Streptanthus niger
(Tiburon jewelflower)

5-Year Review:
Summary and Evaluation

Photo by Angela Picco, Sacramento Fish and Wildlife Office

U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
Sacramento, California

August 2010

5-YEAR REVIEW

Streptanthus niger (Tiburon jewelflower)

I. GENERAL INFORMATION

Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Endangered Species Act (Act) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.

Species Overview:

As summarized from the Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area (Service 1998), *Streptanthus niger* (Tiburon jewelflower) is an annual herb of the mustard family (Brassicaceae). It is restricted to the Tiburon Peninsula of Marin County, where it occurs in only two populations that are within 3 kilometers (2 miles) of one another. It is found on shallow rocky serpentine soils on slopes of the southern Tiburon Peninsula at elevations of approximately 100 meters (350 feet). It is often associated with other federally listed species including the Marin dwarf flax (*Hesperolinon congestum*) and the Tiburon paintbrush (*Castilleja affinis* ssp. *neglecta*). This species is extremely narrowly-distributed; its entire range amounts to less than 90 hectares (222 acres) (Service 1995).

Methodology Used to Complete This Review:

This review was prepared by the Sacramento Fish and Wildlife Office, following the Region 8 guidance issued in March 2008. We used information from the Recovery Plan, survey information from experts who have been monitoring various localities of this species, and the California Natural Diversity Database (CNDDB) maintained by the California Department of Fish and Game. The Recovery Plan and personal communications with experts were our primary sources of information used to update the species' status and threats. We received one letter from the public in response to our Federal Notice initiating this 5-year review. This 5-year review contains updated information on the species' biology and threats, and an assessment of that information compared to that known at the time of listing or since the last 5-year review. We focus on current threats to the species that are attributable to the Act's five listing factors.

The review synthesizes all this information to evaluate the listing status of the species and provide an indication of its progress towards recovery. Finally, based on this synthesis and the threats identified in the five-factor analysis, we recommend a prioritized list of conservation actions to be completed or initiated within the next 5 years.

Contact Information:

Lead Regional Office: Larry Rabin, Deputy Division Chief for Listing, Recovery, and Habitat Conservation Planning, Region 8, Pacific Southwest; (916) 414-6464.

Lead Field Office: Kirsten Tarp, Recovery Branch, Sacramento Fish and Wildlife Office; (916) 414-6600.

Federal Register (FR) Notice Citation Announcing Initiation of This Review: A notice announcing initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the Federal Register on March 5, 2008 (73 FR 11945). One letter regarding the effects of global climate change on the Tiburon jewelflower was received by the California State Attorney General's Office.

Listing History:

Original Listing
FR Notice: Federal Register 60 FR 6671-6685
Date of Final Listing Rule: February 3, 1995
Entity Listed: *Streptanthus niger*, a plant species
Classification: Endangered

State Listing
Streptanthus niger was listed by the State of California as endangered in 1990.

Review History: None.

Species' Recovery Priority Number at Start of 5-Year Review: The recovery priority number for *Streptanthus niger* is 5c according to the Service's 2009 Recovery Data Call for the Sacramento Fish and Wildlife Office, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (Endangered and Threatened Species Listing and Recovery Priority Guidelines, 48 FR 43098, September 21, 1983). This number indicates that the taxon is a species that faces high degree of threat and has a low potential for recovery. The "C" indicates conflict with construction or other development projects or other forms of economic activity.

Recovery Plan or Outline

Name of Plan or Outline: Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area
Date Issued: September 30, 1998

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy

The Endangered Species Act defines "species" as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate wildlife. This definition of species under the Act limits listing as distinct population segments to species of vertebrate fish or wildlife. Because the species under review is a plant, the DPS policy is not applicable, and the application of the DPS policy to the species' listing is not addressed further in this review.

Information on the Species and its Status

Species Biology and Life History

Spatial Distribution

Streptanthus niger is found on shallow, rocky, serpentine soils on southwest facing slopes on the Tiburon Peninsula of Marin County in California. Two populations are known from the southern end of the peninsula where they occur within 3 kilometers (2 miles) of one another (CNDDB, 2009). One is at the tip of the peninsula at Old St. Hilary's Church Preserve (Preserve), and the other is along the Middle Ridge of the peninsula. No historical occurrences are known outside of the Tiburon Peninsula, and it is likely *S. niger* never occurred elsewhere (Morey and Hunter 1989).

Abundance

Both of the reported localities were known at the time of listing, and both populations are currently extant. However, population numbers fluctuate yearly and have been reported to include lows of 50 individuals and highs of 2,000 plants per population (Hunter 1989, Service 1998). During favorable growing conditions in 2009 the Middle Ridge site had a population of approximately 2,000 individuals (R. Brittman, California Department of Fish and Game, *in litt.* 2010). Current abundance information is not available for the Preserve site (E. Buxton, California Native Plant Society, *in litt*. 2010).

