	Kauai Status	KISC Status	HPWRA	Invasive Impacts Score	Feasibility Score	Combined Score
<i>Crassula multicava</i> (Cape Province pygmyweed)	Naturalized	EARLY DETECTION	HIGH RISK (12)	5	7	12

Initial Prioritization Report completed: December 2017
 Report updated as of: N/A
 Current Recommendation for KISC: Pending Ranking and Committee approval
 Knowledge Gaps and Contingencies:

- 1) Delimiting surveys near known locations are necessary to ensure it hasn't spread beyond its known distribution
- 2) Partnerships with other conservation organizations may increase feasibility of control scores

Background

Crassula multicava (Crassulaceae), or “Cape Province pygmyweed”, is a low growing herb (<30 cm tall) that is occasionally cultivated worldwide as an ornamental. *C. multicava* has not been considered for control by KISC in the past. Thus, the purpose of this prioritization assessment report is to evaluate whether KISC should attempt eradication (i.e., accept “Target” status) or joint control with partnering agencies (i.e., accept as “Partnership” species status). This will be informed by scoring and comparing *C. multicava* to other “Early Detection” species known to Kauai (See Table 5 in KISC Plant Early Detection Report for status terminology).

Detection and Distribution

The first herbarium record of *C. multicava* on Kauai was collected in 1993 (D.H. Lorence 7436, PTBG) from a cultivated plant in Kalaheo. However, other herbarium records indicate that it has been present in the horticultural trade in the Hawaiian Islands since at least 1940 (Neal, M.C. s.n., BISH). Statewide, it is considered naturalized in Kauai since 1995 and on Oahu since 2009 (Lorence et al. 1995, Frohlich and Lau 2012, Imada 2012). Herbaria records and 2015-2017 surveys detected 3-4 occurrences of both naturalized and cultivated plants clustered around cabin sites in Kokee, Kauai (Figure C14- 1). All records mention that most plants were observed in dense, discrete patches, suggesting that each patch is spreading by vegetative propagation. More distantly dispersed patches may have established by the transport of vegetative propagules or by seed, which has been observed on plants in Kauai (Lorence et al. 1995). Known patches are small, with the largest infestation occurring along a dirt road for approximately 20-30 m. Because of the plant’s low stature, it is possible that some infestations were overlooked during roadside surveys. Additionally, the herbarium record of cultivated *C. multicava* in Kalaheo indicates that this plant may have been for sale at nurseries in the past and that several more cultivated individuals may be present on Kauai, although none were noted during 2015-2017 surveys. Combined, these data indicate that *C. multicava* has naturalized across one judiciary district (Waimea; and cultivated in the Koloa district) where it occupies three watersheds (Makaha, Kauhao, Hikimoe; Figure C14- 1).

