Viola chamissoniana ssp. *chamissoniana* (Pamakani)

5-Year Review
Summary and Evaluation

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

5-YEAR REVIEW

Species reviewed: *Viola chamissoniana* ssp. *chamissoniana* (Pamakani)

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5-YEAR REVIEW
Viola chamissoniana ssp. *Chamissoniana* (Pamakani)

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:
Region 1, Jesse D'Elia, Chief, Division of Recovery, (503) 231-2071

Lead Field Office:
Pacific Islands Fish and Wildlife Office, Gina Shultz, Assistant Field Supervisor for Endangered Species, (808) 792-9400

Cooperating Field Office(s):
N/A

Cooperating Regional Office(s):
N/A

1.2 Methodology used to complete the review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (USFWS) between June 2006 and June 2007. The Hawaii Biodiversity and Mapping Program provided most of the updated information on the current status of *Viola chamissoniana* ssp. *chamissoniana*. They also provided recommendations for conservation actions that may be needed prior to the next five-year review. The evaluation of the lead PIFWO biologist was reviewed by the Plant Recovery Coordinator. These comments were incorporated into the draft five-year review. The document was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before final approval.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review:
USFWS. 2006. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 70 species in Idaho, Oregon, Washington, Hawaii, and Guam. Federal Register 71(69):18345-18348.

1.3.2 Listing history

Original Listing
FR notice: USFWS. 1991. Endangered and threatened wildlife and plants; determination of endangered status for 26 plants from the Waianae Mountains, island of Oahu, Hawaii, final rule. Federal Register 58(209):55770-55786.

Date listed: October 29, 1991
Entity listed: Subspecies
Classification: Endangered

Revised Listing, if applicable
FR notice: N/A
Date listed: N/A
Entity listed: N/A
Classification: N/A

1.3.3 Associated rulemakings:

USFWS. 2003. Endangered and threatened wildlife and plants; final designations or nondesignations of critical habitat for 101 plant species from the island of Oahu, HI; final rule. Federal Register 68(116):35950-36406.

Critical habitat was designated for *Viola chamissoniana* ssp. *chamissoniana* in six units totaling 279 hectares (689 acres) on the island of Oahu. This designation includes habitat on federal, state/local and private land. Critical habitat was not designated on U.S. Army land because active management of the area by the landowner outweighed any additional benefits from including that area as critical habitat (USFWS 2003).

1.3.4 Review History:
Species status review [FY 2006 Recovery Data Call (September 2006)]:
Stable

Recovery achieved:
1 (0-25%) (FY 2006 Recovery Data Call)

1.3.5 Species' Recovery Priority Number at start of this 5-year review:
3

1.3.6 Current Recovery Plan or Outline
Name of plan or outline: Recovery plan for the Oahu plants. 1998. U.S. Fish and Wildlife Service, Portland, Oregon. 207 pages + appendixes.
Date issued: October 10, 1998
Dates of previous revisions, if applicable: Recovery needs of *Viola chamissoniana* ssp. *chamissoniana* were originally addressed in the Waianae Mountains recovery plan (USFWS 1995). However, this plan was replaced by the more comprehensive Oahu recovery plan (1998).

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

_____ *Yes*
__X__ *No*

2.1.2 Is the species under review listed as a DPS?

____ *Yes*
__X_ *No*

2.1.3 Was the DPS listed prior to 1996?

____ *Yes*
____ *No*

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

____ *Yes*
____ *No*

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

____ *Yes*
____ *No*

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

____ *Yes*
__X_ *No*

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

__X_ *Yes*
____ *No*

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?

__X_ *Yes*
____ *No*

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery?

__X__ *Yes*
____ *No*

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

A synthesis of the threats (Factors A, D, and E) affecting this taxon is presented in section 2.4. Factors B (overutilization for commercial, recreational, scientific, or educational purposes) and C (disease or predation) are not known to be threats to this taxon.

