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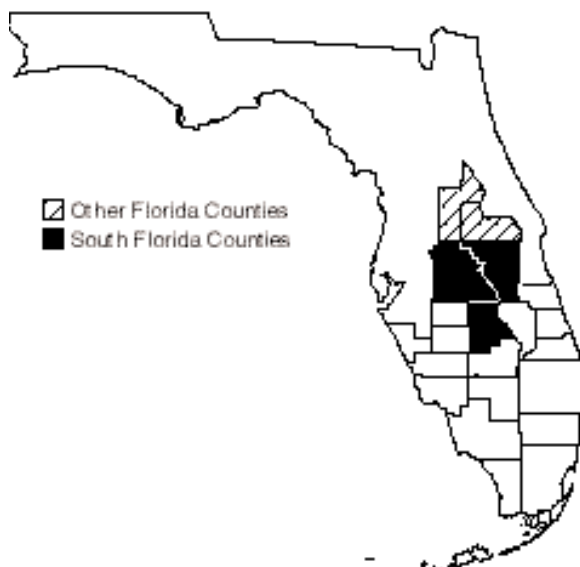
# Papery Whitlow-wort

## *Paronychia chartacea* Fern

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Federal Status:	Threatened (January 21, 1987)
Critical Habitat:	None Designated
Florida Status:	Endangered
Recovery Plan Status:	Revision (May 18, 1999)
Geographic Coverage:	Rangewide

Figure 1. County distribution of the papery



*Paronychia chartacea* (= *Nyachia pulvinata*) is a member of the pink family, Caryophyllaceae. *Paronychia chartacea* is a short-lived dioecious herb, forming small mats. There are two geographically isolated subspecies of this small herb: *P. chartacea* ssp. *chartacea* in central Florida and the recently described *P. chartacea* ssp. *minima* in northwestern Florida. Both subspecies are federally listed as threatened. Like many of the other Lake Wales Ridge endemic scrub plants, this species was listed because of habitat loss to agricultural, commercial, residential, and recreational purposes.

This account represents a revision of the existing recovery plan for the papery whitlow-wort (FWS 1996).

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### Description

The papery whitlow-wort is mat-forming with many bright yellowish-green branches radiating flatly from a strong taproot (Kral 1983, Small 1933). The stems are 5 to 20 cm long and are wiry. The leaf blades are sessile, 1.5 to 3.0 mm long, ovate to triangular-ovate in shape, and strongly revolute. It has numerous small cream-colored to greenish flowers (Small 1933, FWS 1996) that produce a very thin-walled utricle (Kral 1983).

There are two geographically isolated subspecies of this small herb: *P. chartacea* ssp. *chartacea* in central Florida and *P. chartacea* ssp. *minima* L. Anderson in the Florida panhandle. Much of the distinction between the two subspecies is a matter of degree (Anderson 1991). The *P. chartacea* ssp. *minima* is somewhat less pubescent than ssp. *chartacea*. There are also differences in their base stems, leaf width, and flower cluster (Anderson 1991).

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### Taxonomy

The papery whitlow-wort was first named by Small (1925) as *Nyachia pulvinata*. In 1936 Fernald transferred the species to the genus *Paronychia* as *P. chartacea* because the name *P.*

*pulvinata* was pre-empted (Anderson 1991). In 1991 Anderson formally described two geographically distinct subspecies, *P. chartacea* ssp. *chartacea* and *P. chartacea* ssp. *minima*. The subspecies *P. chartacea* ssp. *minima* was formally described by Anderson (1991), several years after *P. chartacea* had been listed as a threatened species. Because the entire species was listed as threatened, the newly described subspecies is also protected.

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## Distribution

*P. chartacea* ssp. *chartacea* is endemic to the scrub community on the Lake Wales Ridge (Kral 1983), in Highlands, Polk, Osceola, Orange, and Lake counties (Anderson 1991) (Figure 1). The subspecies *P. chartacea* ssp. *minima* occurs in the karst region of the Florida panhandle, Washington and Bay counties.

