



# Conservation Gap Analysis of Native U.S. Oaks

## Species profile: *Quercus pumila*

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### SPECIES OF CONSERVATION CONCERN

#### CALIFORNIA

Channel Island endemics:  
*Quercus pacifica*, *Quercus tomentella*

Southern region:  
*Quercus cedrosensis*, *Quercus dumosa*,  
*Quercus engelmannii*

Northern region and /  
or broad distribution:  
*Quercus lobata*, *Quercus parvula*,  
*Quercus sadleriana*

#### SOUTHWESTERN U.S.

Texas limited-range endemics  
*Quercus carmenensis*,  
*Quercus graciliformis*, *Quercus hinckleyi*,  
*Quercus robusta*, *Quercus tardifolia*

Concentrated in Arizona:  
*Quercus ajoensis*, *Quercus palmeri*,  
*Quercus toumeyii*

Broad distribution:  
*Quercus havardii*, *Quercus laceyi*

#### SOUTHEASTERN U.S.

State endemics:  
*Quercus acerifolia*, *Quercus boyntonii*

Concentrated in Florida:  
*Quercus chapmanii*, *Quercus inopina*,  
***Quercus pumila***

Broad distribution:  
*Quercus arkansana*, *Quercus austrina*,  
*Quercus georgiana*,  
*Quercus oglethorpensis*, *Quercus similis*



# Quercus pumila Walter

**Synonyms:** *Cyclobalanopsis sericea* (Aiton) Schottky, *Quercus elliotii* Wilbur, *Q. sericea* (Aiton) Willd. **Common Names:** Runner oak

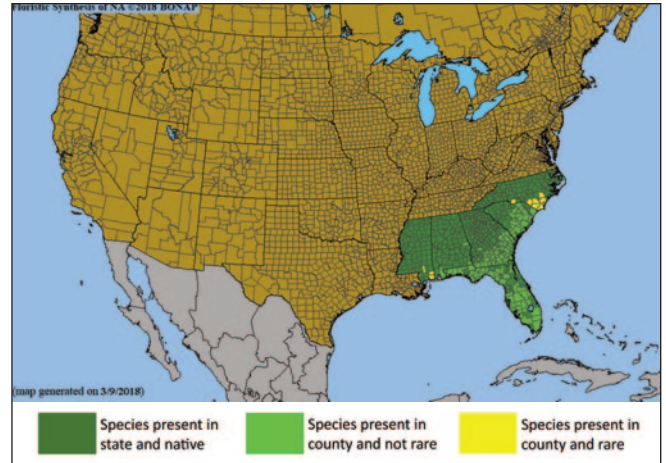
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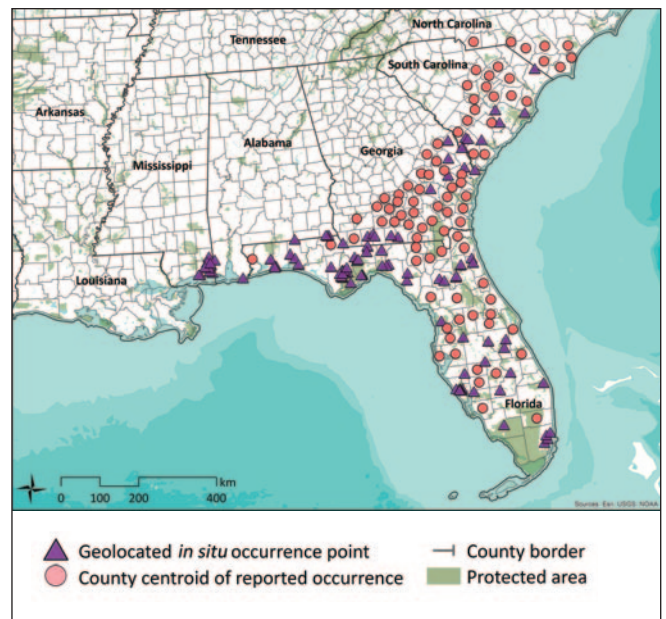


