Gowen Cypress (*Hesperocyparis* [=*Cupressus*] *goveniana*)

5-Year Review:
Evaluation and Summary

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Ventura, California

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5-YEAR REVIEW
Gowen cypress (*Hesperocyparis* [=*Cupressus*] goveniana)

GENERAL INFORMATION:
Species: *Hesperocyparis* [=*Cupressus*] *goveniana*
FR citation: 63 FR 43100
Date listed: August 12, 1998
Classification: Threatened

BACKGROUND:

Most recent status review:
U.S. Fish and Wildlife Service. 2012. *Hesperocyparis* [=*Cupressus*] *goveniana* (Gowen cypress) 5-Year Review: Summary and Evaluation. Ventura Field Office. Ventura, California.

FR Notice citation announcing this status review:
Initiation of 5-Year Status Reviews of 66 species in California and Nevada. Notice of initiation of reviews; request for information (85 FR 4692), January 27, 2020.

Critical Habitat Designation:

No critical habitat has been designated.

State Listing:

Not listed under the California Endangered Species Act.

ASSESSMENT:

Information acquired since the last status review:

This 5-year review was conducted by the U.S. Fish and Wildlife Service (Service) Ventura Fish and Wildlife Office. Initiation of this review was announced through a Federal Register notice on January 27, 2020. We also contacted land managers and species experts to request any data or information we should consider in our review. Additionally, we conducted a literature search and a review of information in our files. There has been very little work towards monitoring, recovery, or research since the previous 5-year review in 2012.

Background:

Nomenclature
Gowen cypress has undergone two taxonomic revisions since listing. The species was listed as *Cupressus goveniana* ssp. *goveniana* in 1998 (Service 1998, 63 FR 43100). A review of new world and old world cypresses in 2006 suggested a change to *Callitropsis goveniana*. This nomenclature was used for the Service's 2008 5-year review (Service 2008, entire). In 2009, the application of *Callitropsis* to describe new world cypresses was challenged. Subsequent genetic analysis suggested a new genus for new world cypresses, *Hesperocyparis*, and this resulted in the

species being recognized as *Hesperocyparis goveniana*. *Hesperocyparis goveniana* was used in the Service's 2012 5-year review and is used in this 5-year review for consistency with current taxonomic literature. None of the taxonomic revisions have resulted in the grouping or splitting of any extant or historical populations from what was considered Gowen cypress at the time of listing (Service 2012, p. 4).

Range

Gowen cypress is known from two locations Monterey County (Figure 1). One population occurs on and near the Samuel F. B. Morse Botanical Reserve on land owned and managed by the Del Monte Forest Conservancy and the Pebble Beach Company. This population has been referred to as the Huckleberry Hill population. The other population occurs within Point Lobos Ranch and is managed by the California Department of Parks and Recreation. The two populations are approximately 4 miles (6.4 kilometers) apart and are believed to be isolated from one another due to distance and topography inhibiting wind driven pollination between the populations (Service 2012, p. 5).

Population data:

Habitat

Gowen cypress occurs in association with pygmy forest and maritime chaparral habitats on shallow, nutrient poor, mineral soils bordered by Monterey pine (*Pinus radiata*) forest (Giffin and Critchfield 1976, p. 17; Jones and Stokes Associates 1996, pp. 28-29). Bishop pines (*Pinus muricata*) may be cooccurring tree species with an understory of chaparral shrubs, and Monterey pines intergrade before excluding Gowen cypress as the soils become deeper and more nutrient rich (Griffin and Critchfield 1976, p. 17). Gowen cypress recruitment and survivorship is greatest in areas of full sunlight with low competition from cooccurring species, invasive species, and plant litter (Vogl et al. 1988, p. 316).

