

**Peters Mountain Mallow**  
***(Iliamna corei Sherff)***

**5-Year Review:**  
**Summary and Evaluation**

**Prepared by Anne Hecht**

**for**

**U.S. Fish and Wildlife Service**  
**Virginia Field Office**  
**Gloucester, Virginia**

**Fall 2008**

**5-YEAR REVIEW**  
**Peters Mountain Mallow (*Iliamna corei* Sherff)**

**1.0 GENERAL INFORMATION**

**1.1 Reviewers**

**Technical Reviewers:**

Wanda SanJule, The Nature Conservancy, Charlottesville, Virginia  
Keith Tignor, Virginia Department of Agriculture and Consumer Services  
John Townsend, Virginia Department of Conservation and Recreation, Division of  
Natural Heritage  
Sumalee Hoskin, U.S. Fish and Wildlife Service, Virginia Field Office

**Lead Field Office:** Virginia Field Office, Sumalee Hoskin, 804-693-6694

**Lead Regional Office:** Region 5, Mary Parkin, 617-876-6173, mary\_parkin@fws.gov

**1.2 Methods Used to Complete the Review**

This 5-year review was an individual effort by Anne Hecht, regional office endangered species biologist, acting on behalf of the U.S. Fish and Wildlife Service Virginia Field Office. A request for new information was distributed to all individuals known to have interest in or prior involvement with the species (see Appendix 1). All available scientific information (including published literature, reports, and other communications) was reviewed and evaluated. A field visit to the site of the only known population and discussion with knowledgeable experts was conducted on June 10, 2008. Technical review of a draft version of the Review Analysis (section 2) was provided by reviewers listed above.

**1.3 Background**

**1.3.1 Federal Register (FR) notice announcing initiation of this review:** January 23, 2008 (Vol. 73, No. 15, pages 3991-3993)

**1.3.2 Listing history**

**FR notice:** Determination of *Iliamna corei* (Peters Mountain mallow) to be an endangered species; 51 FR 17343  
**Date listed:** June 11, 1986  
**Entity listed:** Species  
**Classification:** Endangered

**1.3.3 Associated rulemakings:** None

**1.3.4 Review history:** Peters Mountain mallow (PMM) was included in a cursory 5-year review of all species listed before 1991(56 FR 56882). No new information regarding the status of PMM was received, nor was a change in status recommended.

**1.3.5 Species' Recovery Priority Number at start of 5-year review:** 5 (species with high degree of threats and low recovery potential)

**1.3.6 Recovery plan:**

**Name of plan:** Peters Mountain Mallow (*Iliamna corei*) Recovery Plan

**Date issued:** September 28, 1990

**Dates of previous revisions:** None

## **2.0 REVIEW ANALYSIS**

### **2.1 Application of the 1996 Distinct Population Segment (DPS) Policy**

PMM is a plant; therefore, the DPS policy is not applicable.

### **2.2 Recovery Criteria**

**2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?** Yes; however, see below.

**2.2.2 Adequacy of recovery criteria.**

**2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?** Criteria 1 and 5 for reclassification to threatened should be refined (via recovery plan update) to reflect new information regarding the species' biology and experience with *ex situ* propagation. It is anticipated that these refinements will be consistent with the intent and scope of the corresponding current criteria.

Criteria for delisting require more substantial re-evaluation and probable revision, but this should be deferred until landscape burning has been initiated at the Narrows Preserve (and perhaps until after attainment of reclassification criteria).

**2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?** The relevant listing factors are adequately addressed.

### **2.2.3 Recovery criteria established in the 1990 recovery plan and discussion of how each criterion has or has not been met.**

In order to reclassify PMM from endangered to threatened:

1. *The natural population has reached carrying capacity and has been self-maintaining or expanding into new areas for at least 5 years.* As discussed in section 2.3.1.2, abundance of plants and seed production have both increased since listing. From 2002 to 2007, there has been a positive trend in abundance of flowering plants, fruiting plants, and seed production, but longer-term trends have fluctuated in response to management (prescribed fire), weather, and herbivory. While the areal extent of the population has also increased in recent years, it remains extremely restricted.