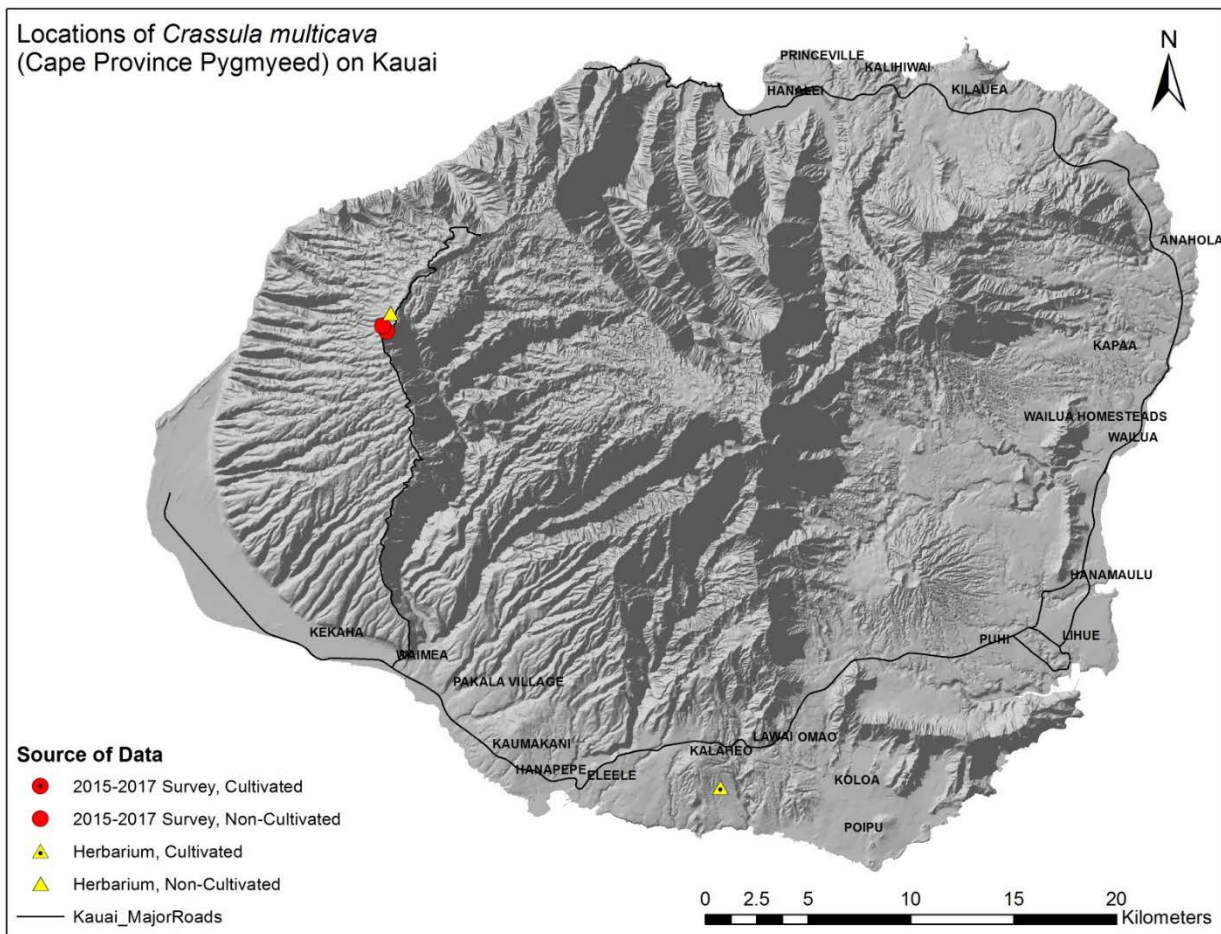


Figure C14- 1. Locations of *C. multicava* on Kauai.

Hawaii Pacific Weed Risk Assessment (HPWRA) Score

C. multicava is designated as “High Risk”, receiving a score of 12 (Daehler et al. 2004, HPWRA 2011). Traits contributing to this status are listed below according to whether they pertain to the likelihood a plant will invade vs. the consequences of the invasion, according to Daehler and Virtue (2010, HPWRA 2011). Categorization of traits in this manner more accurately informs invasive impact potential scoring and prioritization of species that are already established on Kauai.

<i>Likelihood of Invasion</i>	<i>Consequences of Invasion</i>
<ul style="list-style-type: none"> • Suited to some climates found in Hawaii • Naturalized in areas with climates comparable to some regions in Hawaii • Shade tolerant • Forms dense thickets • Produces viable seed • Reproduces by vegetative fragmentation • Matures in less than 1 year • Propagules dispersed both intentionally and unintentionally by people • Propagules dispersed by water • Benefits from disturbance 	<ul style="list-style-type: none"> • A weed of gardens, amenities and disturbed areas • An environmental weed • A congeneric weed, sharing a genus with other known weeds (i.e. implies inheritance of tendencies to inflict invasive impacts)

Refer to the full Weed Risk Assessment for *C. multicava* at
<https://sites.google.com/site/weedriskassessment/assessments/Download-Assessments>.