Habitat or Ecosystem

Streptanthus niger occurs at elevations of approximately 100 meters (350 feets) on the slopes of the southern Tiburon Peninsula on shallow rocky serpentine soils, which are formed from weathered volcanic (ultramafic) rocks such as serpentinite, dunite, and peridotite (Service 1998). These soils provide a harsh environment for plant growth, however, this species has adapted to this harsh environment and requires it for survival (Figure 1). Associated federally listed species are *Hesperolinon congestum* (Marin dwarf-flax) and *Castilleja affinis* ssp. *neglecta* (Tiburon paintbrush). Other associated plants include *Nassella lepida* (foothill needlegrass), *Eriophyllum confertiflorum* (golden yarrow), *Hemizonia congesta* ssp. *congesta* (hayfield tarweed), *Nassella pulchra* (purple needlegrass), *Calamagrostis ophitidis* (serpentine reedgrass), *Calycadenia multiglandulosa* (sticky calycadenia), and *Eriogonum luteolum* var. *caninum* (Tiburon buckwheat) (Service 1998).

Changes in Taxonomic Classification or Nomenclature

Streptanthus niger was described by Edward L. Greene, from a type specimen he collected at St. Hilary's Church in the town of Tiburon in Marin County (Greene 1886). Greene later changed the genus to *Euclisia* (Greene 1904), but Jepson (1925) returned the genus to *Streptanthus*, and others followed. In 1959, Munz and Keck referred to the plant as a subspecies of *Streptanthus glandulosus*, but in 1968, Munz returned it to *S. niger*, following Kruckeberg (1958). Molecular genetic research in the 1990s concluded that *S. niger*, while genetically distinct, did not form a reciprocally monophyletic unit and was nested within the larger and more widespread *S. glanulosus* clade (Mayer and Soltis 1999). Based on these results, Al-Shehbaz and Mayer (2008) proposed a reclassification of *S. niger* to *Streptanthus glandulosus niger*. We originally listed the species as endangered under the name *S. niger* (U.S. Fish and Wildlife Service 1995). However, to remain up-to-date with current nomenclature, we will recommend that an amendment be submitted to change the listing to *Streptanthus glandulosus niger* in the Recommendations for Future Actions section at the end of this document.

Genetics

Genetic taxonomic studies have been conducted for the genus *Streptanthus*, as described above, however no population genetic studies have been conducted for *S. niger*. Genetic variation in the species and/or among the two populations is unknown.

Species-specific Research and/or Grant-supported Activities

Approximately 500 seeds from *Streptanthus niger* were collected in 1997 from 24 plants in the wild at Old St. Hilary's Church Preserve, and are currently stored at the Rancho Santa Ana Botanical Garden (M. Wall, Rancho Santa Ana Botanic Garden, pers. comm.). In addition, seeds from this seed bank sample were propagated at the UC Davis greenhouse, and approximately 30,000 of these seeds from propagation are also stored at the Rancho Santa Ana Botanical Garden. In addition, seeds from the Old St. Hilary's Church Preserve population are stored at the U.C. Berkeley Botanical Garden, and are occasionally propagated.

Five-Factor Analysis

The following five-factor analysis describes and evaluates the threats attributable to one or more of the five listing factors outlined in section 4(a)(1) of the Act.

FACTOR A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

At the time of listing, *Streptanthus niger* was threatened by residential development, foot traffic, and road construction. Currently, *S. niger* is still threatened by urban development and foot traffic. Urban development has destroyed over 40 percent of potential *S. niger* habitat (Hunter 1989). Development continues to be the primary threat to this species (Figure 2). Even in areas where habitat is protected, the development of surrounding lands results in an increase of foot traffic, dog walking and dogs off leash, erosion, run-off, and non-native plants (R. Brittman,

California Department of Fish and Game, *in litt.* 2010). All of these factors are threats to the *S. niger* and discussed further under Factor E.

Of the two *Streptanthus niger* records present in the CNDDB (2009), one is protected by Town of Tiburon Open Space (Middle Ridge) and the other is partially protected by Marin County Open Space (Old St. Hilary's Church Preserve) but a portion at the top of the hill is proposed for development (E. Buxton, California Native Plant Society, *in litt*. 2010) (Table 1). LSA Associates, Inc. (LSA) is currently writing a vegetation and fire management plan for the Town of Tiburon which includes conservation measures for this species in the area.

FACTOR B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Overutilization for commercial purposes was not known to be a factor in the 1995 final listing rule (60 FR 6671). Overutilization for any purpose does not appear to be a threat at this time.

FACTOR C: Disease or Predation

Disease and predation were not known to be factors in the 1995 final listing rule (60 FR 6671). Disease and predation are not known to be threats at this time.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

At the time of listing, regulatory mechanisms thought to have some potential to protect *Streptanthus niger* included: (1) listing under the California Endangered Species Act (CESA); (2) the California Environmental Quality Act (CEQA) and the National Environmental Protection Act (NEPA); and (3) the Federal Endangered Species Act in those cases where *S. niger* occurs and is incidentally protected in habitat occupied by a listed wildlife species. The listing rule (60 FR 6671) provides an analysis of the level of protection that was anticipated from those regulatory mechanisms. This analysis appears to remain currently valid.

State Protections in California

The State's authority to conserve rare wildlife and plants is comprised of four major pieces of legislation: the California Endangered Species Act, the Native Plant Protection Act, the California Environmental Quality Act, and the Natural Community Conservation Planning Act.