This criterion is vague and difficult to assess. Now that existence of a long-lived seed bank is better understood, this criterion should be refined to appropriately reflect a species survival strategy adapted to periodic fire. It is likely that such a criterion will incorporate a running-average number of plants and seed production. However, formulating the appropriate number of plants, seed production, and time-scale reflective of a species that is no longer “endangered” (i.e., is not in danger of extinction) will require further analysis and discussion (see section 4.0, below).

2. *Life history, ecology, and population biology are understood sufficiently to ensure effective management.* Considerable progress has been realized towards understanding PMM seed-banking habits, factors promoting seed germination, and the role of fire. Residual gaps in knowledge include the extent and age of the seed bank, refinement of habitat management needs (especially tolerance for competitors and shade), and the areal extent of habitat susceptible to being made suitable for PMM with appropriate management. Progress towards this criterion is sufficient to support reclassification to threatened, but revised delisting criteria are likely to require additional information to more clearly define long-term management needs.
3. *There exists a permanent monitoring/management program, as necessary.* Intensive annual monitoring and management is conducted by The Nature Conservancy of Virginia (TNC) staff and contractors. Management activities include caging of plants to reduce herbivory, overstory thinning to increase sunlight, prescribed burning to stimulate seed germination and reduce understory vegetation (thereby increasing sunlight reaching the PMM plants), hand-pruning or pulling of competitors, and eradication (spraying and hand-pulling) of invasive garlic mustard (*Allaria petiolata*). Initiation of landscape-scale burning is planned (and funded) for 2009, but this is likely to be a continuing need, requiring substantial recurring funding.

Detailed monitoring data collected since 1991 (including age structure, reproduction, growth, spatial and temporal distribution of mortality, timing and location of management treatments) is stored in an Access database maintained by TNC.

A 10-year conservation action plan for the Narrows Preserve has been drafted and is in process of review and revision (SanJule 2008).

This criterion has been sufficiently met as a reclassification condition.

4. *The tract of land on which it occurs is in permanently protected status.* TNC holds fee title to the 398 acre Narrows Preserve, which abuts the Jefferson National Forest. This criterion has been met.
5. *Plants representing a variety of genotypes are maintained in propagation at a minimum of two established plant breeding facilities.* Propagation of seeds from 12 individuals from Peters Mountain at North Carolina Botanical Garden (NCBG) and outcrossing of their flowers has resulted in the production of 200 seeds from 12 maternal lines, now in frozen seed storage (J. Randall, NCBG 2008, *in litt.*). NCBG will continue to collect seed from five plants extant in their whole plant collection as of May 2008, but does not currently anticipate further cultivation of PMM at their facility. PMM plants in gardens and greenhouses are susceptible to fungal diseases, and seed storage provides a back-up for the wild population with less risk of disease and potential genetic effects from the *ex situ* environment (J. Randall, pers. comm. to A. Hecht, 19 May 2008). NCBG frozen seed storage collection also contains 350 seeds produced from 47 seed capsule accessions collected from the common garden at Virginia Tech (Randall 2006).

Dr. David Carr at the State Arboretum of Virginia (Blandy Experimental Farm, Boyce) reports that March 2008 efforts to germinate “bulk collected” seeds show improved success over earlier attempts (2006 and 2007). After reliable germination and cultural methods are established, Blandy Farm plans to germinate seeds collected from individual maternal plants grown at the Massey Arboretum (Virginia Polytechnic Institute and State University, Blacksburg) in the early 1990s and from wild plants at Peters Mountain with the goal of generating a fresh generation of randomly outcrossed seeds (Carr 2008 *in litt.*)

As currently written, this criterion has been partially met (propagation efforts at Blandy Farm are still unproven and insufficiently established). However, this criterion should receive further consideration and clarification to: (1) Reflect whether long-term seed storage is a biologically preferable (and more efficient) strategy for *ex situ* conservation of this species, and, if so; (2) how much seed should be stored at each of the two facilities.