## DISTRIBUTION AND ECOLOGY

*Quercus pumila*, or Runner oak, occurs in the southeastern U.S., throughout peninsular Florida and along the Coastal Plain north to North Carolina and west to Mississippi. There is recent uncertainty regarding the species' name, since the discovery that no original 1788 herbarium specimen exists, and Walter's accompanying description is not precise enough to confirm the species' identity. *Quercus pumila* is certainly a distinctive species, but *Q. elliotii* has been proposed as the correct name, given by Wilbur in 2002 after deeming Walter's description inadequate. However, some believe the herbarium specimen chosen by Wilbur is actually a hybrid between *Q. falcata* and *Q. phellos*, causing further confusion.<sup>1,2,3</sup> Runner oak grows as a small shrub, deciduous or partially-deciduous, and reaches about one meter in height, sometimes two meters in ideal conditions. Its leaves are unlobed and slightly revolute with white pubescence beneath. Runner oak is highly clonal, producing shoots from a stolon or "runner," and grows primarily horizontally. This species is found on dry sandy to loamy soils of pine flatwoods, oak-pine scrub, savannas and ridges. Adapted to fire, *Q. pumila* re-sprouts quickly with increased acorn production once burned.<sup>1,4,5</sup>



**Figure 1.** County-level distribution map for *Quercus pumila*. Source: Biota of North America Program (BONAP).<sup>6</sup>



**Figure 2.** Documented *in situ* occurrence points for *Quercus pumila*. Protected areas layer from U.S. Geological Survey Gap Analysis Program (GAP) 2016 Protected Areas Database of the U.S. (PAD-US).<sup>7</sup>

## VULNERABILITY OF WILD POPULATIONS

**Table 1.** Scoring matrix identifying the most severe demographic issues affecting *Quercus pumila*. Cells are highlighted when the species meets the respective vulnerability threshold for each demographic indicator. Average vulnerability score is calculated using only those demographic indicators with sufficient data (i.e., excluding unknown indicators).

Demographic indicators	Level of vulnerability						Score
	Emergency Score = 40	High Score = 20	Moderate Score = 10	Low Score = 5	None Score = 0	Unknown No score	
Population size	< 50	< 250	< 2,500	< 10,000	> 10,000	Unknown	0
Range/endemism	Extremely small range or 1 location	E00 < 100 km <sup>2</sup> or A00 < 10 km <sup>2</sup> or 2-4 locations	E00 < 5,000 km <sup>2</sup> or A00 < 500 km <sup>2</sup> or 5-9 locations	E00 < 20,000 km <sup>2</sup> or A00 < 2,000 km <sup>2</sup> or 10+ locations	E00 > 20,000 km <sup>2</sup> or A00 > 2,000 km <sup>2</sup>	Unknown	0
Population decline	Extreme	>= 80% decline	>= 50% decline	>= 30% decline	None	Unknown	5
Fragmentation	Severe fragmentation	Isolated populations	Somewhat isolated populations	Relatively connected populations	Connected populations	Unknown	10
Regeneration/recruitment	No regeneration or recruitment	Decline of >50% predicted in next generation	Insufficient to maintain current population size	Sufficient to maintain current population size	Sufficient to increase population size	Unknown	-
Genetic variation/integrity	Extremely low	Low	Medium	High	Very high	Unknown	5
Average vulnerability score							4.0
Rank relative to all U.S. oak species of concern (out of 19)							17

## THREATS TO WILD POPULATIONS

### High Impact Threats

**Human modification of natural systems — disturbance regime modification, pollution, and/or eradication:** The pine-oak scrub communities that *Q. pumila* occupies are threatened by fire suppression, which allows taller species to encroach and shade out scrub oaks, including Runner oak.<sup>8</sup>

### Moderate Impact Threats

**Human use of landscape — residential/commercial development, mining, and/or roads:** Tall Timbers Research Station and Land Conservancy found that Runner oak was among a group of species especially sensitive to disturbance.<sup>9</sup> Development persists in many areas occupied by *Q. pumila* and may be disproportionately affecting the species. Because *Q. pumila* tends to reproduce sexually only in aboriginal soil conditions, it is unlikely to volunteer in “new ground.” Therefore, its sustained inhabitancy is assured to the extent that its aboriginal habitat is protected from severe soil disturbance (G. Wilhelm pers. comm., 2018).