The two populations occur on Cieneba or podzolic soil types, underlaid by a shallow hardpan soil (Giffin and Critchfield 1976, p. 17; Jones and Stokes Associates 1996, pp. 28-29). The Huckleberry Hill population on the Monterey Peninsula, occurs where claypan or hardpan soils are shallow, acidic, strongly leached, and poorly drained (Griffin and Critchfield 1976 p. 17; Jones and Stokes Associates 1996, pp.28-29). The Point Lobos Ranch population occurs on Cieneba soils on the inland granitic bedrock geologic formation (Jones and Stokes Associates 1996, pp. 28-29). Gowen cypress will grow on more nutrient rich soils in the absence of competition but current expansion into more nutrient rich soils is inhibited by Monterey pine or Monterey cypress (*Hesperocyparis macrocarpa*).

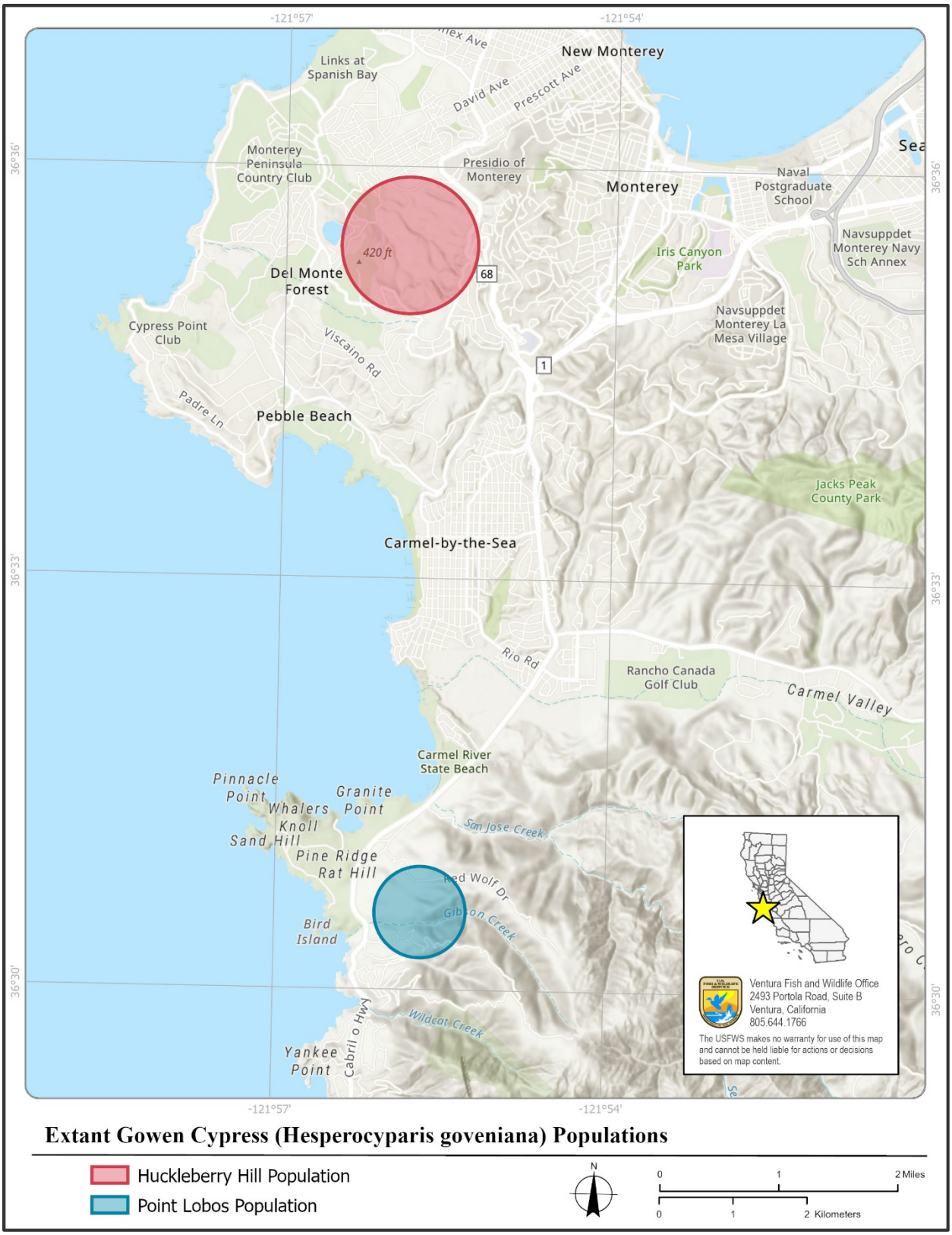

Figure 1. Extant Gowen cypress (*Hesperocyparis goveniana*) Populations.

Huckleberry Hill

No new information regarding trends in population size, recruitment, or mortality is available for the Huckleberry Hill population. The population remains on land that is protected from direct development, but no monitoring or management is currently occurring (Service 2012, p. 5). During a field visit in 2018, Service botanists and Del Monte Forest Conservancy foresters noted recruitment of Gowen cypress near access roads where competition was low during a field visit. No fire or prescribed burn had occurred in these areas. The extent of recruitment at the time of the field visit and survivorship of the seedlings are unknown (Lemein 2019, pers. obs.).

Point Lobos Ranch

No new information regarding trends in population size, recruitment, or mortality is available for the Point Lobos Ranch population. This population occurs on land owned and managed by the California Department of Parks and Recreation and is not currently open to the public (CASP 2018, p. 2-5). The perimeter of the population of Gowen cypress was mapped by the California Department of Parks and Recreation and during that effort it was noted that the stand appeared to be of uniform age although that age was not determined (Allen 2021, pers. com.). The population occurs over 23 acres (9.3 hectares) and is restricted to podzolized soils that are moderately