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for Oahu plants (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Viola chamissoniana* ssp. *chamissoniana* is a short-lived perennial, and to be considered stable, the taxon must be managed to control threats (*e.g.*, fenced) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on Oahu. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Viola chamissoniana* ssp. *chamissoniana* should be documented on Oahu. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with a minimum of 300 mature individuals per population. Each population should persist at this level for a minimum of five consecutive years before downlisting is considered.

This recovery objective has not been met.

For delisting, a total of eight to ten populations of *Viola chamissoniana* ssp. *chamissoniana* should be documented on Oahu. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with 300 mature individuals per population for short-lived perennials. Each population should persist at this level for a minimum of five consecutive years before delisting is considered.

This recovery objective has not been met.

2.3 Updated Information and Current Species Status

In addition to the status summary table below, information on the species' status and threats was included in the final critical habitat rule referenced above in section I.C.5 ("Associated Rulemakings") and in section II.D ("Synthesis") below, which also includes any new information about the status and threats of the species.

Status of *Viola chamissoniana* ssp. *chamissoniana* from listing through 5-year review.

Date	No. wild inds	No. outplanted	Stability Criteria	Stability Criteria Completed?
1991 – listing	14	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1998 – recovery plan	257	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
2003 – critical habitat	59	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2007 – 5-yr review	662	0	All threats managed	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

2.3.1.4 Taxonomic classification or changes in nomenclature:

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

2.3.1.7 Other:

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

2.3.2.3 Disease or predation:

2.3.2.4 Inadequacy of existing regulatory mechanisms:

2.3.2.5 Other natural or manmade factors affecting its continued existence:

2.4 Synthesis

Viola chamissoniana ssp. *chamissoniana* is an endemic subspecies that is historically known from the center and southern Waianae Mountains from Makaleha Valley to Kaakukai in Oahu. At the time of listing, this species was only known from three populations (USFWS 1991). The majority of the known plants of this taxon are within the boundaries of the U.S. Army's Makua Military Reservation. Makua Military Reservation contains 433 mature and ten immature plants of the total population. Another seven mature individuals occur on the southern side of Ohikilolo Ridge in Makaha Valley. Forty mature and ten immature plants occur on a branch of

the Ohikilolo Ridge system on State-owned land in Keaau Valley (U.S. Army 2006a). Kamaileunu Ridge divides the valleys of Makaha and Waianae Kai. Two *Viola chamissoniana* ssp. *chamissoniana* sites on this ridge are within the area the U.S. Army is fencing in Makaha, on land owned by the City and County of Honolulu. These two sites contain a total of 24 mature plants and two seedlings in one population. Another 35 plants on Kamaileunu Ridge are outside of the area to be fenced. Some of these plants are on the Makaha side of the ridge owned by the City and County of Honolulu, and others are on the Waianae Kai side of the ridge (U.S. Army 2006a; Hawaii Biodiversity and Mapping Program 2006). Another population of *Viola chamissoniana* ssp. *chamissoniana* is located at Puukumakalii, north of Kolekole Pass, on the U.S. Army Schofield Barracks Military Reservation. There are 44 mature plants currently known in this population (U.S. Army 2006a). Also on the military reservation just south of Kolekole Pass is the Puuhapapa population, which consists of 13 mature plants. The southernmost population of *V. chamissoniana* ssp. *chamissoniana* is in the Halona section of Lualualei Valley. There are two subpopulations in Halona. The northern subpopulation is on land owned by the U.S. Navy and contains 32 mature and three immature plants. The southern subpopulation consists of nine mature plants, and is located on the ridge between Halona and Nanakuli Valley on land owned by the State of Hawaii (U.S. Army 2006b). Currently, a total of 637 mature and 23 immature individuals are known in eight populations.