In order to determine PMM to be a recovered species, no longer in need of listing as threatened or endangered:

1. *Ecological studies and site investigations indicate that appropriate sites for establishment of additional PMM populations exist on Peters Mountain.* No new populations of PMM have been discovered (J. Allen, TNC, 2004, *in litt.*). Several sites on Peters Mountain appear to have characteristics similar to that of the known

population, and it is possible that landscape burning, scheduled for initiation in 2009, will stimulate germination of seeds at other sites on the Narrows Preserve. Establishment of additional populations is likely to require pro-active introduction of seed, as well as continuing burning and other management efforts (e.g. caging to reduce herbivory). This criterion has not been met, but requires re-evaluation to determine continued relevance.

2. *At least five additional populations have been located or established.* No additional PMM sites have been discovered. The recovery plan (USFWS 1990) reported searches along the entire outcrop of Clinch sandstone on Peters Mountain, as well as on similar sandstone outcrops in the area, between 1986 and 1988. Documented searches included Dan River Gorge, Patrick County (26 May 1987), Indian Grave Creek and Peak Creek, Patrick County (29 May 1987), Peters Mountain, Alleghany County (14 July 1987), and South Gap, Pulaski County in 1988 (Porter 1987, 1988). No formal searches have been commissioned recently, but the species' rarity probably stimulates professional and amateur botanists to keep an eye out for potential new occurrences. This criterion has not been met, but it may not bear continued relevance.
3. *These populations are permanently protected, monitored, and managed.* This criterion cannot be evaluated at this time and may not bear continued relevance.
4. *The new populations are demonstrated to be self-maintaining or expanding for at least 5 years.* This criterion cannot be evaluated at this time and may not bear continued relevance.

These delisting criteria should be re-evaluated and revised to reflect new understanding of the intrinsic resilience of PMM accorded by the durability of a seed bank that is relatively resistant to extrinsic threats. Appropriateness of establishing new populations outside the species' historic range should be reconsidered, and feasibility of alternative strategies to provide for long-term security of PMM should be evaluated. However, re-evaluation will be more effectively and efficiently accomplished with the increased understanding of long-term protection needs likely to be acquired with landscape burning experience. Indeed, it may be advisable to defer reconsideration of delisting criteria until after reclassification criteria have been refined and fully attained.

## **2.3 Updated Information and Current Species Status**

### **2.3.1 Biology and habitat:**

**2.3.1.1 New information on the species' biology and life history:** Greenhouse studies by Baskin and Baskin (1997) demonstrated that dormancy of PMM seed may be broken by mechanical scarification (nicking with a razor blade), dipping in boiling water, dry heating, and soaking in concentrated sulfuric acid. Burning a 5- cm layer of dead oak leaves (fire duration 1-2 minutes) was effective in breaking dormancy of seeds on the soil surface, but not those covered with 3 cm

of soil. Experiments also demonstrated that PMM is capable of forming a long-lived seed bank. At least 65 percent of seeds were germinable after more than 3 years, 58 percent of seeds in another trial survived after 6 years (Baskin and Baskin 1997).

Continuing observations confirm that formation of abundant viable seed requires cross-pollination of flowers (USFWS 1990, Caljouw et al. 1994). Although the pollinator species have not been identified, no impediments to pollination have been observed as long as multiple flowering plants are available concurrently.

Further evidence of seed bank longevity was provided by germination of approximately 60 seedlings outside (but adjacent to) the extant plant site following a hot natural fire in 2004. Due to the topography of the site, it is unlikely that the extant plant population was the source of the seeds, thus indicating a more extensive and long-lived seed bank than previously known (W. SanJule, TNC, pers. comm. 18 July 2008).

Site expansion following burning also demonstrated PMM presence on southeast facing slope of Peters Mountain (in addition to previous location on the northwest slope).