### Low Impact Threats

**Human use of landscape — tourism and/or recreation:** Scrub habitat is readily damaged by off-road vehicle traffic or even foot traffic, which destroys the delicate ground cover and allows the loose sand to erode.<sup>10</sup>

**Climate change — habitat shifting, drought, temperature extremes, and/or flooding:** Scrub communities are known to be sensitive to disturbance regime changes, which are altered by a changing climate. Further research is necessary regarding the effects of climate change on the fluctuation of fire regimes.<sup>11</sup> No climate change projections are known for *Q. pumila* specifically.

**Genetic material loss — inbreeding and/or introgression:** Negative effects have not yet been seen, but hybridization with *Quercus hemisphaerica*, *Q. incana*, *Q. myrtifolia*, and *Q. phellos* has been noted.<sup>1</sup>

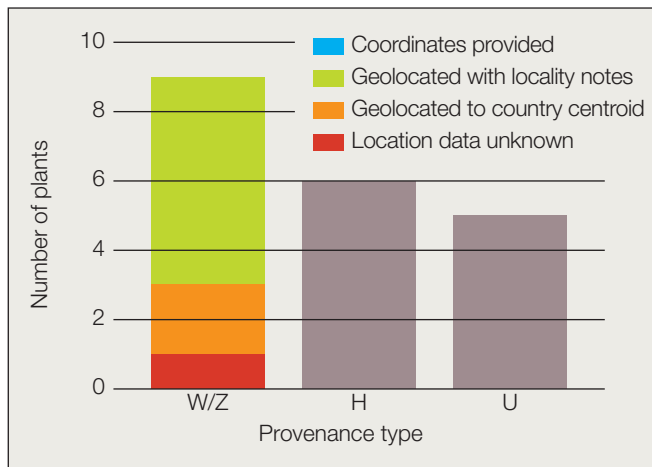
**Pests and/or pathogens:** Because *Q. pumila* is a member of the red oak clade (Sect. Lobatae), it has the potential to be affected by oak wilt, Sudden oak death (SOD), and Goldspotted oak borer.<sup>12,13,14</sup> No serious damage has been reported to-date, though continued monitoring is necessary. Based on SOD’s current distribution in California and the environmental conditions at these locations, models “indicated highest potential for establishment [of SOD] in the southeastern USA;” therefore, Runner oak is at particular risk should the pathogen spread throughout the Southeast.<sup>13</sup>

## CONSERVATION ACTIVITIES

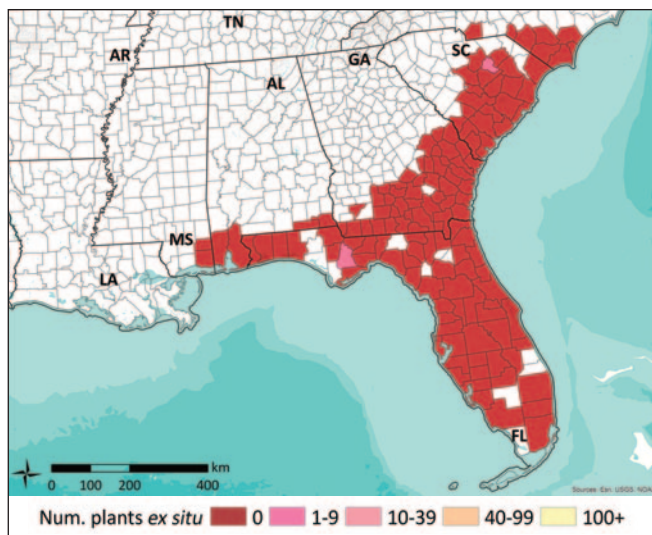
In 2017 *Quercus* accessions data were requested from *ex situ* collections. A total of 162 institutions from 26 countries submitted data for native U.S. oaks (Figures 3 and 4). Past, present, and planned conservation activities for U.S. oak species of concern were also examined through literature review, expert consultation, and conduction of a questionnaire. Questionnaire respondents totaled 328 individuals from 252 organizations, including 78 institutions reporting on species of concern (Figure 6).