Viola chamissoniana ssp. *chamissoniana* usually occurs in mesic habitats on steep cliffs. Typically, few of the plants are reachable without the aid of ropes. These cliffs are sparsely to moderately vegetated with native shrubs, grasses, and sedges. The population at Puukumakalii is unusual in that many of its individuals occur not on cliffs, but on more accessible slopes above the cliffs. *Viola chamissoniana* ssp. *chamissoniana* can be found growing near the other subspecies of *V. chamissoniana* occurring in the Waianae Mountains, namely the common *V. chamissoniana* ssp. *tracheliifolia*. Hybridization between the two has not been reported, and the potential for hybridization between them is not known (Makua Mitigation Team 2003). In some cases, the identification of individuals of *V. chamissoniana* to subspecific level can be difficult. Some of the individuals counted as *V. chamissoniana* ssp. *chamissoniana* in the Halona population may actually represent *V. chamissoniana* ssp. *tracheliifolia* (U.S. Army 2006a).

Feral goats (*Capra hircus*) are considered to be the major threat to *Viola chamissoniana* ssp. *chamissoniana* (Factors A and D) (USFWS 1991, 1995, 1998 and 2003; U.S. Army 2006). Feral pigs (*Sus scrofa*) represent less of a threat to *V. chamissoniana* ssp. *chamissoniana* (Factors A and D) (USFWS 1995 1998 and 2003; U.S. Army 2006). A fence completed in year 2000 runs along the southern perimeter of Makua Valley, preventing feral goats from entering the valley from the adjacent valleys of Makaha and Keaau. Goats have been almost completely eradicated from *V. chamissoniana* ssp. *chamissoniana*'s habitat on Ohikilolo Ridge within Makua Valley. However, goat sign was observed by U.S. Army staff in 2006 within the perimeter fence (U.S. Army 2006a). In the Makaha Valley area proposed for fencing,

V. chamissoniana ssp. *chamissoniana* occurs at two sites, with one of the sites scheduled to be fenced in 2007. The plants at the other site in Makaha Valley are growing on a vertical cliff face, and are not threatened by goats (U.S. Army 2005 and 2006a). Feral goats do not currently threaten the plants at the other two populations scheduled for management at Puukumakalii and Halona. However, with both of these populations, goats currently present nearby will have to be prevented from expanding their range into plant's habitat (U.S. Army 2006a).

Habitat degradation by and competition from invasive introduced plant species poses a threat to *Viola chamissoniana* ssp. *chamissoniana*. Invasive introduced plant species that threaten the taxon include *Ageratina adenophora* (maui pamakani), *Ageratina riparia* (spreading mist flower), *Erigeron karvinskianus* (daisy fleabane), *Melinus minutiflorus* (molasses grass), *Morella faya* (fire tree), and *Schinus terebinthifolius* (Christmasberry) (U.S. Army 2006a; USFWS 1991, 1995, 1998 and 2003).

Fire is a potential threat to *Viola chamissoniana* ssp. *chamissoniana* (Factor E) (USFWS 1995, 1998 and 2003; U.S. Army 2006). Fires ignited during military training at Makua Military Reservation could threaten the Ohikilolo Ridge population of *V. chamissoniana* ssp. *chamissoniana*. Fires originating from military training in West Range on the Schofield Barracks Military Reservation pose a threat to the Puukumakalii population (U.S. Army 2005). *Viola chammisoniana* ssp. *chamissoniana* is also susceptible to landslides that can cause a severe decline of known individuals (USFWS 2003).

In addition to all of the other threats, species like *Viola chamissoniana* ssp. *chamissoniana* that are endemic to a small portion of a single island, and limited to a few populations and individuals, are inherently more vulnerable to extinction than widespread species because of the higher risks posed by random demographic fluctuations and localized catastrophes such as hurricanes and disease outbreaks (Factor E).