**2.3.1.2 Abundance, population trends, demographic features, or demographic trends:** Following a steady decline spanning the years between discovery (50 plants) and 1991 to 1992, when the wild population dipped to 3 individuals, abundance of PMM has experienced substantial overall improvement (Table 1). Plant numbers have fluctuated from year to year. A severe drought in 2001 to 02 resulted in a major decline (complete seed capsule production failure in 2002 and 2003, with extremely low numbers produced in 2001 and 2004) that was reversed by subsequent prescribed burning and more suitable growing seasons. In contrast, record seed capsule production occurred in 2007, despite drought conditions, but out-year effects are, as yet, unknown (Edwards and SanJule 2007).

**2.3.1.3 Genetics, genetic variation, or trends in genetic variation:** Analysis of intersimple sequence repeat (ISSR) data from the natural population and two garden populations found high within-population variability, indicating that genetic drift does not appear to be affecting the taxon (Slotta and Porter 2006). Self-incompatibility and resultant genetic recombination reduces the species' vulnerability to inbreeding, even when low numbers and reproductive failure pose substantial demographic risks. Germination stimulated by the 2004 natural fire may have further increased genetic diversity of the current plant population.

**2.3.1.4 Taxonomic classification or changes in nomenclature:** Endangered Species Act (ESA) listing relied on the taxonomy of Sherff (1949), capping earlier debate (summarized in USFWS 1986 and 1990) regarding the relationship between *Iliamna corei* and the closely related species, *I. remota*. Stewart et al.

Table 1. Population age structure and reproduction of Peters Mountain mallow, by year.*																	
	Year																
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of 1yr old plants	0	0	3	43	19	0	65	1	0	0	0	<10	0	33	40	0	0
Number of plants >1yr	3	3	3	6	34	34	27	59	49	47	44	17	12	11	31	61	53
Number of budded or flowering plants	2	3?	3	3	11	18	44	36	31	29	29	2	4	10	22	31	29
% flowering plants among those ≥1yr post-burn	67%	100?	50%	6%	21%	53%	48%	60%	63%	62%	66%	8%	33%	23%	31%	51%	54.7%
Number of fruiting plants	2	2	2	3	6	3	29	18	8	23	3	0	0	8	21	20	26
% fruiting plants among those that flowered	100%	67%?	67%	100%	17%	17%	66%	50%	26%	79%	10%	0	0	80%	95%	64%	89.6%
Total capsule yield	200	79	34	91	319	85	322	229	28	198	5	0	0	30	388	233	>588

\*Reproduced from Edwards and SanJule 2007 (Table 5).

(1996) suggested that genetic separation between *I. corei* and *I. remota* (three populations in Virginia) based on analysis of random amplified polymorphic DNA (RAPD) markers might be more consistent with a subspecies relationship. However, a subsequent study using intersimple sequence repeat (ISSR) data and examining a broader distribution of *I. remota* populations found sufficient evidence of genetic distinctiveness and significant variation to support continued separation of the two full species (Slota and Porter 2006).

#### **2.3.1.5 Spatial distribution, trends in spatial distribution or historic range:**

Distribution of extant plants within the historic site has expanded with management and discovery of approximately 60 seedlings in a 20m x 50m area following a hot, natural (lightening-caused) fire in June 2004. The species' range in the wild is still confined to about 0.1 acre at the single historic site.

**2.3.1.6 Habitat or ecosystem conditions:** Preliminary field investigations using samples from fire-scarred trees and age structure of existing vegetation indicated a mean fire return interval of 6.1 years for the period 1941-1992. Oral accounts provided evidence of large fires in the 1940s and '50s (Caljouw et al. 1994). ✓

Detailed analysis of cross-sections from fire-scarred pines documented a median fire interval for the site of 2.2 years during the period 1867 to 1976, with a mean interval of 12.5 years (range = 6.9 to 18.2 years) for fires scarring  $\geq 25$  percent of the sampled trees. Most (93.5 percent) fires occurred during the dormant season (between completion of growth in the fall and before initiation of spring growth), and were probably relatively mild surface fires. The short interval between successive burns is unlikely to have permitted heavy fuel accumulations. These fires helped maintain open forests of fire-adapted tree species such as chestnut oak (*Quercus prinus*) and pitch pine (*Pinus rigida*) with abundant light reaching the forest floor. The last major natural fire on Peters Mountain occurred in 1954. Chestnut oak remains the dominant species on the Narrows Preserve, but an increased number of fire-intolerant species have established in the decades of decreased fire frequency and pine species are now restricted to rocky outcrops (Lafon et al. 2007, Hoss 2007).