sterile, acidic, and poorly drained soils of the Narlon series. At the boundaries of this soil type where the soil becomes deeper and more nutrient rich, the population gives way to Monterey pine forest against which the Gowen cypress cannot compete (Allen 2021, pers. com.). Gowen cypress is considered a fire dependent species suggesting that a previous fire resulted in the current uniform stand structure. The date of the last fire within the property is not known, but is believed to have occurred over 100 years ago (Allen 2021, pers. com.).

California Department of Parks and Recreation manages the population based on its vegetation management plan and intends to attempt to secure funding for a monitoring plan, long term management, and invasive species control (Allen 2021, pers. com).

Ex Situ Collections

The Santa Cruz Arboretum has a single adult Gowen cypress although this species is not currently being used for seed collection or conservation studies (Service 2012, p. 17). Other living collections may exist for Gowen cypress but are not known to the Service at this time.

Evaluation of Threats:

At the time of the 1998 listing, the threats to Gowen cypress were primarily development resulting in habitat loss, and the related effects of habitat fragmentation, fire suppression, invasive species introduction, and constraining the populations to their existing locations (Service 1998, p. 43102; Service 2012, pp. 8-11). The 2004 Recovery Plan reiterated these threats (Service 2004, pp. 46-48). In 2008, the 5-year review recognized that construction and erosion from unauthorized recreational trails was resulting in direct loss of young Gowen cypress at the Huckleberry Hill population. Recruitment of Gowen cypress is inhibited at both populations from erosion issues related to either unauthorized recreational trails or access roads (Service 2008, p. 12). The 2012 5-year review added climate change as a potential threat to the

species (Service 2012, pp. 14-15). With our current understanding of the management of the existing populations of Gowen cypress, and the surrounding land uses, all threats previously described are on-going. In summary, these threats are development and related effects, invasive species, erosion, and climate change.