Invasive Impacts Score

1. Impact on natural community structure and/or composition

Score: 2 = Moderate impacts

C. multicava was assigned a score of 2 because although impacts to natural systems have not been specified where this plant has naturalized in Australia, New Zealand, Portugal, or Hawaii, control efforts have been implemented in some countries (Csurhes and Edwards 1998, Zimer 2010, HPWRA 2011). Early Detection programs in Australia have identified this plant as a potential environmental weed and have recommended preventative control due to its ability to form dense patches that threaten dry forests, coastal areas and rocky outcrops (Csurhes and Edwards 1998). In New Zealand it has become conspicuously common in some coastal areas where it prevents germination of native plants by forming a dense groundcover (Wotherspoon and Wotherspoon 2002, Zimer 2010). A plan attempting to categorize and prioritize weeds in New Zealand lists this plant as a class 2 priority weed and recommends it for eradication (Wotherspoon and Wotherspoon 2002). However, it is unlikely that Kauai would experience comparable invasive impacts from this plant in dry, lowland (including coastal) areas due to dissimilarities between Kauai's tropical latitude and climates of its native and other invaded ranges. Staples (2005) insinuates that growth conditions in the tropics are only ideal at high elevations for this species, and the HPWRA for *C. multicava* categorizes its climate suitability for Hawaii as "Intermediate" rather than "High" (2011). Nonetheless, field observations on Kauai and Oahu have documented this plant forming dense patches above 700m elevation in forested mesic areas, indicating that it may become a common ground cover in these forests, especially where soil has been disturbed. On Kauai, one herbarium voucher was collected from a naturalized patch of *C. multicava* in a diverse native ohia (*Metrosideros*)- koa (*Acacia*) dominated forest (N. Tangalin 3164, PTBG). Although *C. multicava* is a semi-succulent in the Crassulaceae family, which is characterized by drought-tolerant sun-loving species, this plant is notable for its ability to proliferate in shady conditions (HPWRA 2011). This trait may allow it to invade native forest understories. Further monitoring is necessary to determine whether *C. multicava* can affect germination and seedling survival of native species. Currently, known populations of *C. multicava* are located within one POPREF polygon (Kauhao - KAU) also containing PEP plants.



Figure C14- 2. Photo of *C. multicava* infestation along a road in Kokee, growing in shady conditions under *Eucalyptus*.

2. Impacts to Agriculture, Culture and other Human Systems

Score: 2 = Moderate impacts

C. multica was assigned a score of 2 in this category because it is known as a weed in gardens, landscaped areas, and disturbances around buildings (Zimer 2010, HPWRA 2011). However, as discussed in the “Impact on natural community structure and/or composition” section above, it may only become problematic at high elevations on Kauai. Zimer (2010), whose report summarizes survey results from New Zealand, remarks: “It grows everywhere, even in debris of dead vegetation and forms well-sized populations, especially near abandoned gardens”. On both Kauai and Oahu it has been collected from naturalized populations forming under *Eucalyptus* plantations (J. Beachy USARMY 134, BISH; Lorence et al. 1995), which indicates that it may colonize stands intended for timber harvest. However, because of its herb growth habit and short stature, it may only be moderate nuisance to the forestry industry during sapling recruitment phases.

3. Impacts to biotic and abiotic processes

Score: 1 = Minor Impacts

C. multica was given a score of 1 because no impacts to biotic or abiotic factors have been identified. However, because this plant forms a dense ground cover, interception of rainfall will likely have at least a minor effect on soil properties, including changes in soil moisture, leaf litter decomposition and nutrient cycling (Dassonville et al. 2008). Further study and monitoring of this plant is necessary to determine if greater impacts should be predicted.

TOTAL INVASIVE IMPACTS SCORE: 5

Feasibility of Control Score

Feasibility of Control Scoring and rationale for *C. multica* is presented below. Refer to Appendix A for details regarding the Invasive Impact Score.

Delimiting Survey:

Score: 2 = Moderate Effort

Feasibility of a delimiting survey for *C. multica* was given a score of 2 because although only three patches have been detected (within 4 TMKs/land parcels), surveys of adjacent forests are necessary to delimit the infestation, especially since this shade-tolerant species can establish in forest understories. Partnership with other conservation organizations may improve survey coverage and cost effectiveness, as this site is far away from the KISC base yard. Outreach to the public and nursery industry is necessary to detect infestations on other private lands, as it is thought to be transported through the horticultural trade. Particularly, plants cultivated in Kokee tend to be traded amongst cabin sites. However, undetected cultivated plants at low elevations on Kauai may not become problematic as climate suitability suggests that *C. multica* may be only capable of invading high-elevations (Staples and Herbst 2005, HPWRA 2011). However, it should remain on future botanical surveys lists to monitor its invasive status in Kauai’s lowlands.