<u>California Endangered Species Act (CESA) and Native Plant Protection Act (NPPA):</u> The CESA (California Fish and Game Code, section 2080 *et seq*.) prohibits the unauthorized take of State-listed threatened or endangered species. The NPPA (Division 2, Chapter 10, section 1908) prohibits the unauthorized take of State-listed threatened or endangered plant species. The CESA requires State agencies to consult with the California Department of Fish and Game 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.

With regard to prohibitions of unauthorized take under NPPA, landowners are exempt from this prohibition for plants to be taken in the process of habitat modification. Where landowners have been notified by the State that a rare or endangered plant is growing on their land, the landowners are required to notify the California Department of Fish and Game 10 days in advance of changing land use in order to allow salvage of listed plants.

California Environmental Quality Act: The CEQA 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). Protection of listed species through CEQA is, therefore, dependent upon the discretion of the lead agency involved.

California Coastal Act: The California Coastal Commission considers the presence of listed species in determining environmentally sensitive habitat lands subject to section 30240 of the California Coastal Act of 1976, which requires their protection. Certain local jurisdictions have developed their own Local Coastal Programs or Land Use Plans that have been approved by the Coastal Commission. Some of the major accomplishments of this act include reduction in overall development, the acquisition of prime habitat along the coast, restoration of coastal streams and rivers, and a reduction in the rate of wetland loss.

Federal Protections

National Environmental Policy Act: NEPA (42 U.S.C. 4371 *et seq*.) provides some protection for listed species that may be affected by activities undertaken, authorized, or funded by Federal agencies. Prior to implementation of such projects with a Federal nexus, NEPA requires the agency to analyze the project for potential impacts to the human environment, including natural resources. In cases where that analysis reveals significant environmental effects, the Federal agency must propose mitigation alternatives that would offset those effects (40 CFR 1502.16). These mitigations usually provide some protection for listed species. However, NEPA does not require that adverse impacts be fully mitigated, only that impacts be assessed and the analysis disclosed to the public.

Endangered Species Act of 1973, as amended: The Act is the primary Federal law providing protection for this species. The Service's responsibilities include administering the Act, including sections 7, 9, and 10 that address take. Since listing, the Service has analyzed the potential effects of Federal projects under section 7(a)(2), which requires Federal agencies to consult with the Service prior to authorizing, funding, or carrying out activities that may affect listed species. A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its reproduction, numbers, or distribution (50 CFR 402.02). A non-jeopardy opinion may include reasonable and prudent measures that minimize the amount or extent of incidental take of listed species associated with a project.

Section 9 prohibits the taking of any federally listed endangered or threatened species. Section 3(18) defines "take" to mean "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Service regulations (50 CFR 17.3) define "harm" to include significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. Harassment is defined by the Service as an intentional or negligent action that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. The Act provides for civil and criminal penalties for the unlawful taking of listed species. Incidental take refers to taking of listed species that results from, but is not the purpose of, carrying out an otherwise lawful activity by a Federal agency or applicant (50 CFR 402.02). For projects without a Federal nexus that would likely result in incidental take of listed species, the Service may issue incidental take permits to non-Federal applicants pursuant to section 10(a)(1)(B). To qualify for an incidental take permit, applicants must develop, fund, and implement a Service-approved Habitat Conservation Plan (HCP) that details measures to minimize and mitigate the project's adverse impacts to listed species. Regional HCPs in some areas now provide an additional layer of regulatory protection for covered species, and most of these HCPs are coordinated with California's related Natural Community Conservation Planning program or other permits through the California Department of Fish and Game.

With regard to federally listed plant species, section 7(a)(2) requires Federal agencies to consult with the Service to ensure any project they fund, authorize, or carry out does not jeopardize a listed plant species. Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the "take" of federally endangered wildlife; however, the take prohibition does not apply to plants. Instead, plants are protected from harm in two particular circumstances. Section 9 prohibits (1) the removal and reduction to possession (i.e., collection) of endangered plants from lands under Federal jurisdiction, and (2) the removal, cutting, digging, damage, or destruction of endangered plants on any other area in knowing violation of a state law or regulation or in the course of any violation of a state criminal trespass law. Federally listed plants may be incidentally protected if they co-occur with federally listed wildlife species.

Summary of Regulatory Mechanisms

In summary, the Endangered Species Act is the primary Federal law that provides protection for this species since its listing as endangered in 1995. Other Federal and State regulatory mechanisms provide discretionary protections for the species based on current management direction, but do not guarantee protection for the species absent its status under the Act. Therefore, we continue to believe other laws and regulations have limited ability to protect the species in absence of the Endangered Species Act.

FACTOR E: Other Natural or Manmade Factors Affecting Its Continued Existence

At the time of listing, other recognized natural or manmade threats to *Streptanthus niger* included, foot traffic and trampling, competition with introduced nonnative species, and low genetic variability. These threats, and those that have been identified since listing, are discussed

below.