The Army is addressing the threat from small number of populations and small population sizes through genetic storage. Propagation for genetic storage and reintroduction is occurring in the Army's baseyard, the University of Hawaii's Lyon Arboretum Micropropagation and Seed Storage Laboratories, National Tropical Botanical Garden, the state of Hawaii's Division of Forestry and Wildlife's Pahole Rare Plant Facility, and at Waimea Valley Park. These organizations and agencies are working together to store genetic material long-term against stochastic events and to supply the U.S. Army with plants for reintroductions (U.S. Army 2006b; Makua Implementation Team 2003).

Four populations of *Viola chamissoniana* ssp. *chamissoniana* are scheduled to be managed for interim stability by the U.S. Army, as defined in the recovery criteria. They are on the north side of Ohikilolo Ridge in Makua Valley, on the Makaha Valley side of Kamaileunu Ridge, and at Puukumakalii and Halona. Propagules will

be collected from the other populations of *V. chamissoniana* ssp. *chamissoniana* for long-term genetic storage (U.S. Army 2006a).

The stabilization and recovery goals for this species have not been met, as only one population has numbers above stability and not all of the threats are currently managed. Therefore, *Viola chamissoniana ssp. chamissoniana* meets the definition of endangered as it remains in danger of extinction throughout its range.

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
__X__ No change is needed

3.2 New Recovery Priority Number:

Brief Rationale:

3.3 Listing and Reclassification Priority Number:

Reclassification (from Threatened to Endangered) Priority Number: ____
Reclassification (from Endangered to Threatened) Priority Number: ____
Delisting (regardless of current classification) Priority Number: ____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS:

- Continue seed collection for *ex situ* genetic storage and reintroduction.
- Control introduced invasive plant species around wild plants.
- Fence areas to eliminate feral pigs.
- Study *Viola chamissoniana ssp. chamissoniana* populations with regard to population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.
- Study *Viola chamissoniana* ssp. *chamissoniana* and *Viola chamissoniana* ssp. *tracheliifolia* with respect to their taxonomic relationship, the potential for hybridization

between the two taxa, morphological differences, and differences in their ecological requirements.

5.0 REFERENCES:

Hawaii Biodiversity and Mapping Program. 2006. Program Database. Unpublished, Honolulu.

Makua Implementation Team. 2003. Implementation Plan for the Makua Military Reservation, Island of Oahu. Prepared for U.S. Army Garrison, Hawaii, May 2003.

[U.S. Army] U.S. Army Garrison, Hawaii. 2005. 2005 Status report, Makua Implementation Plan, Island of Oahu.

[U.S. Army] U.S. Army Garrison, Hawaii. 2006a. 2006 Status reports for the Makua Implementation Plan and the Draft O`ahu Implementation Plan.

[U.S. Army] U.S. Army Garrison, Hawaii. 2006b. Rare plant database, Dec. 6, 2006. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 1991. Endangered and threatened wildlife and plants; determination of endangered status for 26 plants from the Waianae Mountains, island of Oahu, Hawaii, final rule. Federal Register 58(209):55770-55786.

[USFWS] U.S. Fish and Wildlife Service. 1995. Recovery plan for the Waianae plant cluster. Portland, Oregon. 207 pages + appendixes.

[USFWS] U.S. Fish and Wildlife Service. 1998. Recovery plan for the Oahu plants. Portland, Oregon. 207 pages + appendixes.

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Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Viola chamissoniana ssp. chamissoniana* (Pamakani)

Current Classification: E

Recommendation resulting from the 5-Year Review:

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

Appropriate Listing/Reclassification Priority Number, if applicable:_____

Review Conducted By:
Marilet A. Zablan, Recovery Program Leader and Acting Assistant Field Supervisor for Endangered Species, June 24, 2007
Marie Bruegmann, Plant Recovery Coordinator, May 30 and June 29, 2007
Christian Torres-Santana, Fish and Wildlife Biologist, May 3 and June 29, 2007

Approve Patrick Leonard Date 1/15/08
Lead Field Supervisor, Fish and Wildlife Service

Viola chamissoniana ssp. *chamissoniana* (Pamakani)