Empirical evidence that PMM is fire-adapted and fire-dependent is provided by positive response of the plants to prescribed fire treatments and the 2004 hot natural fire.

### **2.3.2 Five-factor analysis (threats, conservation measures, and regulatory mechanisms):**

**2.3.2.1 Factor A. Present or threatened destruction, modification or curtailment of its habitat or range:** TNC holds full interest in the 398-acre Narrows Preserve, for the primary purpose of protecting PMM and its habitat in perpetuity. TNC's active stewardship commitments are evidenced by annual management efforts as documented in detailed annual reports. These include

caging of plants to reduce herbivory, overstory thinning to increase sunlight, prescribed burning to stimulate seed germination and reduce understory vegetation, hand-pruning or pulling of competing vegetation, and eradication (spraying and hand-pulling) of invasive garlic mustard (*Allaria petiolata*). As a further effort to reduce herbivory threats, deer hunting is encouraged via a special use authorization to a local hunt club (W. SanJule, TNC, pers. comm. 2008).

While the activities described above substantially reduce the species' vulnerability to extinction, it remains limited to its known historic range, one 0.1-acre site. Efforts to locate additional populations have not been successful (USFWS 1990, Allen 2004 *in litt.*).

Maintenance of suitable habitat conditions for PMM requires frequent fire. TNC and the inter-agency prescribed burn team initiated prescribed burning of small habitat patches in 1992 (Dunscumb et al. 1997). A large "landscape" burn has been in planning since 2004. A fire history study was completed in 2007, and funding has been secured for an initial burn of approximately 300 acres in 2009.

**2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:** No evidence of illegal collection has been observed since the 1987-88 incidents reported in the 1990 recovery plan. The site is more than a mile away from any road, and there is no marked trail. A persistent seedbank also provides the species with some natural insurance against vandalism.

**2.3.2.3 Disease or predation:** Herbivory by deer and other animals is a continuing threat, mitigated by placement of small wire cages around individual and small groups of PMM. Replacement and enlargement of these enclosures to accommodate plant growth requires continuing annual effort throughout the field season (Edwards and SanJule 2007).

**2.3.2.4 Inadequacy of existing regulatory mechanisms:** Virginia's Endangered Plant and Insect Species Act prohibits digging, cutting, collecting, removing, transporting, buying, selling, or possessing PMM without a permit from the Commissioner of Agriculture and permission of the landowner (TNC, in the case of Peters Mountain). The ESA further prohibits export from the United States, sale or transport in interstate commerce, and damage or destruction of endangered plants in knowing violation of State law or in the course of violating a State criminal trespass law.

Except for illegal collection or malicious destruction of plants, no identified threats to PMM are susceptible to regulatory mechanisms.

**2.3.2.5 Other natural or manmade factors affecting its continued existence:** Suppression of natural fires necessitates an on-going commitment to prescribed burning. Invasive vegetation and drought also constitute threats. Extremely constrained natural distribution and small population are intrinsic risks for PMM.

**2.4 Synthesis** – The prospects for persistence of PMM have substantially increased since 1990, when only 4 plants remained in the population, and fecundity was extremely low. Positive factors include acquisition of the site by TNC with the primary objective of long-term conservation of PMM, restoration of natural process (fire) that perpetuates its ecosystem, and the intrinsic buffer against natural environmental variation conferred by a durable seedbank. Because the species exists at only a single, very small site, it will remain in danger of extinction (albeit at a lower level than at the time of listing) until sufficient seed (this should be quantified) is in permanent storage at two institutions with suitable seed storage facilities. Additionally, the species' need for active management requires formal long-term commitments, and these cannot be fully determined without more information about the scale, frequency, and cost of landscape management. Improved understanding of PMM life history and management requirements supports increased optimism that eventual removal from ESA protection is possible. Delisting criteria should be revisited at some time in the future to incorporate new information on the species' ecology and management.