The threat of trampling has intensified since the time of listing. Currently, *Streptanthus niger* is threatened by trampling from hikers, joggers, dog walkers, and off-trail bicyclists. The Middle Ridge and Preserve occurrences are adjacent to the Ring Mountain open space managed by the Marin Open Space District. Ring Mountain is a very popular site and heavily visited by the public whose activities extend into *S. niger* habitat. Dog walkers and off-leash dogs currently create the greatest impact, followed by hikers, joggers, and mountain bicyclists (G. Ngarangad, Marin County Open Space District, pers. comm. 2010). The Middle Ridge site is used extensively by professional dog walkers and dogs are frequently off-leash resulting in additional trampling of *S. niger* habitat (R. Brittman, California Department of Fish and Game, *in litt.* 2010; E. Buxton, California Native Plant Society, *in litt*. 2010). Trampling has also increased due to off trail hikers and illegal bicycle trails. Rangers from the Marin County Open Space District and a contracted Sherriff's deputy patrol the area and both educate individuals about the environment and issue citations (G. Ngarangad, Marin County Open Space District, pers. comm. 2010).

Competition with introduced species continues to be a serious threat to serpentine native plants (Service 1995, Service 1998). Competition and displacement from invasive plant species poses a potential threat to *Streptanthus niger*. Exotic and/or invasive, weedy plant species reduce native plant diversity and diminish the habitat suitability for native species; this is particularly the case in sensitive habitats (G. Cooley, California Department of Fish and Game, pers. comm. 2008). The consistent pattern of heavy growth of nonnative grasses when not controlled by grazing or other management can 'smother' native plants, resulting in the subsequent crowding out, outcompeting, or overshadowing of native annuals. A common consequence of such heavy annual grass growth is development of thatch, which adds to the strong smothering effect by inhibiting annuals' germination and growth (Weiss *et al.* 2007). *S. niger* is particularly threatened by nonnative invasive species such as *Genista monspessulana* (French broom), *Cytisus scoparius* (Scotch broom), *Avena fatua* (wild oats), and *Cortaderia selloana* (pampas grass).

Streptanthus niger is extremely restricted in its range, and known from only two occurrences on the Tiburon Peninsula in Northern California, each of which fluctuates between 50 and 2,000 individuals between years. The small population sizes and the restricted range of the species places *S. niger* at risk from catastrophic or stochastic events and loss of genetic variability. Potential future development of the areas surrounding the Preserve, and on the top of the hill at Old St. Hilary's Church would have direct negative effects on this species and exacerbate the threat from low numbers of individuals. Since the total number of individuals per year fluctuates drastically (from 50 to 2000 individuals per locality), these populations are at risk of extirpation by a random event such as a disease outbreak, drought, fire, or other natural or human-caused factors. Additionally, few populations, low population numbers and, large population fluctuations among years increase the likelihood of loss of genetic variability which may lead to a decrease in average fitness and reduced resilience to environmental stressors such as disease and alterations in habitat.

Impacts to *Streptanthus niger* under future climate change scenarios are unclear. A trend of

warming in the mountains of western North America is expected to decrease snowpack, hasten spring runoff, and reduce summer stream flows, and increased summer heat may increase the frequency and intensity of wildfires (IPCC 2007). While it appears reasonable to assume that *S. niger* may be affected, we lack sufficient certainty to know how and how soon climate change will affect this species, the extent of average temperature increases in California/Nevada, or potential changes to the level of threat posed by drought and fire. The most recent literature on climate change includes predictions of hydrological changes, higher temperatures, and expansion of drought areas, resulting in a northward and/or upward elevation shift in range for many species (IPCC 2007). We have no knowledge of more detailed climate change information specifically within the range of *S. niger*.

Current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying (Field et al. 1999; Cayan *et al*. 2005; IPCC 2007). However, predictions of climatic conditions for smaller sub-regions such as California remain uncertain. It is unknown at this time if climate change in California will result in a warmer trend with localized drying, higher precipitation events, or other effects. While we recognize that climate change is an important issue with potential effects to listed species and their habitats, we lack adequate information to make accurate predictions regarding its effects to particular species at this time. A severe drought, if compounded by other factors such as development, invasive plant species, and other unforeseen circumstances, could contribute to the extinction of *Streptanthus niger* given its small population size.

A modeling study completed by Loarie *et al.* (2008) provides an evaluation of potential trends to California's floristic communities under climate change scenarios. In general, plant diversity will shift in two divergent directions: along the coast and northwards at higher elevations; and southwards at higher elevations of the Sierra Nevada. The models suggest that climate change has the potential to break up local floras, resulting in new species combinations, with new patterns of competition and biotic interactions (Loarie *et al*. 2008). Based on these modeling results, *Streptanthus niger* may be unable to shift its range because of isolated, small populations, whose growth depend upon particular hydrological regimes and soil characteristics, and the limited available, suitable habitat surrounding extant occurrences.

III. RECOVERY CRITERIA

The recovery plan for *Streptanthus niger* was approved in 1998 (Service 1998). Recovery plans provide guidance to the Service, States, and other partners and interested parties on ways to minimize threats to listed species, and on criteria that may be used to determine when recovery goals are achieved. There are many paths to accomplishing the recovery of a species and recovery may be achieved without fully meeting all recovery plan criteria. For example, one or more criteria may have been exceeded while other criteria may not have been accomplished. In that instance, we may determine that, over all, the threats have been minimized sufficiently, and the species is robust enough, to downlist or delist the species. In other cases, new recovery approaches and/or opportunities unknown at the time the recovery plan was finalized may be more appropriate ways to achieve recovery. Likewise, new information may change the extent that criteria need to be met for recognizing recovery of the species. Overall, recovery is a

dynamic process requiring adaptive management, and assessing a species' degree of recovery is likewise an adaptive process that may, or may not, fully follow the guidance provided in a recovery plan. We focus our evaluation of species status in this 5-year review on progress that has been made toward recovery since the species was listed (or since the most recent 5-year review) by eliminating or reducing the threats discussed in the five-factor analysis. In that context, progress towards fulfilling recovery criteria serves to indicate the extent to which threat factors have been reduced or eliminated.