5-Year Review
Summary and Evaluation

U.S. Fish and Wildlife Service
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5-YEAR REVIEW

Species reviewed: *Viola chamissoniana* ssp. *chamissoniana* (Pamakani)

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Lead Field Office:
Pacific Islands Fish and Wildlife Office, Gina Shultz, Assistant Field Supervisor for Endangered Species, (808) 792-9400

Cooperating Field Office(s):
N/A

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1.2 Methodology used to complete the review:

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Entity listed: Subspecies
Classification: Endangered

Revised Listing, if applicable
FR notice: N/A
Date listed: N/A
Entity listed: N/A
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1.3.3 Associated rulemakings:

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Critical habitat was designated for *Viola chamissoniana* ssp. *chamissoniana* in six units totaling 279 hectares (689 acres) on the island of Oahu. This designation includes habitat on federal, state/local and private land. Critical habitat was not designated on U.S. Army land because active management of the area by the landowner outweighed any additional benefits from including that area as critical habitat (USFWS 2003).

1.3.4 Review History:
Species status review [FY 2006 Recovery Data Call (September 2006)]:
Stable

Recovery achieved:
1 (0-25%) (FY 2006 Recovery Data Call)

1.3.5 Species' Recovery Priority Number at start of this 5-year review:
3

1.3.6 Current Recovery Plan or Outline
Name of plan or outline: Recovery plan for the Oahu plants. 1998. U.S. Fish and Wildlife Service, Portland, Oregon. 207 pages + appendixes.
Date issued: October 10, 1998
Dates of previous revisions, if applicable: Recovery needs of *Viola chamissoniana* ssp. *chamissoniana* were originally addressed in the Waianae Mountains recovery plan (USFWS 1995). However, this plan was replaced by the more comprehensive Oahu recovery plan (1998).

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

_____ *Yes*
__X__ *No*

2.1.2 Is the species under review listed as a DPS?

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__X_ *No*

2.1.3 Was the DPS listed prior to 1996?

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____ *No*

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

____ *Yes*
____ *No*

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

____ *Yes*
____ *No*

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

____ *Yes*
__X_ *No*

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

__X_ *Yes*
____ *No*

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?

__X_ *Yes*
____ *No*

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery?

__X__ *Yes*
____ *No*

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

A synthesis of the threats (Factors A, D, and E) affecting this taxon is presented in section 2.4. Factors B (overutilization for commercial, recreational, scientific, or educational purposes) and C (disease or predation) are not known to be threats to this taxon.

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This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Viola chamissoniana* ssp. *chamissoniana* should be documented on Oahu. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with a minimum of 300 mature individuals per population. Each population should persist at this level for a minimum of five consecutive years before downlisting is considered.

This recovery objective has not been met.

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This recovery objective has not been met.

2.3 Updated Information and Current Species Status

In addition to the status summary table below, information on the species' status and threats was included in the final critical habitat rule referenced above in section I.C.5 ("Associated Rulemakings") and in section II.D ("Synthesis") below, which also includes any new information about the status and threats of the species.

Status of *Viola chamissoniana* ssp. *chamissoniana* from listing through 5-year review.

Date	No. wild inds	No. outplanted	Stability Criteria	Stability Criteria Completed?
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2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

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2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

2.3.1.7 Other:

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2.4 Synthesis

Viola chamissoniana ssp. *chamissoniana* is an endemic subspecies that is historically known from the center and southern Waianae Mountains from Makaleha Valley to Kaakukai in Oahu. At the time of listing, this species was only known from three populations (USFWS 1991). The majority of the known plants of this taxon are within the boundaries of the U.S. Army's Makua Military Reservation. Makua Military Reservation contains 433 mature and ten immature plants of the total population. Another seven mature individuals occur on the southern side of Ohikilolo Ridge in Makaha Valley. Forty mature and ten immature plants occur on a branch of