Development and Related Effects

The threat of development and related effects remains generally unchanged since the 2012 5-year review (Service 2012, pp. 8-11). Direct loss of Gowen cypress trees is not expected from development because both the Huckleberry Hill population and the Point Lobos Ranch population occur on land that is protected from development (Service 2012, pp. 8-11). The Huckleberry Hill population has been subject to continued development of adjacent land since listing in 1998. The development of adjacent land has created a situation in which the population is constrained to its current extent, natural cycles of fire are suppressed, and introduction of invasive species (particularly French broom (*Genista monspessulana*)) may occur from adjacent properties. Recent wildfires throughout California, and the proximity to residential areas, likely preclude prescribed fire as a possible management strategy. In the absence of canopy and ground clearing events, such as fire, understory vegetation, both native and nonnative, may outcompete any Gowen cypress that germinate in the absence of fire. If unmanaged, this may result in a slow loss of Gowen cypress individuals and extent as older individuals die and are not replaced with new trees. However, recruitment has been observed at the Huckleberry Hill population both in 2012 during the last 5-year review and in 2018 (Service 2012, p. 7; Lemein 2021, pers. obs.). This suggests that non-fire disturbance may be a suitable management strategy, although this hypothesis needs further research.

The Point Lobos Ranch population does not have the same adjacent developmental pressure as the Huckleberry Hill population and is instead constrained by soil type and competition with adjacent Monterey pine forest. A dirt road borders much of the Point Lobos Ranch stand and may be viewed both as a threat through increased erosion (described below) and suppressed recruitment from use, as well as a possibility for population expansion if the road is abandoned (Allen 2021, pers. com.).

In summary, development adjacent primarily to the Huckleberry Hill population has altered the natural processes of fire and has constrained the population to its current extent. The current situation is not likely to change and mitigation of this threat must instead come from active management of the existing stand to create opportunities for recruitment and survival of new Gowen cypress. Similarly, maintenance of the existing extent of the Point Lobos Ranch population and the possibility of a small amount of expansion through road abandonment present the most likely strategy to address this threat.

Invasive Species

French broom and pampas grass (*Cortaderia* spp.) are the current primary invasive species of concern within the Gowen cypress populations. Both of these species have been regularly removed from the Huckleberry Hill population in an effort to maintain habitat suitability and encourage recruitment (Service 2012, p. 14). Monterey cypress has also been the target of

removal efforts since, while native to the area, they are aggressive upon establishment and can outcompete Gowen cypress (Service 2012, p. 10). The California Department of Parks and Recreation has a vegetation management plan that describes an ongoing need to maintain the Gowen cypress population through invasive species removal (Allen 2021, pers. com.). At the Point Lobos Ranch population Monterey Pine is the only competing native species and has invaded the Gowen cypress occupied areas but do constrain population expansion.

Erosion

Erosion resulting from mountain bike and hiking trails within the Huckleberry Hill population and from a road bordering the Point Lobos Ranch population was identified as a threat in the 2008 5-year review (Service 2008, p 12). The construction of mountain bike trails consisting of jumps and other built features were observed to directly impact small Gowen cypress. When this threat was identified, the Pebble Beach Company did not have the personnel to address the issue completely, but began attempting to remove and control the expansion of these trails. By 2011, the number of trails had decreased (Service 2012, p. 13). The current status of the extent of trails and the degree to which they are controlled and removed is unknown. The proximity of the Huckleberry Hill population to residential areas is likely to make continued development of unauthorized trails a persistent threat that will require active management.

Erosion at the Point Lobos Ranch population occurs along a road that borders the population. Top soil has been lost from this area that likely would have supported Gowen cypress. The California Department of Parks and Recreation views this road as an opportunity to expand the population through road closure, recontouring, and reclaiming topsoil from a berm on the lower side of the road (Allen 2021, pers. com.). However, funding for this project has not been secured.