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## Habitat

The natural habitat for the papery whitlow-wort on the Lake Wales Ridge (that is for *P. chartacea* ssp. *chartacea*) is rosemary scrub, which is also known as the rosemary phase of sand pine scrub (Abrahamson *et al.* 1984, Christman 1988, Menges and Kohfeldt 1995). At Archbold Biological Station, rosemary scrubs are found only on the higher ridges and knolls in the intra-ridge valley at 40 to 50 m in elevation, and are largely restricted to St. Lucie and Archbold soil types (Abrahamson *et al.* 1984), both well-drained white sands (Carter *et al.* 1989). The fire cycle in rosemary scrub can range from 10 to as long as 100 years (Johnson 1982, Myers 1990). Rosemary scrub is dominated by Florida rosemary (*Ceratiola ericoides*) and oak species (*Quercus chapmannii*, *Q. geminata*, *Q. inopina*) with occasional sand pine (*Pinus clausa*). Abrahamson *et al.* (1984) provides a full description of the rosemary scrub habitat. The shrub matrix is interspersed with open sandy areas that contain a cover of herbs and lichens (Abrahamson *et al.* 1984, Hawkes and Menges 1996). These gaps are more persistent in rosemary scrubs than in scrubby flatwoods (Hawkes and Menges 1996).

Within these scrub communities, papery whitlow-wort is more abundant in disturbed, sandy habitats such as road rights-of-way and recently cleared high pine (Abrahamson *et al.* 1984, Christman 1988, FWS 1996). In rosemary scrub paper whitlow-wort can become very abundant after a fire or on disturbed sites such as along fire lanes or trails (FWS 1996, Johnson and Abrahamson 1990).

The subspecies *P. chartacea* ssp. *minima* occurs in the Florida panhandle in coarse white sand along margins of karst lakes (Anderson 1991). It is apparently favored by mild disturbance. It often occurs in nearly pure stands (Anderson 1991).

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## Reproduction

Anderson (1991) notes that *P. chartacea* ssp. *chartacea* has repeatedly been described as an annual, but states that it is often a short-lived perennial. Observations at Bok Tower Gardens indicate that *P. chartacea* ssp. *chartacea* behaves, both in the garden and in the wild, as a short-lived perennial. The

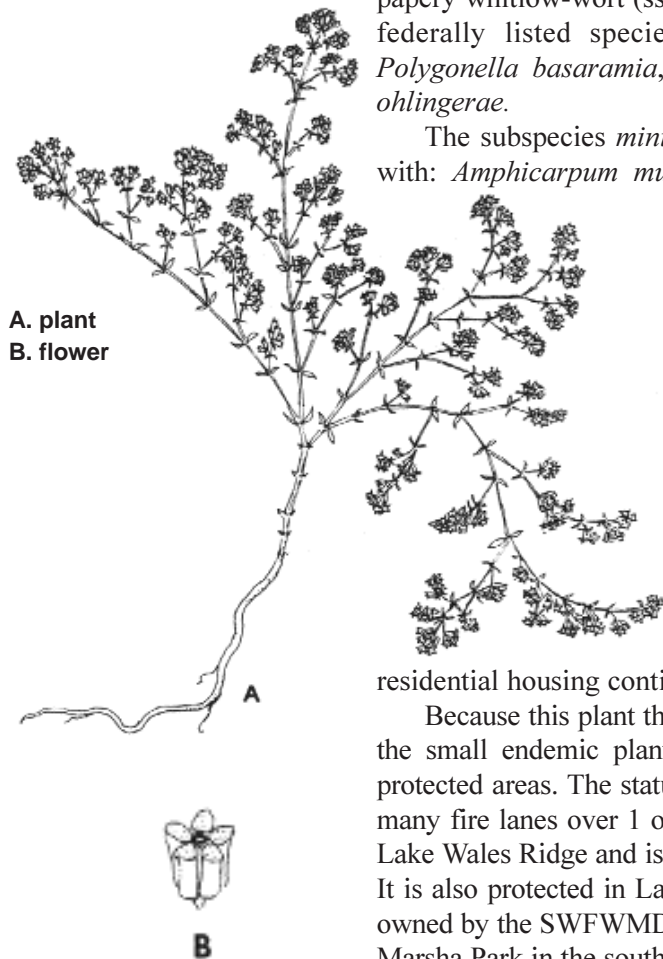
**Papery whitlow-wort.** Image adapted from an original drawing by Anna-Lisa King.

subspecies *P. chartacea* ssp. *minima* is strictly an annual (Anderson 1991). Flowering and fruiting occur in late summer or fall (Anderson 1991) and the seeds mature in September or October (T. Race, Bok Tower Gardens, personal communication 1996).