the Ohikilolo Ridge system on State-owned land in Keaau Valley (U.S. Army 2006a). Kamaileunu Ridge divides the valleys of Makaha and Waianae Kai. Two *Viola chamissoniana* ssp. *chamissoniana* sites on this ridge are within the area the U.S. Army is fencing in Makaha, on land owned by the City and County of Honolulu. These two sites contain a total of 24 mature plants and two seedlings in one population. Another 35 plants on Kamaileunu Ridge are outside of the area to be fenced. Some of these plants are on the Makaha side of the ridge owned by the City and County of Honolulu, and others are on the Waianae Kai side of the ridge (U.S. Army 2006a; Hawaii Biodiversity and Mapping Program 2006). Another population of *Viola chamissoniana* ssp. *chamissoniana* is located at Puukumakalii, north of Kolekole Pass, on the U.S. Army Schofield Barracks Military Reservation. There are 44 mature plants currently known in this population (U.S. Army 2006a). Also on the military reservation just south of Kolekole Pass is the Puuhapapa population, which consists of 13 mature plants. The southernmost population of *V. chamissoniana* ssp. *chamissoniana* is in the Halona section of Lualualei Valley. There are two subpopulations in Halona. The northern subpopulation is on land owned by the U.S. Navy and contains 32 mature and three immature plants. The southern subpopulation consists of nine mature plants, and is located on the ridge between Halona and Nanakuli Valley on land owned by the State of Hawaii (U.S. Army 2006b). Currently, a total of 637 mature and 23 immature individuals are known in eight populations.

Viola chamissoniana ssp. *chamissoniana* usually occurs in mesic habitats on steep cliffs. Typically, few of the plants are reachable without the aid of ropes. These cliffs are sparsely to moderately vegetated with native shrubs, grasses, and sedges. The population at Puukumakalii is unusual in that many of its individuals occur not on cliffs, but on more accessible slopes above the cliffs. *Viola chamissoniana* ssp. *chamissoniana* can be found growing near the other subspecies of *V. chamissoniana* occurring in the Waianae Mountains, namely the common *V. chamissoniana* ssp. *tracheliifolia*. Hybridization between the two has not been reported, and the potential for hybridization between them is not known (Makua Mitigation Team 2003). In some cases, the identification of individuals of *V. chamissoniana* to subspecific level can be difficult. Some of the individuals counted as *V. chamissoniana* ssp. *chamissoniana* in the Halona population may actually represent *V. chamissoniana* ssp. *tracheliifolia* (U.S. Army 2006a).

Feral goats (*Capra hircus*) are considered to be the major threat to *Viola chamissoniana* ssp. *chamissoniana* (Factors A and D) (USFWS 1991, 1995, 1998 and 2003; U.S. Army 2006). Feral pigs (*Sus scrofa*) represent less of a threat to *V. chamissoniana* ssp. *chamissoniana* (Factors A and D) (USFWS 1995 1998 and 2003; U.S. Army 2006). A fence completed in year 2000 runs along the southern perimeter of Makua Valley, preventing feral goats from entering the valley from the adjacent valleys of Makaha and Keaau. Goats have been almost completely eradicated from *V. chamissoniana* ssp. *chamissoniana*'s habitat on Ohikilolo Ridge within Makua Valley. However, goat sign was observed by U.S. Army staff in 2006 within the perimeter fence (U.S. Army 2006a). In the Makaha Valley area proposed for fencing,

V. chamissoniana ssp. *chamissoniana* occurs at two sites, with one of the sites scheduled to be fenced in 2007. The plants at the other site in Makaha Valley are growing on a vertical cliff face, and are not threatened by goats (U.S. Army 2005 and 2006a). Feral goats do not currently threaten the plants at the other two populations scheduled for management at Puukumakalii and Halona. However, with both of these populations, goats currently present nearby will have to be prevented from expanding their range into plant's habitat (U.S. Army 2006a).