Climate Change

The tolerance of Gowen cypress to changes in annual precipitation, minimum temperature, and maximum temperature are unknown. Current climate modeling suggests that average annual precipitation may increase by 1.6 to 2.1 inches under all future scenarios of carbon emission by 2099 (Table 1, CalAdapt 2021, data). The average minimum and maximum temperatures are also predicted to increase under the same time period (CalAdapt 2021, data). The timing of precipitation coupled with changes in temperature is predicted to lead to more variability with greater frequency of extreme droughts and, conversely, more extreme wet years (Langridge 2018, pp. 16-17). For commonly occurring species, it is hypothesized that species ranges will change to follow climatic conditions that are favorable for survival (Loarie *et al.* 2008, pp. 3-5). However, this would likely require dispersal pathways, available unoccupied suitable habitat, and a shift in climate gradual enough to allow for passive dispersal. For rare species that have small geographic ranges and are restricted to specific soil types, dispersal along changing climatic gradients is not likely to occur. If the climatic conditions become unsuitable for Gowen cypress where it currently exists only active relocation to suitable habitat may allow for the persistence of the species.

Table 1. Changes in precipitation, minimum average temperature, and maximum average temperature for low and high emission scenarios compared to historical averages for each population of Gowen cypress

	Precip (inches)	**Precip (inches)**	**Min T (deg. F)**	**Min T (deg. F)**	**Max T (deg. F)**	**Max T (deg. F)**
Population	Historical Average	RCP 4.5 (RCP 8.5)	Historical Average	RCP 4.5 (RCP 8.5)	Historical Average	RCP 4.5 (RCP 8.5)
Huckleberry Hill	17.6	19.2 (19.5)	48.2	51.1 (52.8)	65.5	68.4 (70.0)
Point Lobos Ranch	19.0	20.8 (21.1)	47.6	50.6 (52.2)	65.7	68.6 (70.1)

Precip = Precipitation; Min T = Minimum Average Temperature; Max T = Maximum Average Temperature. Reported values for the modeled futures are based on the average of the HadGEM2-ES (warmer and drier) and CNRM–CM5 (cooler and wetter) future scenarios. The Representative Concentration Pathway (RCP) 4.5 scenario refers to a future scenario where emissions peak near 2040 and then decline, while RCP 8.5 refers to a scenario where emissions continue to rise strongly through 2050 and plateau near 2100. The historical average is based on the years 1950–2005 as reported by cal-adapt.org. The modeled values are estimates from the years 2022–2099. Reported values are from spatial files delineating the extent of each population.

Summary of threats:

The threat of effects of development continues. This threat is greatly reduced at the Point Lobos Ranch population since most of the immediately surrounding area is preserved and the population is constrained by soil type and competing vegetation rather than development. The reduction of this threat will need to come from active management to address the issues of fire suppression and resulting decreased recruitment at both populations.

Invasive species are a threat for rare species in California and will similarly need continued active management to reduce the chance that they inhibit recruitment or outcompete existing Gowen cypress. The threat is currently being addressed at both populations through vegetation management plans, although it is unclear how regularly invasive species removal occurs at either location.

Erosion will continue to be a threat as long as unauthorized trails are constructed at the Huckleberry Hill population, and until the road is removed and ground restored at the Point Lobos Ranch population. This threat is greater at the Huckleberry Hill population due to its proximity to residential areas and the fact that the unauthorized trail construction has the potential to result in both direct loss of individuals as well as facilitating erosion and reduction of habitat suitability.

The tolerance of Gowen cypress to changes in climate are unknown. If the changes in climate fall within the tolerance range of the species, then the threat of climate change could be considered low. However, if the changes in climate fall outside the tolerance of the species, this threat may considered severe due to the lack of suitable habitat outside of its current range.

EVALUATION OF DOWNLISTING AND DELISTING CRITERIA

Delisting criteria are described in the Recovery Plan (Service 2004, pp.55-56) and are reiterated here:

1. Monitoring of the Del Monte Forest population and the Point Lobos population for a minimum of 10 years (or longer if needed) shows long term reproductive success in both populations. As determined by research, protected habitat must be of adequate size (large enough to support a functioning ecosystem, including areas that support suitable unoccupied habitat for population expansion and fluctuations in distribution) to ensure that ecosystem and community processes and associated species (e.g., hydrologic regime, fire, food webs, fauna, Monterey pine forest communities) are maintained, and that the locations are adequate to provide for population expansion and for colonization of new areas as microhabitat conditions change.