### Results of 2017 *ex situ* survey

Number of <i>ex situ</i> collections reporting this species:	9
Number of plants in <i>ex situ</i> collections:	20
Average number of plants per institution:	2
Percent of <i>ex situ</i> plants of wild origin:	45%
Percent of wild origin plants with known locality:	89%



**Figure 3.** Number and origin of *Quercus pumila* plants in *ex situ* collections. Provenance types: W = wild; Z = indirect wild; H = horticultural; U = unknown.

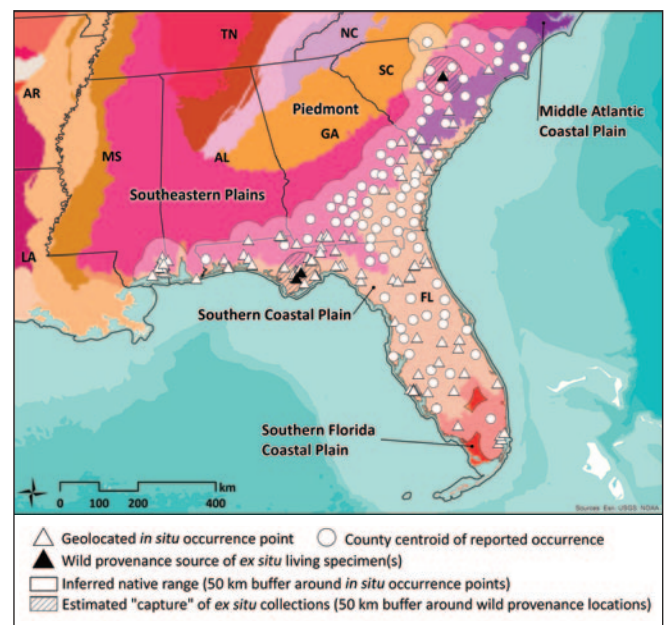


**Figure 4.** *Quercus pumila* counties of *in situ* occurrence, reflecting the number of plants from each county in *ex situ* collections.

A spatial analysis was conducted to estimate the geographic and ecological coverage of *ex situ* collections (Figure 5). Fifty-kilometer buffers were placed around each *in situ* occurrence point and the source locality of each plant living in *ex situ* collections. Collectively, the *in situ* buffer area serves as the inferred native range of the species, or “combined area *in situ*” (CAI50). The *ex situ* buffer area represents the native range “captured” in *ex situ* collections, or “combined area *ex situ*” (CAE50). Geographic coverage of *ex situ* collections was estimated by dividing CAI50 by CAE50. Ecological coverage was estimated by dividing the number of EPA Level IV Ecoregions present in CAE50 by the number of ecoregions in CAI50.