The *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* discusses Factors A and E, although they are not specifically addressed using these titles. For example, the Recovery Plan discusses the current threats to the species and other factors that threaten its continued existence, which are summarized earlier in this review.

The recovery criteria for *Streptanthus niger* first includes protecting and managing the two natural populations by working with the Town of Tiburon, Marin Open Space District, Tiburon Landmark Society, and other landowners to ensure the long-term survival of the species on their lands. The largest possible block of serpentine habitat should be protected at each site, including 150 meter (500 foot) buffers around the habitat. Other unoccupied habitat nearby should also be protected to provide space for potential expansion of the populations. Management plans including monitoring, minimization of threats, and educational outreach, should be developed and implemented. This recovery criterion is still important due to continued development threats in the area. Even though some of the remaining habitat for *S. niger* is in a preserve, much of it remains as permanent open space which should be protected by a preserve.

Second, the recovery plan stresses the need for collection and banking of seed in Center for Plant Conservation certified botanic gardens from both populations, making sure that seed collection does not adversely affect the existing populations. Seeds from wild population of *Streptanthus niger* at the Old St. Hilary's Church Preserve are currently stored at the Santa Ana Botanical Garden, and seeds from the Old St. Hilary's Church Preserve population are also stored and propagated at the UC Berkeley Botanical Garden.

Third, surveys of other potential serpentine habitat on the Tiburon Peninsula should be conducted to determine whether other populations exist. No directed surveys have taken place in the last 10 years, so this criterion is likely not met.

Fourth, experimental burning and weeding in plots adjacent to existing populations should be conducted to determine whether existing populations may expand into suitable habitat that has been made available by burning or weeding. Additional research needs include studies on demography and reproductive biology. No research has been done on *Streptanthus niger* in the last 10 years, so no new information is available.

Delisting:

The *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* issued September 20, 1998, does not include delisting criteria, because it states that *Streptanthus niger* should not be delisted.

Downlisting:

Streptanthus niger may be recommended for downlisting with the completion of the following criteria (*Service* 1998):

1. Secure and protect the occupied habitat at the St. Hilary's and Middle Ridge sites along with adjacent unoccupied habitat and a 150-meter (500-foot) buffer.

Is criterion still valid: Yes.

Listing factors addressed: A, D, E

Has criterion been met: No. This criterion has been partially met. Of the total two *Streptanthus niger* records present in the CNDDB (2009), one is protected by Town of Tiburon Open Space (Middle Ridge) and the other is partially protected by Marin County Open Space (Old St. Hilary's Church Preserve) but a portion at the top of the hill is proposed for development (E. Buxton, California Native Plant Society, *in litt*. 2010) (Table 1) and unoccupied buffer habitat has yet to be secured and protected.

2. Management plan is approved and implemented for both populations and any adjacent areas identified as essential to continued survival, including survival of the species as an objective.

Is criterion still valid: Yes.

Listing factors addressed: A, D, E.

Has criterion been met: No.

3. Population monitoring shows that the populations are stable or increasing over 20 years that include the normal precipitation cycle (or longer if suggested by the results of the demographic monitoring).

Is criterion still valid: Yes.

Listing factors addressed: A, E.

Has criterion been met: No.

4. Seeds from both populations are stored in at least two Center for Plant Conservation certified facilities.

Is criterion still valid: Yes.

Listing factors addressed: A, E.

Has criterion been met: No. Seeds from only one population are stored at one Center for Plant Conservation certified facility (Rancho Santa Ana Botanical Garden), and seeds from the Old St. Hilary's Church Preserve population are stored at another Center for Plant Conservation certified facility (UC Berkeley Botanical Garden).

5. Seed germination and propagation techniques are understood.

Is criterion still valid: Yes.

Listing factors addressed: A, D, E.

Has criterion been met: Yes. Seeds were germinated and propagated at the UC Davis Greenhouse, and are currently stored at the Santa Ana Botanical Garden. In addition, seeds from the Old St. Hilary's Church Preserve population have been propagated at the UC Berkeley Botanical Garden.

IV. SYNTHESIS

At the time of listing in 1995, two populations of *Streptanthus niger* were known on the Tiburon Peninsula; these are still the only two known populations. No formal research or surveys have been conducted since the 1990s, although the California Native Plant Society does informal surveys for the species on occasion. Of the total two records present in the CNDDB (2009), one is protected by Town of Tiburon Open Space (Middle Ridge) and the other is partially protected by Marin County Open Space (Old St. Hilary's Church Preserve) but a portion at the top of the hill is proposed for development. The status of the species remains endangered due the low numbers of individuals, low numbers of populations, continued threat of development, invasive species, other human-caused factors including trampling, and climate change. Therefore, we believe *Streptanthus niger* still meets the definition of endangered, and recommend no status change at this time.