This criteria has not been met. No monitoring of either population has occurred since listing in 1998. Observations of recruitment have been made, although it is unknown whether the observed recruitment is surviving at a rate that matches mortality of older trees and the age structure of each population remains unknown. No research has been conducted that has estimated population size, although the restriction of Gowen cypress to specific soil types and the constraint of the Huckleberry Hill population by surrounding development make expansion outside of the current occupied areas unlikely. In order for this criteria to be met, repeated inventories of each population need to be made, including age structure and recruitment for a long enough period of time to suggest whether or not the populations are stable within their current extent.

2. Twelve or more years (or possibly as much as one generation) of monitoring have determined that successful recruitment has increased the overall size of both populations. Regeneration success should be measured in terms of abundant natural regeneration (with parental contributions from many trees for genetic purposes) and measured directly with genetic analysis if possible.

This criteria has not been met. No monitoring has occurred at either the Huckleberry Hill population or the Point Lobos Ranch population. As a result, an increase or decrease in population size and levels of recruitment associated with population trends is not available.

3. A prescribed burn plan is established to improve surrounding habitat to reduce high vegetation cover and promote recruitment, or research has documented an alternative method to burning that is successful in promoting reproduction. Appropriate management to improve the surrounding habitat would need to be successfully implemented. Funds must be available for appropriate long-term management.

This criteria has not been met. No prescribed burn plan has been proposed for either population. The increase in severe wildfires throughout California, continued drought, and the proximity of the Huckleberry Hill population to residential areas reduce the chance that a prescribed burn plan

will be adopted at either population. However, recruitment in disturbed areas without fire has been observed at the Huckleberry Hill population and may suggest that long term stability of the population could be achieved without fire. This hypothesis needs research to be considered a viable option for long term management.

4. A seed bank is established at a recognized institution certified by the Center for Plant Conservation (CPC). The seed bank is needed for protection of the species in case of an unforeseen naturally occurring event that would create a lack of reproduction or die-off from disease. Seeds should represent the remaining genetic diversity of the species and the viability (i.e., germination percentage) of the seed collection should be determined.

There are four accessions of Gowen cypress at the California Botanic Garden (formerly Rancho Santa Ana Botanic Garden). Three of the accessions date from 2003 and are from the Huckleberry Hill population. Germination tests on this seed, conducted in 2003, had between 0% and 38% germination success (CBG 2021, data). These accessions are held by the California Botanic Garden, but have no funding for additional germination trials or other conservation work. The 2012 5-year review concluded that since these accessions lacked funding they did not meet the recovery criteria for having seed stored in a CPC approved seed bank (California Botanic Garden is a CPC approved seed bank) (Service 2012, p. 17). In 2013, Gowen cypress seed from the Point Lobos Ranch population was sent to the California Botanic Garden. This seed had been collected in 2003 and stored under refrigeration from 2003 through 2012 (Birker 2021, pers. com.). Germination trials were conducted by the California Botanic Garden in 2013 and found 10% success (CBG 2021, data). This fourth accession is also not funded. Considering the age of all the seed currently stored, low germination rates, and lack of funding for additional conservation work, the recovery criteria for seed banking remains unmet.

CONCLUSION

The evaluation of threats affecting the species under the factors in 4(a)(1) of the Act and the analysis of the status of the species in our 2012 5-year review remain accurate reflections of the species current status. After reviewing the best available scientific information, we conclude that Gowen cypress remains a threatened species.

