subumbellata* seed collection protocol has been established. Seeds of this species have been collected and are being stored at the Rae Selling Berry Seed Bank and Rancho Santa Ana Botanic Garden (Stanton 2015, p. 63). Three nurseries (NDF Nursery in Washoe Valley, Nevada; Sierra Valley Farms in Beckwourth, California; and NRCS Plant Materials Center in Lockeford, California) have successfully propagated *R. subumbellata* in a greenhouse setting (Stanton 2015, p. 65).

An outplanting protocol for *Rorippa subumbellata* grown in nurseries has also been established. From 2003–2009, almost 10,000 container grown *R. subumbellata* plants were installed in experimental plots at 14 sites around Lake Tahoe on both private and public property (Stanton 2015, p. 67). In addition, experimental translocation of *R. subumbellata* from one beach location to another was conducted from 2007–2009 to compare translocation to outplanting and to determine if translocation is a potential restoration or mitigation option for unavoidable impacts of construction or other projects on the shores of Lake Tahoe (Stanton 2015, p. 71). A translocation protocol has been established, and data demonstrated that translocation is a viable option in good to optimal habitat conditions, however, container grown plants have increased growth and seed output (Stanton 2015, p. 75).

SUMMARY OF THREATS and RATIONALE FOR NOT WARRANTED FINDING

Rorippa subumbellata appears well adapted to its dynamic shorezone environment and is capable of recolonizing sites after periods of inundation. At this time, the most manageable impact to *R. subumbellata* is from recreational activities on public beaches and adjacent habitat around the shore of Lake Tahoe; however this potential threat is being adequately addressed by ongoing management actions that include fencing, signage, and adherence to beach raking guidelines on public lands. Beach ranking on private lands remains a concern, because guidelines are voluntary and cannot be enforced. However, this impact is not sufficiently great as to present an extinction risk. Risks from shorezone development are being effectively managed via TRPA's ongoing and effective implementation of applicable shorezone ordinances. The Conservation Strategy is being actively implemented by numerous Federal, State, and local agencies to address the potential threats to *R. subumbellata*. An annual monitoring plan is in place, and propagation, transplanting, and translocation strategies have been examined and successfully initiated. At this time, methods have been identified to manage and avoid or mitigate identified potential threats.

As required by the Act, we considered the five factors in assessing whether *Rorippa subumbellata* is endangered or threatened throughout all or a significant portion of its range. We examined the best scientific and commercial information available regarding the past, present, and future threats faced by *R. subumbellata*. We reviewed the information available in our files, other available published and unpublished information, and we consulted with recognized *R. subumbellata* experts and other Federal, State, and tribal agencies. Based on our review of the best available scientific and commercial information pertaining to the five factors, we find that the impacts to the plant are not of sufficient imminence, intensity, or magnitude to indicate that

R. subumbellata is in danger of extinction (endangered), or likely to become endangered within the foreseeable future (threatened), throughout all of its range. In considering any significant portion of the range of this species, we evaluated whether the stressors facing *R. subumbellata* might be geographically concentrated in any one portion of its range and whether these stressors manifest as threats to *R. subumbellata* such that it would be presently in danger of extinction throughout all of the species' range. Because the distribution of the species is limited to the shoreline areas of Lake Tahoe and stressors are similar throughout the species range, we found no concentration of stressors that suggests that *R. subumbellata* may be in danger of extinction in a portion of its range. We also found no portion of its range where the stressors are significantly concentrated or substantially greater than in any other portion of its range. Therefore, we find that factors affecting *R. subumbellata* are essentially uniform throughout its range, indicating no portion of the range warrants further consideration of possible endangered or threatened status under the Act.

Therefore, we find that maintaining the species as a candidate or listing *Rorippa subumbellata* as a threatened or endangered species is not warranted throughout all or a significant portion of its range at this time.

POLICY FOR EVALUATION OF CONSERVATION EFFORTS

For species that are being removed from candidate status:
__NO__ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES

Ongoing, substantive revisions of the conservation strategy are expected to be completed by the end of calendar year 2015. Reliable funding for the Stewardship Program remains an ongoing need. Public outreach and fence construction and maintenance should continue on public beaches, especially during high lake level years, when less shoreline habitat is available.

LISTING PRIORITY

No longer applicable, because the species is being removed from candidate status.