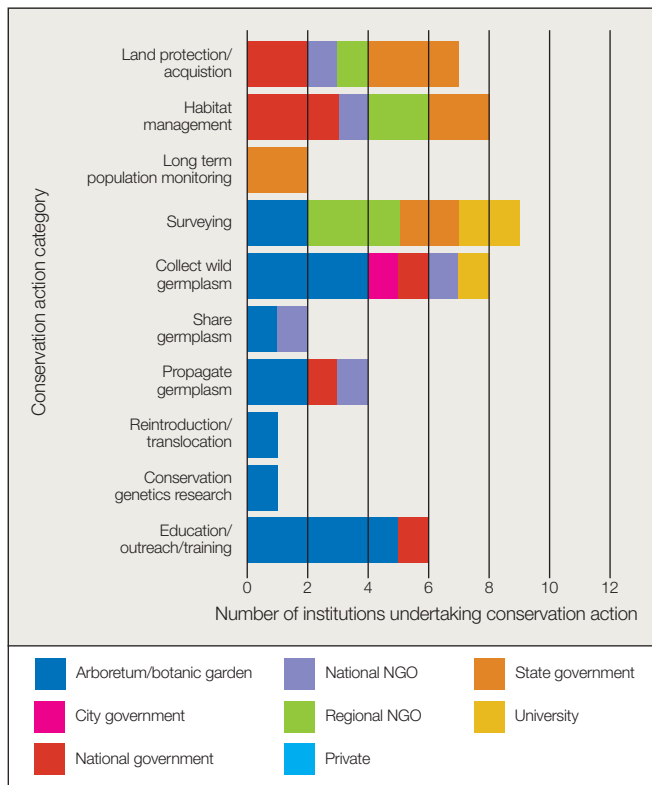
### Estimated *ex situ* representation

Geographic coverage:	5%
Ecological coverage:	41%



**Figure 5.** *Quercus pumila* *in situ* occurrence points and *ex situ* collection source localities. U.S. EPA Level III Ecoregions are colored and labeled.<sup>15</sup> County centroid is shown if no precise locality data exist for that county of occurrence. Email [treeconservation@mortonarb.org](mailto:treeconservation@mortonarb.org) for information regarding specific coordinates.





**Figure 6.** Number of institutions reporting conservation activities for *Quercus pumila* grouped by organization type. Twenty-one of 252 institutions reported activities focused on *Q. pumila* (see Appendix D for a list of all responding institutions).

**Land protection:** Within the inferred native range of *Q. pumila*, 19% of the land is covered by protected areas (Figure 7). However, compared to other regions in the southwestern U.S., Florida has a large proportion of protected area, indicating this estimate may be low. Runner oak is also known to have many robust populations within protected areas, and the more concerning issue is fragmentation of preserves rather than the lack of land protection.

*Quercus pumila* is often associated with Longleaf pine, whose habitat is actively protected and managed across the southeastern U.S. Detailed maps are available and include locations of significant landscapes, protected areas, federally managed lands, and conservation organizations and projects associated with each area.<sup>16</sup> The species is also specifically documented on Persimmon Ridge Preserve in Lee County, Florida, which connects to a series of other preserves.<sup>17</sup>

**Sustainable management of land:** As a keystone species, Longleaf pine decline in the southeastern U.S. affects the entire fire-adapted associated ecosystem. Litter buildup of longleaf promotes the spread of low temperature fires, and the coexisting species within these ecosystems have developed a reliance on this fire frequency and intensity. *Quercus pumila*, *Q. minima*, *Q. laevis*,

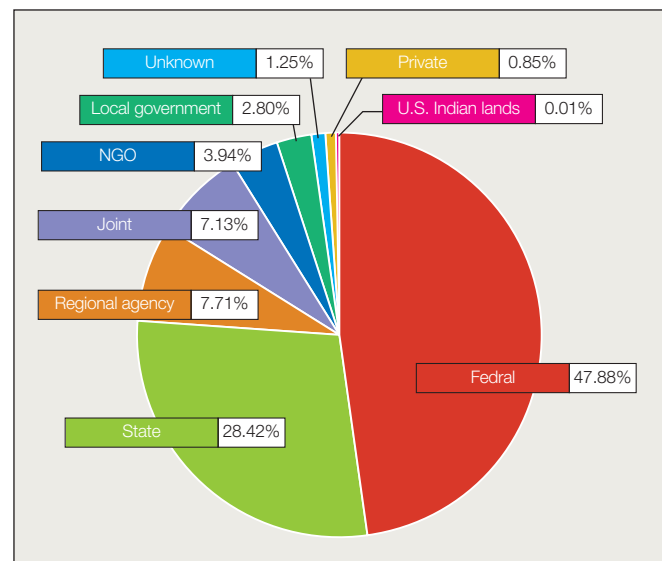
*Q. incana*, and *Q. margareta* all produce acorns on two-year old shoots after fire.<sup>18</sup> Therefore, restoration and management of Longleaf pine habitat (for which there are many initiatives), is likely to increase the survival and successful regeneration of *Q. pumila* and related scrub oaks in the ecosystem. Runner oak is also within a Gopher tortoise habitat management area, where active management takes place to increase tortoise populations. Short-term management aims to create “appropriate canopy coverage (canopy thinning and other treatments to achieve immediate site enhancement)” and long-term plans are focused on “establishing [a] thriving understory to support gopher tortoises (prescribed fires, roller chopping) in perpetuity.”<sup>19</sup> It is unclear if these management actions will negatively affect *Q. pumila*, due to its sensitivity to disturbance.