### Relationship to Other Species

In rosemary scrub, the papery whitlow-wort is found in association with 37 vascular plants and seven species of reindeer lichens (Johnson and Abrahamson 1990). In a study of the responses of species to fire in rosemary scrub, Johnson and Abrahamson (1990) identified two groups of this species: seeders and sprouters, and a third group that they were uncertain about. The papery whitlow-wort was considered a seeder along with 11 other species (Johnson and Abrahamson 1990, Ostertag and Menges 1994). Johnson and Abrahamson (1990) have also found that the papery whitlow-wort appeared in post burn plots of rosemary scrub when it was rare or absent prior to the burn. The papery whitlow-wort was displaced by rosemary and reindeer lichens within about 9 to 12 years post fire (Johnson and Abrahamson 1990). The papery whitlow-wort (ssp. *chartacea*) occurs in association with several other federally listed species: *Bonamia grandiflora*, *Hypericum cumulicola*, *Polygonella basaramia*, *Cladonia perforata*, *Eryngium cuneifolium*, *Liatris ohlingerae*.

The subspecies *minima* can occur in nearly pure stands or in association with: *Amphicarpum muhlenbergianum*, *Bulbostylis barbata*, *B. ciliatifolia*, *Chrysopsis lanuginosa*, *Eriocaulon lineare*, *Hypericum lissophloeus*, *H. reductum*, *Lachnanthes carolinianam*, *Lachnocaulon anceps*, *Paronychia patula*, *Polypremum procumbens*, *Rhexia salicifolia*, *Rhynchospora globularis*, *Sagittaria isoetiformis*, and *Xyris longisepala*.



### Status and Trends

The loss of scrub habitat is the primary reason the papery whitlow-wort is listed as a threatened species (52 CFR 2234). More than two-thirds of the historic scrub habitat of this plant was destroyed by 1980 (Christman 1988). Land conversion for citrus and residential housing continues to diminish scrub habitats.

Because this plant thrives in fire lanes and along sand roads, it is the last of the small endemic plants of the Lake Wales Ridge to disappear from fire-protected areas. The status of this species could be assessed by examining it in many fire lanes over 1 or 2 years (FWS 1996). It is ubiquitous in scrub on the Lake Wales Ridge and is protected in all of the biological preserves in this area. It is also protected in Lake County at the Crooked Lake site near Lake Louisa owned by the SWFWMD (FWS 1996) and in Orange County at Lakes Cain and Marsha Park in the southwest Orlando area.

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## Management

The density of *P. chartacea* ssp. *chartacea* increases in relation to available open space (Hawkes and Menges 1996, Menges and Kohfeldt 1995). Open spaces are commonly found in rosemary scrub after fire and in fire lanes and trails. The rosemary scrub has developed with periodic disturbances and the available open space and frequencies of disturbances are likely to influence the species composition (Hawkes and Menges 1996). Densities of *P. chartacea* ssp. *chartacea* decrease with time after fire, and it is displaced from rosemary scrub within 9 to 12 years post fire (Johnson and Abrahamson 1990, Hawkes and Menges 1996). Because it thrives in fire lanes, along sand roads, and trails, it is the least likely of the rare scrub plants to go extinct.

Management for *P. c.* ssp. *chartacea* will require the development of long-term burning regimes that mimic the natural fire cycles of rosemary scrub. There are complex relationships among fire, open space, and plant distributions within a xeric scrub that are essential for fire management and need to be studied further (Hawkes and Menges 1996). Management practices for rosemary scrub should include the fire requirements for all scrub flora and fauna (Hawkes and Menges 1996).

The species' tendency to colonize disturbed areas along easily accessible State road cuts and rights of way can result in over-estimation of the species abundance and health. On publicly managed lands, we caution against using species presence or abundance in altered habitats as the benchmark with which management decisions are made. Instead, management decisions should be made that maintain or enhance the dynamic diversity of Florida's scrub vegetation.

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# Recovery for the Papery Whitlow-wort

## *Paronychia chartacea* Fern

**Recovery Objective:** DELIST the species once recovery criteria are met.

### Recovery Criteria

*Paronychia chartacea* may be delisted when: enough demographic data are available to determine the appropriate numbers of self-sustaining populations and sites needed to assure 95 percent probability of persistence for 100 years; when these sites, within the historic range of *P. chartacea*, are adequately protected from habitat loss, degradation, and fragmentation; when these sites are managed to maintain the rosemary phase of xeric oak scrub communities to support *P. chartacea*; and when monitoring programs demonstrate that these sites support the appropriate numbers of self-sustaining populations, and those populations are stable throughout the historic range of the species.