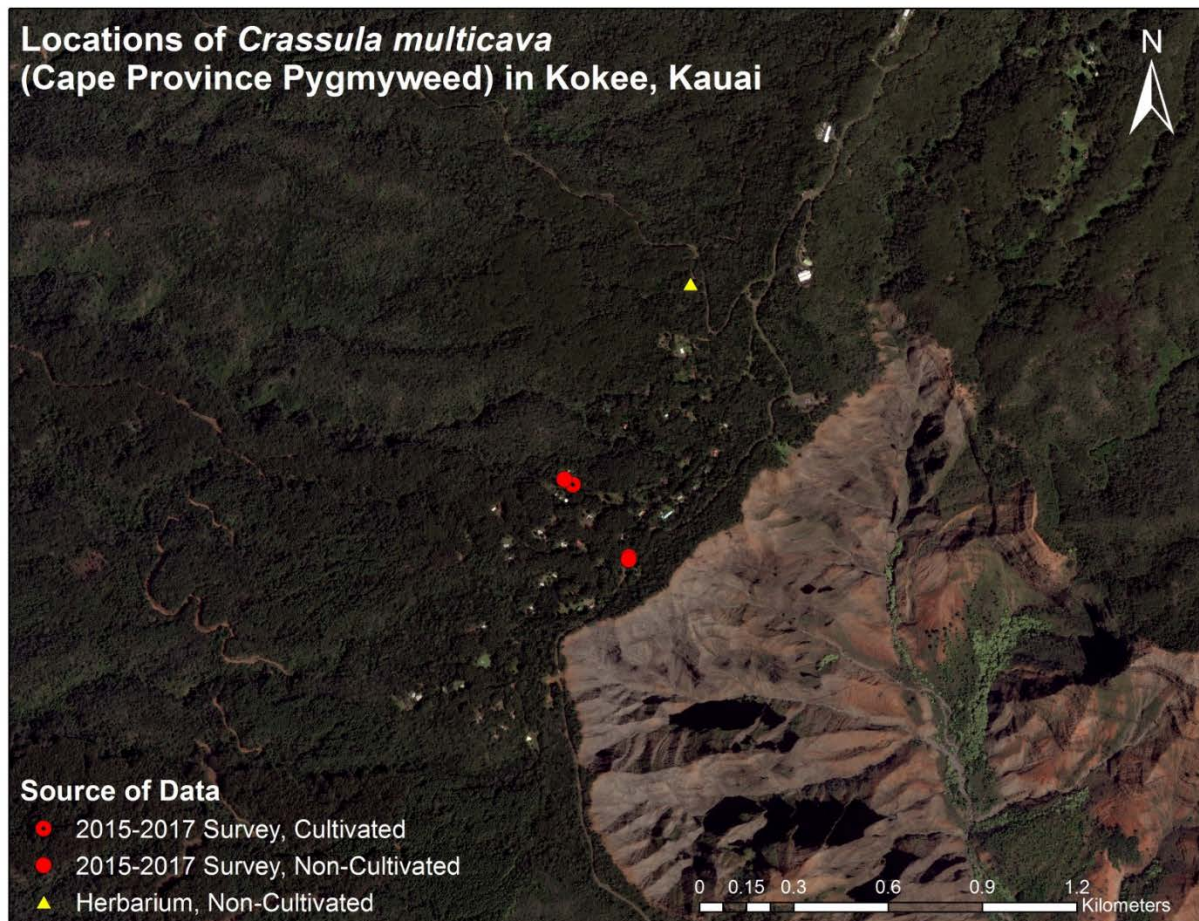


Figure C14- 3. Locations of *C. multicava* in Kokee.

Initial control:

Score: 3 = Minimal Effort.

Feasibility of initial control for *C. multicava* was given a score of 3 because known patches are not very large and herbicide (triclopyr) is presumed to effectively control this species (HPWRA 2011). This score may increase if delimiting surveys reveal larger populations.

Monitoring:

Score: 2 = Moderate Effort.

Although infestations of *C. multicava* in New Zealand are thought to have mostly spread by vegetative reproduction, production of seed has been observed in plants from Kauai (Lorence et al. 1995). No data has been collected on the duration seeds are able to persist in the soil, but because the Crassulaceae includes species that are adapted to withstand harsh environments, the ability of seeds to remain dormant during low-resource periods may have been inherited. Our inability to predict the duration of the seed bank to ensure populations are eradicated would force crews to return for multiple years. Partnership with other conservation organizations may make monitoring revisits more feasible.

FEASIBILITY OF CONTROL SCORE: 7

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