V. RESULTS

Recommended Listing Action:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist (indicate reason for delisting according to 50 CFR 424.11):
    ____ *Extinction*
    ____ *Recovery*
    ____ *Original data for classification in error*
_X__ No Change

New Recovery Priority Number and Brief Rationale: No change. If the new taxonomic classification *Streptanthus glandulosus niger* is accepted, we will propose a change in the recovery priority number to reflect a change from species to subspecies.

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

- Preservation and protection of all *Streptanthus niger* habitat in perpetuity. A portion of the habitat is currently protected by the Old St. Hilary's Church Preserve, however, areas near Middle Ridge are currently designated open space, but could be threatened by development in the future. Protecting all potential and occupied *S. niger* habitat in perpetuity would eliminate this threat.

- Conduct research on the species, specifically on the demography, reproduction, and genetics. No information currently exists on these topics, yet this information would be helpful in trying to manage and preserve the existing populations. In addition, yearly surveys for the plant should be conducted to track population sizes each year. Given the low number of individuals in some years, it is extremely important to be aware of when these lows are occurring, and to ensure that the populations do not disappear altogether.

- Management of a seed bank of this species for potential reseeding in newly created or discovered habitat, and to ensure that a seed bank exists for replanting in case of total loss of wild populations. A seed bank for these purposes should be available at either the Santa Ana Botanical Garden or at the UC Berkeley Botanical Garden.

- In order to reflect the most current understanding of the species taxonomy, the name should be formally changed in the Code of Federal Regulations from *Streptanthus niger* to *Streptanthus glandulosus niger*.

- Finally, it is important to better understand the potential effects of global climate change on the habitat and microclimate of the Tiburon Peninsula; potential changes in phenology and demography of *Streptanthus niger*; ecosystem associates such as pollinators; and pest and disease outbreaks associated with *S. niger*.

VII. REFERENCES CITED

Al-Shehbaz, I.A. and M.S. Mayer. 2008. New or Noteworthy Streptanthus (Brassicaceae) for the Flora of North America. Novon 13: 279-282.

Cayan, D., M. Dettinger, I. Stewart, and N. Knowles. 2005. Recent changes towards earlier springs: early signs of climate warming in western North America? U.S. Geological Survey, Scripps Institution of Oceanography, La Jolla, California.

[CNDDB] California Department of Fish and Game, Natural Diversity Data Base. 2009. Element Occurrence Reports for *Streptanthus niger*. Unpublished cumulative data current to June 15, 2009.

Field, C.B., G.C. Daily, F.W. Davis, S. Gaines, P.A. Matson, J. Melack, and N.L. Miller. 1999. Confronting climate change in California. Ecological impacts on the golden state. A report of the Union of Concerned Scientists, Cambridge, Massachusetts, and the Ecological Society of America, Washington, DC.

Greene, E.L. 1886. Some California Polypetalae. Bulletin of the Torrey Botanic Club 13: 141-142.

Greene, E.L. 1904. Certain west American Cruciferae. Leaflets of Botanical Observation and Criticism 1: 81-90.

Hunter, J.C. 1989. Report to the Fish and Game Commission on the status of Tiburon jewelflower (*Streptanthus niger*). Natural Heritage Division, California Department of Fish and Game. Status Report 89-28.

[IPCC] Intergovernmental Panel on Climate Change. 2007. Climate change 2007: the physical science basis. Summary for policymakers. Contribution of working group I to the fourth assessment report of the Intergovernmental Panel on Climate Change, IPCC Secretariat, World meteorological organization and United Nations environment programme, Geneva, Switzerland.

Jepson, W.L. 1925. A manual of the flowering plants of California. University of California Press, Berkeley, California. 1238 pp.

Kruckeberg, A.R. 1958. The taxonomy of the species complex, *Streptanthus glandulosus* Hook. Madrono 14: 217-227.

Loarie, S.R., Carter, B.E., Hayhoe, K., McMahon, S., Moe, R., Knight, C.A., and D.D. Ackerly. June 2008. Climate change and the future of California's endemic flora. PLOS One 3:1-10.

Mayer, M.S., and P.S. Soltis. 1999. Intraspecific Phylogeny Analysis Using ITS Sequences: Insights from Studies of the *Streptanthus glandulosus* Complex (Cruciferae). Systematic Botany 24: 47-61.

Morey, S.C., and J.C. Hunter. 1989. A management strategy for the recovery of Tiburon jewelflower (*Streptanthus niger*). Endangered Plant Program, Natural Heritage Division, California Department of Fish and Game, Sacramento, California.

Munz, P.A. 1968. A supplement to the California flora. University of California Press, Berkeley, California.

Munz, P.A., and D.D. Keck. 1959. A California flora. University of California Press, Berkeley, California.

[Service] U.S. Fish and Wildlife Service. 1995. Endangered and threatened wildlife and plants; determination of endangered status for ten plants and threatened status for two plants from serpentine habitats in the San Francisco Bay region of California. Federal Register 60 (23): 6671-6685.

[Service] U.S. Fish and Wildlife Service. 1998. Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area. Portland, Oregon. 330+ pp.