### **3.0 RESULTS**

#### **3.1 Recommended Classification:**

- Downlist to Threatened**
- Uplist to Endangered**
- Delist** (*Indicate reasons for delisting per 50 CFR 424.11*):
  - Extinction*
  - Recovery*
  - Original data for classification in error*
- No change is needed**

#### **3.2 New Recovery Priority Number: 8 (moderate threats and high recovery potential)**

**Brief Rationale:** Recovery activities since 1990 have substantially ameliorated the threats to this species, but the existence of only one small population and dependence on active management are causes for continuing concern. While this species will always require active management, a durable seed bank creates an intrinsic buffer against environmental variation and optimism that the species can eventually be removed from the legal protections of the ESA.

#### 4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- A. Conduct and assess effects of landscape burn in 2009. Burn implementation is already scheduled and funded.
- B. Continue *ex situ* seed increase efforts and assure secure long-term seed storage.
- C. Update reclassification criteria 1 and 5 (see discussion in section 2.3.3), to clarify target population size and composition (whole plants and seed production) in the wild and requirements for *ex situ* conservation. Updated criteria, consistent with the scope and intent of the corresponding criteria in the 1990 recovery plan, should reflect current information about PMM biology.
- D. Based on results of initial landscape scale burn, evaluate future burning requirements and associated funding needs (funding for initial (one-time) burn was provided under fiscal year 2004 recovery initiative).
- E. Develop long-term agreements for continuing management of PMM population(s) at the Narrows Preserve.
- F. Reconsider need for and desirability of establishing additional PMM populations outside the species' known historic range. Evaluate feasibility of alternative strategies to provide for long-term security and delisting of PMM. If necessary, revise delisting criteria and recovery plan accordingly.

#### 5.0 REFERENCES

- Allen, J. May 19, 2004 electronic mail to Eric Davis. Subject: *Iliamna corei* query.
- Baskin, J. M., and Baskin, C. C. 1997. Methods of breaking seed dormancy in the endangered species *Iliamna corei* (Sherff) with special attention to heating. *Natural Areas Journal* 17:313-323.
- Caljouw, C. A., Lipscomb, M. V., Adams, S., and St. Clair, M. 1994. Prescribed burn and disturbance history studies at the Narrows: habitat studies for the endangered Peters Mountain mallow. *Natural Heritage Technical Report Number 94-8*. 28 pp.
- Carr, D. E. April 3, 2008, electronic mail to Anne Hecht (USFWS, Sudbury, Massachusetts) regarding status of efforts to establish an *ex situ* population of Peters Mountain mallow at University of Virginia Blandy Experimental Farm, Boyce. 3 pp.
- Dunscumb, J. K., Edwards, R., and Lipscomb, M. V. 1997. Prescribed burn and monitoring studies for the Peters Mountain mallow (*Iliamna corei*), final report 1995. The Nature Conservancy, VAFO Technical Report 97-1. The Nature Conservancy, Charlottesville, Virginia.