Habitat degradation by and competition from invasive introduced plant species poses a threat to *Viola chamissoniana* ssp. *chamissoniana*. Invasive introduced plant species that threaten the taxon include *Ageratina adenophora* (maui pamakani), *Ageratina riparia* (spreading mist flower), *Erigeron karvinskianus* (daisy fleabane), *Melinus minutiflorus* (molasses grass), *Morella faya* (fire tree), and *Schinus terebinthifolius* (Christmasberry) (U.S. Army 2006a; USFWS 1991, 1995, 1998 and 2003).

Fire is a potential threat to *Viola chamissoniana* ssp. *chamissoniana* (Factor E) (USFWS 1995, 1998 and 2003; U.S. Army 2006). Fires ignited during military training at Makua Military Reservation could threaten the Ohikilolo Ridge population of *V. chamissoniana* ssp. *chamissoniana*. Fires originating from military training in West Range on the Schofield Barracks Military Reservation pose a threat to the Puukumakalii population (U.S. Army 2005). *Viola chammisoniana* ssp. *chamissoniana* is also susceptible to landslides that can cause a severe decline of known individuals (USFWS 2003).

In addition to all of the other threats, species like *Viola chamissoniana* ssp. *chamissoniana* that are endemic to a small portion of a single island, and limited to a few populations and individuals, are inherently more vulnerable to extinction than widespread species because of the higher risks posed by random demographic fluctuations and localized catastrophes such as hurricanes and disease outbreaks (Factor E).

The Army is addressing the threat from small number of populations and small population sizes through genetic storage. Propagation for genetic storage and reintroduction is occurring in the Army's baseyard, the University of Hawaii's Lyon Arboretum Micropropagation and Seed Storage Laboratories, National Tropical Botanical Garden, the state of Hawaii's Division of Forestry and Wildlife's Pahole Rare Plant Facility, and at Waimea Valley Park. These organizations and agencies are working together to store genetic material long-term against stochastic events and to supply the U.S. Army with plants for reintroductions (U.S. Army 2006b; Makua Implementation Team 2003).

Four populations of *Viola chamissoniana* ssp. *chamissoniana* are scheduled to be managed for interim stability by the U.S. Army, as defined in the recovery criteria. They are on the north side of Ohikilolo Ridge in Makua Valley, on the Makaha Valley side of Kamaileunu Ridge, and at Puukumakalii and Halona. Propagules will

be collected from the other populations of *V. chamissoniana* ssp. *chamissoniana* for long-term genetic storage (U.S. Army 2006a).

The stabilization and recovery goals for this species have not been met, as only one population has numbers above stability and not all of the threats are currently managed. Therefore, *Viola chamissoniana ssp. chamissoniana* meets the definition of endangered as it remains in danger of extinction throughout its range.

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
__X__ No change is needed

3.2 New Recovery Priority Number:

Brief Rationale:

3.3 Listing and Reclassification Priority Number:

Reclassification (from Threatened to Endangered) Priority Number: ____
Reclassification (from Endangered to Threatened) Priority Number: ____
Delisting (regardless of current classification) Priority Number: ____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS:

- Continue seed collection for *ex situ* genetic storage and reintroduction.
- Control introduced invasive plant species around wild plants.
- Fence areas to eliminate feral pigs.
- Study *Viola chamissoniana ssp. chamissoniana* populations with regard to population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.
- Study *Viola chamissoniana* ssp. *chamissoniana* and *Viola chamissoniana* ssp. *tracheliifolia* with respect to their taxonomic relationship, the potential for hybridization

between the two taxa, morphological differences, and differences in their ecological requirements.

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Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Viola chamissoniana ssp. chamissoniana* (Pamakani)

Current Classification: E

Recommendation resulting from the 5-Year Review:

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

Appropriate Listing/Reclassification Priority Number, if applicable:_____

Review Conducted By:
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Approve Patrick Leonard Date 1/15/08
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