Weiss, S. B., Wright, D. H., and C. Niederer. 2007. Serpentine vegetation management project: Final report. FWS Grant Agreement No. 814205G240, pp. 1-47; p. 3.

Personal Communications

Cooley, Gene. September 24, 2008. California Department of Fish and Game, Sacramento, California.

Ngarangad, Gabe. July 22, 2010. Marin County Open Space District.

Wall, Michael. October 22, 2009. Rancho Santa Ana Botanic Garden.

in litteris

Brittman, R. 2010. California Department of Fish and Game. E-mail to Josh Hull, U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, dated July 15, 2010. Subject: Recovery update.

Buxton, E. 2010. California Native Plant Society. E-mail to Josh Hull, U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, dated July 21, 2010. Subject: Recovery update.

Figure 1. Photo of *Streptanthus niger* habitat at Old St. Hilary's Preserve in Tiburon, California.

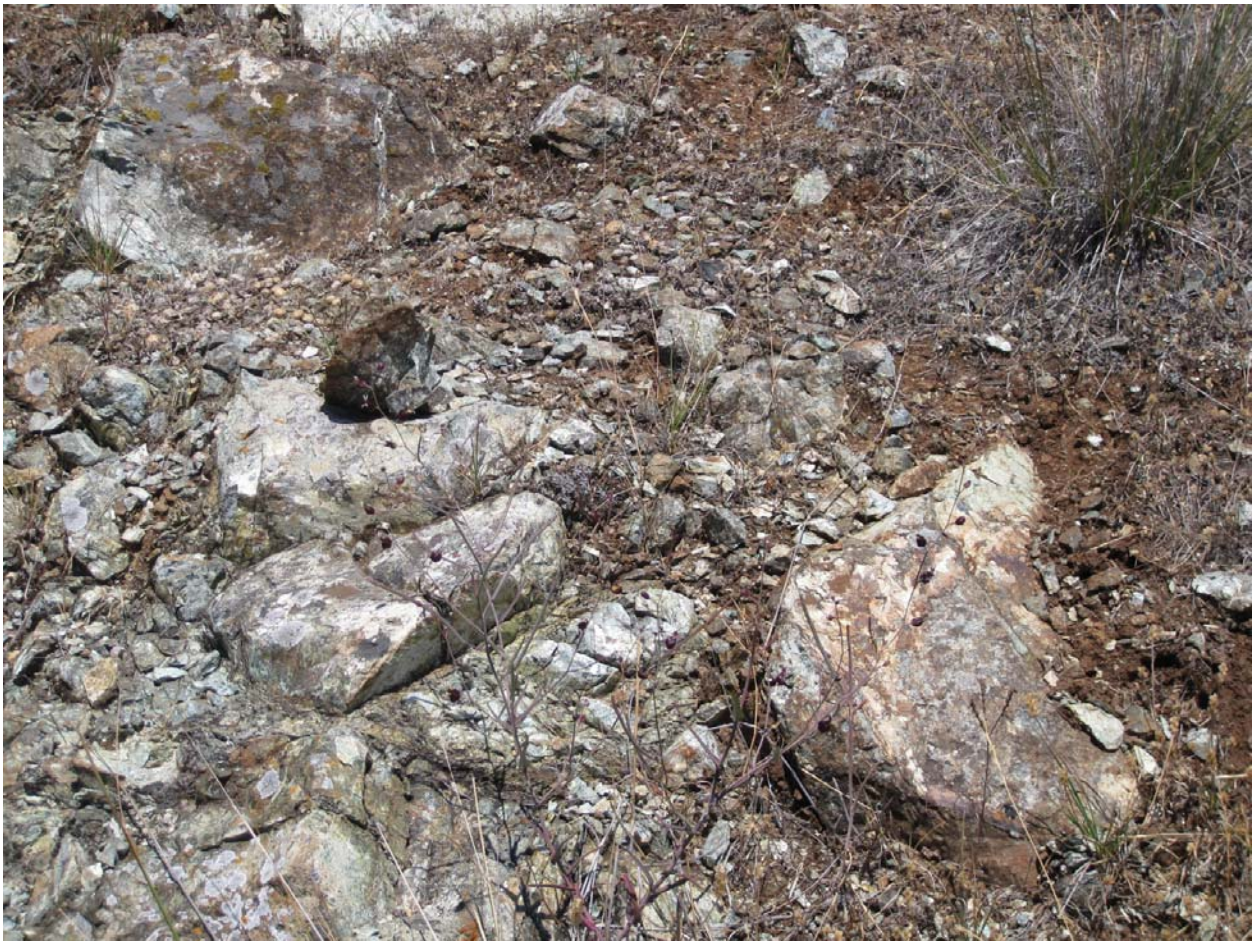

Figure 2. Photo of housing development just upslope from Old St. Hilary's Preserve in Tiburon, California. This photo illustrates the threat of existing and potential future development in the area.