- Edwards, R. and SanJule, W. 2007. Population monitoring and management of Peters Mountain Mallow (*Iliamna corei*), annual report 2007. TNC-VA Technical Report 07-2. The Nature Conservancy, Charlottesville, Virginia. 23 pp.
- Hoss, J. A. 2007. Rekindling the flame: reconstructing a fire history for Peters Mountain, Giles County, Virginia. M.S. Thesis. Texas A&M University, College Station, Texas. 110 pp.
- Lafon, C. W., Grissino-Mayer, H. D., Hoss, J. A., and Wight, G. D. 2007. Fire history and forest stand dynamics of the Narrows Preserve, Peters Mountain, Virginia. Final Report for The Nature Conservancy, Charlottesville, Virginia. 13 pp.
- Porter, D. M. 1987. Field and Greenhouse Studies on the Peters Mountain Mallow, *Iliamna corei*, Status Report, Job Number 2, Searches for Additional Populations. Nov. 1, 1987. Report for The Nature Conservancy, Charlottesville, Virginia. 4 pp.
- Porter, D. M. 1988. Field and Greenhouse Studies on the Peters Mountain Mallow: Status Report, Job Number 2, Searches for Additional Populations. Sep. 15, 1988. Report for The Nature Conservancy, Charlottesville, Virginia. 2 pp.
- Randall, J. 2006. *Iliamna corei* (Peters Mountain mallow) *ex situ* germplasm storage and seed increase project to maximize genetic diversity. North Carolina Botanical Garden, Chapel Hill, North Carolina. Final report to The Nature Conservancy, Charlottesville, Virginia. 1 pp.
- Randall, J. 24 June 2008 electronic mail to Anne Hecht regarding the North Carolina Botanical Garden Peters Mountain Mallow seed increase project. 3 pp.
- SanJule, W. 2008. Draft 10 year conservation action plan, the Narrows Preserve. The Nature Conservancy, Charlottesville, Virginia. 11 pp.
- SanJule, W. July 18, 2008 electronic mail to Anne Hecht (USFWS, Sudbury, Massachusetts). Subject: thanks and one follow-up question.
- Slotta, T. A. and Porter, D. M. 2006. Genetic variation within and between *Iliamna corei* and *I. remota* (Malvaceae): implications for species delimitation. Botanical Journal of the Linnean Society 151:345-354.
- Stewart, C. N., Rosson, G., Shirley, B. W., and Porter, D. M. 1996. Population genetic variation in rare and endangered *Iliamna* (Malvaceae) in Virginia. Botanical Journal of the Linnean Society 58:357-369.
- U.S. Fish and Wildlife Service. 1986. Determination of *Iliamna corei* (Peters Mountain mallow) to be an endangered species. Final rule. *Federal Register* 51:17343-17346.
- U. S. Fish and Wildlife Service. 1990. Peters Mountain Mallow (*Iliamna corei*) Recovery Plan. Newton Corner, Massachusetts. 30 pp.

U.S. FISH AND WILDLIFE SERVICE  
5-YEAR REVIEW of Peters Mountain Mallow (*Iliamna corei*)

Current Classification: Endangered

Recommendation Resulting from the 5-Year Review:

- Downlist to Threatened  
 Uplist to Endangered  
 Delist  
 No change needed

Review Conducted By: Anne Hecht, Region 5

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve *Ken L. Mays* Date *10/1/2008*

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

Approve  Date *10-23-08*

Acting Regional Director

Appendix 1: List of persons contacted (via email) to solicit information for this status review

George Annis, U.S. Forest Service  
Carol Baskin, University of Kentucky, Lexington  
Jerry Baskin, University of Kentucky, Lexington  
David Carr, University of Virginia Blandy Experimental Farm, Boyce \*  
Ruth Douglas, Piedmont Virginia Community College (retired)  
Rhonda Edwards \*  
Henri Grassino-Mayer, University of Tennessee, Knoxville \*  
Sumalee Hoskin, USFWS Virginia Field Office †  
Charles Lafon, Texas A&M University, College Station \*  
Elizabeth Lament, U.S. Forest Service  
Mary Lipscomb, Virginia Technical Institute and State University, Blacksburg  
Jesse Overcash, U.S. Forest Service  
Duncan Porter, Virginia Technical Institute and State University, Blacksburg  
Johnny Randall, University of North Carolina Botanical Garden, Chapel Hill \*  
Kim Smith, USFWS Virginia Field Office \*  
Wanda SanJule, The Nature Conservancy in Virginia, Charlottesville \* †  
Tracey Slotta, Virginia Technical Institute and State University, Blacksburg  
Keith Tignor, Virginia Department of Agriculture and Consumer Services, Richmond \* †  
John Townsend, Virginia Department of Conservation and Recreation, Richmond †  
Tom Wieboldt, Virginia Technical Institute and State University, Blacksburg

\* provided information for this review

† reviewed the technical draft of section 2