**Population monitoring and/or occurrence surveys:** Nine institutions reported this activity in the conservation action questionnaire, but no other details are currently known.

**Wild collecting and/or ex situ curation:** Seven institutions reported this activity in the conservation action questionnaire, but no other details are currently known.

**Propagation and/or breeding programs:** The non-profit organization Trees Atlanta propagated and sold *Q. pumila* in their fall 2011 tree sale.<sup>20</sup>

**Reintroduction, reinforcement, and/or translocation:** One institution reported this activity in the conservation action questionnaire, but no other details are currently known.



**Figure 6.** Management type of protected areas within the inferred native range of *Quercus pumila*. Protected areas data from the U.S. Geological Survey Gap Analysis Program (GAP) 2016 Protected Areas Database of the U.S. (PAD-US).<sup>7</sup>

Adam Black



**Research:** In winter 2012 and 2013, Tall Timbers Research Station and Land Conservancy took advantage of firebreaks created with a tractor and disk in two different longleaf pine-wiregrass areas to study the subsequent impact on the native plants. Of the species monitored, 12 were significantly reduced by the single disking three to four years after the disturbance. Oak species found to be sensitive to soil disturbance include Running oak, Sand post oak (*Q. margarettae*), and Bluejack oak (*Q. incana*). The study concludes “that while most plant species in longleaf native groundcover can survive or become re-established following a small-scale soil disturbances, there is a certain suite of species that are negatively impacted and slow to recover, and which otherwise make up a significant proportion of the vegetation cover in undisturbed areas.”<sup>9</sup>

**Education, outreach, and/or training:** The Natives For Your Neighborhood program in southern Florida lists *Q. pumila* as a landscaping possibility, though only “grown by enthusiasts and occasionally by native plant nurseries.”<sup>21</sup>

**Species protection policies:** No known initiatives at the time of publication.

## PRIORITY CONSERVATION ACTIONS

Conservation of Runner oak should include a study of wild populations to determine the amount of genetic diversity within the species; once an understanding of this diversity is known, it can inform the necessary *in situ* and *ex situ* preservation efforts. Among these efforts, it would be useful to verify the locations that are only known from county centroid occurrence data. It is clear that there are threats to *Q. pumila* from various human activities, including fire suppression, land use, and development. In order to target populations for conservation, it would be important to get a fuller understanding of those populations with high or unique levels of diversity. With this information in hand, distinct populations could be targeted for *in situ* conservation through habitat restoration and appropriate controlled burns regimes. It may be important to provide training for land managers, regarding best practices for Runner oak habitats. Given the extremely low level of the species’ wild distribution represented in collections, a greater understanding of the most vulnerable and diverse populations would inform targeted collecting of populations to be held in *ex situ* collections.

### Conservation recommendations for *Quercus pumila*

#### Highest Priority

- Research (climate change modeling; demographic studies/ecological niche modeling; land management/disturbance regime needs; population genetics)
- Sustainable management of land

#### Recommended

- Education, outreach, and/or training
- Population monitoring and/or occurrence surveys
- Reintroduction, reinforcement, and/or translocation
- Wild collecting and/or *ex situ* curation

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