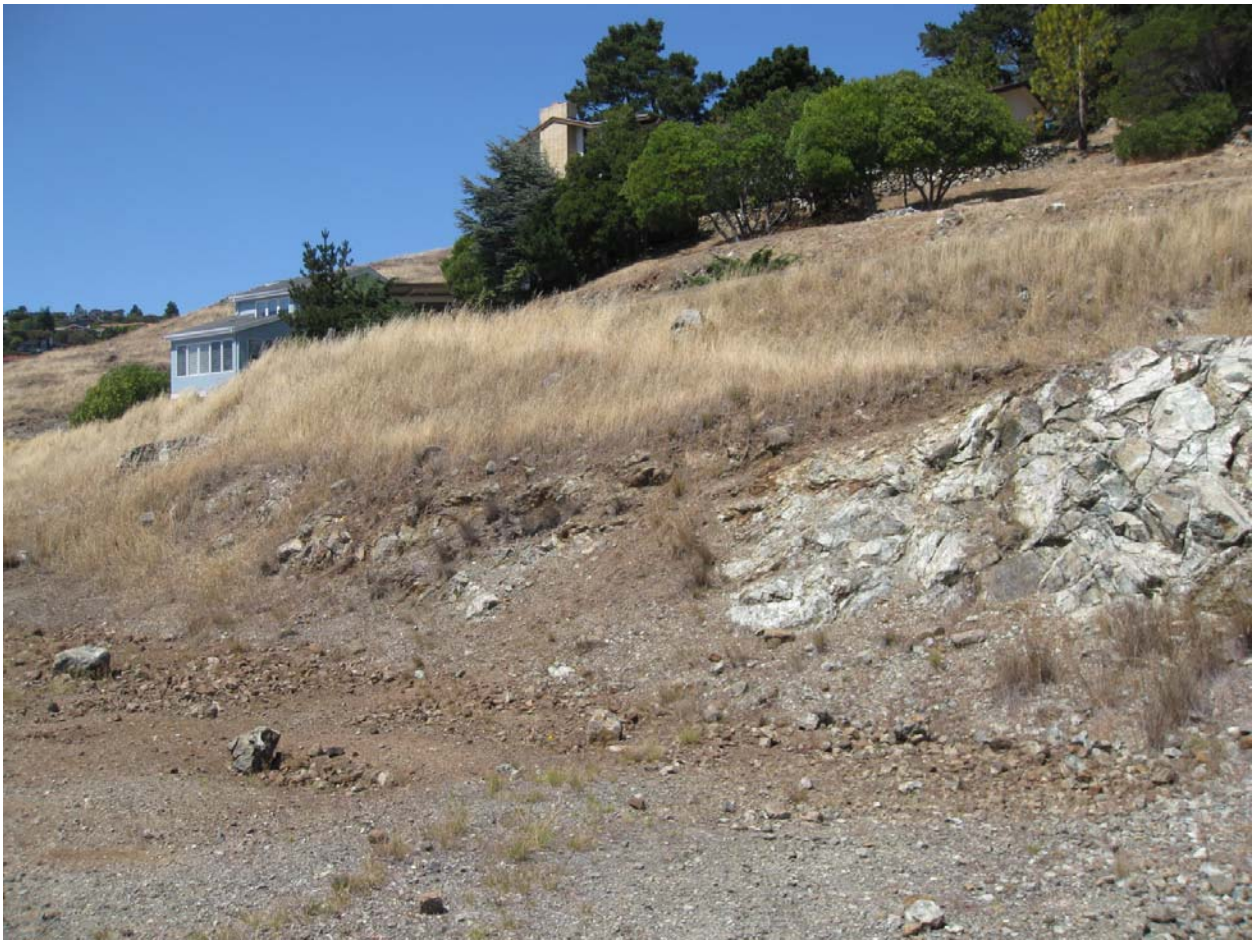

Table 1 –SPECIES INFORMATION

Streptanthus niger occurrences, status 2009; prepared for 5-year review, 2009.

OCCURRENCE (1)	KNOWN AT LISTING (2)	CURRENT THREATS (3)	CURRENT CONSERVATION (4)
Old St. Hilary's Preserve EO 1	Known at listing. Present in 2009.	Factor A: Near existing development, proposed development. Factor E: Trail activity, dogs off leash, invasive nonnative plants, small population size, climate change	Portion in Old St. Hilary's Preserve protected by Marin County Open Space, the remainder at top of hill is proposed for development. LSA is writing a vegetation and fire management plan for the Town of Tiburon which includes measures for this species.
Tiburon Middle Ridge EO 2	Known at listing. Present in 2009.	Factor E: Trail activity, dogs off leash, invasive nonnative plants, small population size, climate change	Protected by Town of Tiburon Open Space. LSA is writing a vegetation and fire management plan for the Town of Tiburon which includes measures for this species.

Abbreviations:
EO = CNDDB Element Occurrence.
Identifications are based on CNDDB names, previous USFWS determinations, location information, and ownership boundaries.

1. Name of occurrence and CNDDB EO number if assigned.
2. Information about occurrence as known at listing.
3. Current threats to the occurrence segregated by listing factor.
4. Current conservation measures for each occurrence.

U.S. FISH AND WILDLIFE SERVICE 5-YEAR REVIEW

***Streptanthus niger* (Tiburon jewelflower)**

Current Classification: Endangered

Recommendation Resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__X__ No change needed

Review Conducted By: _____Sacramento Fish and Wildlife Office staff_____

FIELD OFFICE APPROVAL:

Lead Field Supervisor, U.S. Fish and Wildlife Service

Approve _____ Date Aug 10, 2010