### Species-level Recovery Actions

- S1. Determine current distribution of *P. chartacea*.** Some portions of *P. chartacea*'s range have been well surveyed yet a total distribution has not been ascertained for this species. A thorough survey is needed to determine the distribution for this species.
  - S1.1. Conduct surveys for additional populations of *P. chartacea*.**
    - S1.1.1. Continue surveys in Polk, Osceola, and Highlands counties.** The Lake Wales Ridge has probably been adequately surveyed, though new sites for *P. chartacea* may still be found.
    - S1.1.2. Continue surveys on protected lands.** New sites for listed species are still being found on protected lands. This survey work should be continued to catalog all existing protected sites and new sites as they are purchased.
  - S1.2. Maintain distribution of known populations and suitable habitat in GIS database.** Use GIS to map existing populations and to assess the species' status and trends over time. The database should contain information on locations, population sizes, and status. This information should also be used for project review, in land acquisition activities, and to coordinate updates with the Florida Natural Areas Inventory database. Currently, the Lake Wales Ridge Ecosystem Working Group and Archbold Biological Station are proposing to map the entire central ridge. This information would show potential habitat for scrub endemics based on their habitat needs.

- S2. Protect and enhance existing populations.** Much of the native xeric uplands on the Lake Wales Ridge and surrounding counties have been converted to agriculture or urban development. The remaining habitat is fragmented into small parcels and in many cases, has been isolated. For this reason, existing populations are in need of protection from a variety of threats.
- S2.1. Protect privately-owned habitat through acquisition, conservation easements, or agreements with landowners.**
  - S2.2. Protect populations on public lands.** Develop management guidelines that allow for a fire regime that includes a mosaic of successional stages.
  - S2.3. Use local or regional planning to protect habitat.** Utilize available regional and county planning processes to encourage protection of suitable habitat both unoccupied and occupied of *P. chartacea*.
  - S2.4. Continue *ex situ* conservation.** *Ex situ* collections are important for preserving genetic diversity, preventing extirpation, and determining ecological characteristics and habitat management needs of species. These collections will be instrumental in the recovery of *P. chartacea*.
    - S2.4.1. Conserve germ plasm.** The seed for this species is not presently in long term storage.
    - S2.4.2. Maintain *ex situ* collection.** Currently, the Center for Plant Conservation coordinates conservation activities and maintains a database for the National Collection. Bok Tower Gardens, as a participating institution, maintains and propagates *P. chartacea* as part of the National Collection.
  - S2.5. Enforce available protective measures.** Use local, State and Federal regulations to protect this species from overcollecting and damage from off-road vehicle use. Regulations should also be used to protect xeric vegetative communities where *P. chartacea* lives.
    - S2.5.1. Initiate section 7 consultation when applicable.** Initiate section 7 consultations when Federal activities may affect this species.
    - S2.5.2. Enforce take and trade prohibitions.** This species is protected by take provisions of the ESA (including its prohibition against removing and reducing to possession any endangered plant from areas under Federal jurisdiction; maliciously damaging or destroying any such species on any such area; or removing, cutting, or digging up any such species), by the Preservation of Native Flora of Florida Act, and by the Florida rules regarding removal of plants from State lands.
- S3. Conduct research on life history characteristics of *P. chartacea*.** Much of the basic biology and ecology of this species remains poorly understood. To effectively recover this species, more specific biological information is needed.
- S3.1. Continue research to determine demographic information, such as numbers of sites and populations, numbers of individuals in a population, recruitment, dispersal, growth, survival, and mortality.**
  - S3.2. Once demographic data are known, conduct population viability and risk assessment analysis to determine the numbers of plants, sites, subpopulations/populations, and spatial distribution needed to ensure persistence of the species.**