RECOMMENDATIONS FOR FUTURE ACTIONS:

1. Conduct inventories of the Huckleberry Hill population and the Point Lobos Ranch population including age structure of each stand and recruitment through time. Inventories should also include associated information such as co-occurring vegetation and amount of available space for colonization. Inventories should be conducted every five years or at an interval such that meaningful comparisons can be made.
2. Conduct research to evaluate whether a more general ground disturbance may replace fire in order to encourage recruitment. It is unlikely that prescribed fire will be an acceptable management tool so additional strategies are needed.
3. Evaluate inter- and intra- population genetic diversity.
4. Establish a funded seed collection with seed from both populations, representing the majority of the genetic diversity of the species.

APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approved STEPHEN HENRY Digitally signed by STEPHEN HENRY Date: 2021.05.14 09:54:36 -07'00'

REFERENCES

Allen, M. 2021. Email from Matthew Allen, California State Parks, to Todd Lemein, U.S. Fish and Wildlife Service, regarding Gowen cypress management at Point Lobos Ranch. April 16, 2021.

Birker, C. 2021. Email from Cheryl Birker, California Botanic Garden, to Todd Lemein, U.S. Fish and Wildlife Service, regarding the seed of Gowen cypress stored at California Botanic Garden. April 29, 2021.

Cal-adapt. 2021. Annual Averages Data Viewer. Available on the internet at <https://cal-adapt.org/tools/annual-averages>. Accessed April 2021.

[CASP] Carmel Area State Parks. 2018. Preliminary General Plan and Draft Environmental Impact Report. State Clearinghouse #2012041016.

[CBG] California Botanic Garden. 2021. Spreadsheet data of seed held in storage and associated information. Accessed from < https://www.calbg.org/conservation/seed-conservation> April 2021.

Griffin, J.R., and W.B. Critchfield. 1976. The distribution of forest trees in California and supplement. USDA Forest Service Research Paper PSW-82/1972.

Jones and Stokes Associates, Inc. 1996. Recovery strategies for six coastal plant species on the Monterey Peninsula. Report prepared for the California Department of Fish and Game, Sacramento, California. 35 pp. + appendices.

Langridge, R. (University of California, Santa Cruz). 2018. Central Coast Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCCA4-2018-006.

Lemein, T. 2019. Field notes from Pebble Beach area site assessments for Monterey clover, coastal dunes milk-vetch, Hickman's potentilla, Menzies wallflower, and Gowen cypress. February 28, 2019.

Loarie, S.R., B.E. Carter, K.H. Hayhoe, S. McMahon, R. Moe, C.A. Knight, and D.D. Ackerly. 2008. Climate Change and the Future of California' Endemic Flora. PLoS ONE 3(6): e2502. Doi: 10.1371/journal.pone.0002502

[Service] U.S. Fish and Wildlife Service. 1998. Endangered and Threatened Wildlife and Plants; Final Rule Listing Five Plants From Monterey County, CA, as Endangered or Threatened. 63 FR 43100-43116.

[Service] U.S. Fish and Wildlife Service. 2004. Recovery Plan for Five Plants from Montery County, California. U.S. Fish and Wildlife Service, Portland, Oregon. 175 pp.

[Service] U.S. Fish and Wildlife Service. 2008. *Callitropsis* [=*Cupressus*] *goveniana* (Gowen cypress) 5-Year Review: Summary and Evaluation. Ventura, California. 22 pp.

[Service] U.S. Fish and Wildlife Service. 2012. *Hesperocyparis* [=*Cupressus*] *goveniana* (Gowen cypress) 5-Year Review: Summary and Evaluation. Ventura, California. 27 pp.

[Service] U.S. Fish and Wildlife Service. 2020. Initiation of 5-Year Status Reviews of 66 species in California and Nevada. Notice of initiation of reviews; request for information (85 FR 4692), January 27, 2020.

Vogl, R.J., W.P. Armstrong, K.L. White, and K.L. Cole. 1988. The closed-cone pines and cypress. In: Barbour, M.G. and J. Major (eds.) Terrestrial Vegetation of California. California Native Plant Society, Spec. Pub. No. 9. Sacramento. Pp. 295-324.