DESCRIPTION OF MONITORING

Various surveys and studies of *Rorippa subumbellata* have been conducted on the beaches around Lake Tahoe since 1979. Many historical locations of *R. subumbellata* have been well documented, providing long-term presence-absence data for the region (Knapp 1979b, pp. 1–7; 1980, pp. 1–10; Ferreira 1987, pp. 1–335; CSLC 1998, pp. 1–162; 2002, pp. 1–27; Service 2004, pp. 1–28; BMP Ecosciences 2004, pp. 1–45; 2005, pp. 1–81; 2006, pp. 1–84; 2007, pp. 1–80; 2008, pp. 1–80; 2009, pp. 1–87; 2010, pp. 1–64; 2011, unpubl. data, Stanton 2015; Appendix C). Early in the surveying protocol, inconsistencies in survey methods (non-consecutive survey years, incomplete surveys, and variable sampling methodology) and naming convention of sites

made direct comparisons of data difficult. Therefore, a survey protocol was established prior to the 2001 survey to allow for data comparisons. In addition, site names were reconciled; some sites were combined and some were separated based on the presence of protective enclosure fences.

As part of research by Pavlik *et al.* 2002 and Stanton 2015, the survey protocol that was developed and implemented included a census of known populations and systematic searches of areas supporting unoccupied, potentially suitable habitat (Pavlik *et al.* 2002, p. A-45; Stanton 2015, pp. 12–15). Beginning in 2001, the annual survey was designed to expand on previous efforts through the collection of data on habitat variables that would assist in determining the distribution patterns and abundance of *Rorippa subumbellata*. The annual survey includes collection of information on occurrence size, number of stems, and other habitat characteristics. In 2010, *R. subumbellata* annual survey protocols were modified based on lake level, but still were in accordance with measures outlined in Pavlik *et al.* 2002 (pp. 71–72, 95–96). *Rorippa subumbellata* monitoring currently is linked to lake level. At lake level 6,226 ft (1,897.9 m) and above, monitoring will occur annually; below 6,226 ft (1,897.9 m), surveys will be conducted every other year. Thus in 2010, an annual survey was not conducted, due to low lake levels in 2009, but was conducted again in 2011 because lake levels rose. Survey protocols and the annual survey data form have been standardized as of 2001 and all identified sites will be surveyed using these methods in years when the survey is conducted.

The annual (or biannual) lake-wide survey for *Rorippa subumbellata* is consistently conducted during the week following Labor Day, in early September. Participants typically include staff from the TRPA, Service, USFS, NDSP, NDF, CDFW, CDPR, CTC, and CSLC. Participants are divided into teams that survey the known, historical, and potential habitat sites by covering the entire width of the beach from water's edge to the high water line. Land use (type and disturbance) and search effort are recorded at both occupied and unoccupied sites. Search effort is defined as the amount of person minutes spent actively searching for and collecting data on *R. subumbellata*. Site boundaries are delineated using Global Positioning System (GPS) technology and are generally defined either by natural (river mouth or substrate change) or artificial features that restrict the surveyor's movement around the lakeshore (changes in ownership, jetties, and fences).

For sites supporting *Rorippa subumbellata*, surveyors estimate general habitat parameters across the entire site, with GPS data obtained for each "cluster" of plants within the site boundaries. To better characterize the occupied habitat, the physical and biological attributes are recorded for each individual cluster. A cluster is defined as a group of plants that occur within a 21-ft (6.5-m) diameter of each other. This distance equates to the resolution capability for point data using handheld GPS units. Information specific to each cluster is also collected including the actual or estimated number plants, actual or estimated of plants in each phenological stage, and minimum and maximum rosette diameter. Additional physical and biological attributes are recorded for each cluster including slope, distance to lake, substrate/soil cover, and percent cover of associated plant species. These data are compiled and maintained by the Nevada Natural Heritage Program (http://heritage.nv.gov/vlibtyc.htm).

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: California, Nevada

Indicate which State(s) did not provide any information or comments: None.

See CONSERVATION MEASURES PLANNED OR IMPLEMENTED section above for discussion of coordination efforts with the States of California and Nevada.

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: Alexandra Pitts 6.26.15
Regional Director, Fish and Wildlife Service — Date

Concur: Gary Frazer SEP 23 2015
Director, Fish and Wildlife Service — Date

Do not concur: _____ _____
Director, Fish and Wildlife Service — Date

Director's Remarks: _____

U.S. Fish and Wildlife Service Species Assessment
For *Rorippa subumbellata* (Tahoe Yellow Cress)

Date of annual review: April 2015
Conducted by: Sarah Kulpa, Reno Fish and Wildlife Office