- S3.3. Conduct research to assess management requirements of *P. chartacea*.** Determine which natural populations can be stabilized or increased by habitat management. Surveys, research, and monitoring information will provide factors contributing to any declines at each site. Monitoring of populations should be in reference to various habitat management practices. Site-specific management guidelines should be provided to land managers and close coordination among land managers is essential to develop adaptive management techniques. This species experiences a dramatic increase in flowering the first year after a burn, yet can bloom up to 30 years without fire. More information is needed on the response to management activities for this species.
- S4. Monitor populations of *P. chartacea*.**
- S4.1. Develop monitoring protocol to assess population trends for *P. chartacea*.**
- S4.1.1. Monitor to detect changes in demographic characteristics, such as reproduction, recruitment, growth, dispersal, survival, and mortality.** Also monitor for pollinators, herbivory, disease, and injury.
- S4.1.2. Monitor the effects of various land management actions on *P. chartacea*.** Assess any changes in demographic characteristics of *P. chartacea* in response to land management activities, such as prescribed fire, exotic plant control, *etc.*
- S4.2. Develop a quantitative description of the population structure of *P. chartacea*.** This description will provide a baseline for monitoring population dynamics in response to natural environmental changes and management treatments. Data recorded should include morphology, survivorship, mortality, and reproduction for individual plants. Collect data about each plant's microsite (vegetation cover, litter depth, substrate, and closest neighbors).
- S5. Provide public information about *P. chartacea*.** It is important for the recovery of this species that governmental agencies, conservation organizations such as the Florida Native Plant Society, and private landowners be appropriately informed about this species. Care is needed, though, to avoid revealing specific locality information about *P. chartacea*.
- Public outreach efforts must also continue to address the increasing concern that horticultural demand for this and other rare species may not benefit conservation of threatened and endangered species. Public education should identify that commercial production and horticultural uses of endangered species provide little benefit to species, since the recovery of *P. chartacea* and other rare species requires a self-sustaining, secure, number of natural populations.

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### Habitat-level Recovery Actions

- H1. Prevent degradation of existing habitat.** Extensive habitat loss, degradation, and fragmentation have already occurred throughout the range of this species. Both urbanization and fire suppression have decreased the available habitat. This species is ubiquitous in the scrub preserves in Polk and Highlands counties.
- H1.1. Secure habitat through acquisition, landowner agreements, and conservation easements.** With so little xeric scrub habitat left, any method of securing protected populations should be sought.

- H1.2. Manage and enhance habitat.** Manage habitat to maintain *P. chartacea* populations by preventing damage from off-road vehicle use, over collection, and provide proper management of habitat including prescribed fire.
- H1.2.1. Perform prescribed fires.** Fire is a necessary and integral characteristic of the scrub community. A variable interval in fire return and in season is important to mimic the natural fire regime. In addition, spatial variation in fire intensity and unburned patches are necessary to construct a natural fire landscape. The scrub is naturally made up of islands of suitable and unsuitable habitat. To repeat this landscape pattern, sites should be burned as a mosaic when possible to allow for variation.
- H1.2.2. Control and eliminate exotic and invasive plants and animals.** Exotic plant and animal species are not yet a major threat in Florida scrub as compared to other communities in South Florida. However, in isolated areas, exotic species are becoming established. Without control, exotic/invasive plants may become a threat to the survival and recovery of *P. chartacea*.
- H1.2.3. Control access to areas where listed plants are growing.** Collection, trampling, and off road vehicles can severely threaten individual populations.
- H2. Restore areas to suitable habitat.** Native habitats that have been disturbed or that have experienced a long history of fire suppression may be good candidates for future reserves.
- H2.1. Restore natural fire regime.** Long periods without fire can change the species composition and the ability of the site to carry fire. Rehabilitation of a site may be a lengthy process, but with fewer and fewer sites remaining, these sites may become more valuable for future recovery. On these sites a seed bank may exist that could include rare endemic species.
- H2.2. Enhance sites with native plant species.** Because of logging or long periods without fire, certain native plant species that were present historically may now be absent from the natural composition of the community. These species can be reintroduced if natural colonization is not possible.
- H3. Conduct habitat-level research projects.** Study the response of *P. chartacea* to various land management practices, such as prescribed fire regimes, vegetative thinning, and control of exotic/invasive vegetation..
- H4. Monitor habitat/ecological processes.** Monitor the effects of land management actions, such as prescribed fire, exotic plant control, etc., on the habitats where *P. chartacea* occurs.
- H5. Provide public information about scrub and its unique biota.** Educational efforts, especially those conducted by Archbold Biological Station, have been successful. Without these successful efforts, the Lake Wales Ridge NWR would not have been created. Florida's system of biological preserves depends on a broad base of public understanding and support for its funding and future success. In addition to past and ongoing educational efforts by The Nature Conservancy, Bok Tower Gardens, and Archbold Biological Station, future efforts by these organizations, and the Florida Park Service, the Florida Division of Forestry, the South Florida Water Management District, the Florida Native Plant Society, and local garden clubs are crucial in increasing public appreciation of scrub and high pine communities, and their associated plant species. The Arbuckle Appreciation Day sponsored by the Florida Division of Forestry has been successful in disseminating knowledge about these unique communities.