 KISC KAUAI INVASIVE SPECIES COMMITTEE	<i>Kauai Status</i>	<i>KISC Status</i>	<i>HPWRA</i>	<i>Invasive Impacts Score</i>	<i>Feasibility Score</i>	<i>Combined Score</i>
<i>Rubus sieboldii</i> (Molucca raspberry)	Naturalized	RETIRED	HIGH RISK (13)	7	3	10

Initial Prioritization Assessment Report completed: March 2017

Report updated as of: N/A

Current Recommendation for KISC: Voted to RETIRE or PARTNERSHIP SPECIES Status at 2/16/2018 KISC Committee Meeting

Knowledge Gaps and Contingencies:

- 1) Need to investigate how many TMKs are along waterways and how much permitting will cost.
- 2) Need to investigate if any progress can be made with Aquamaster and herbicide application limits
- 3) Need to investigate the potential to partner with landowners (eg. The Kilauea neighborhood association) as it may be the only feasible way forward
- 4) Need to investigate whether berries contain viable seed, and subsequently provide this information to the HPWRA.

Background

Rubus sieboldii (Rosaceae) is a prickly scrambling shrub that appears to spread on Kauai mostly by rapid vegetative growth (Wagner et al. 1999). The Hawaii Pacific Weed Risk Assessment for this species indicates that seed set may be limited in Hawaii, thus reducing the potential rate of spread (HPWRA 2015), although presence of fruit has been recorded in herbarium vouchers (D.H. Lorence 9540, 2007; H. Oppenheimer H110815, 2008). No data regarding minimum time to maturity exists, although vegetative propagation likely occurs before production of flowers occurs (HPWRA 2015). Little is known about seed dormancy for *R. sieboldii*, although one study investigating seed dormancy and viability after herbivory suggests that seeds have some ability to persist in the seedbank (Yamashiro and Yamashiro 2006).

Detection and Distribution

R. sieboldii was first recorded on Kauai at an unknown location in 1970 (Herbst & Au s.n, BISH). Roughly two large populations are known to exist: one in Lawai valley and one in Kilauea with dense infestations near the Kalihiwai Reservoir and in Kilauea town. *R. sieboldii* is considered naturalized on Kauai and Hawaii (Imada 2012).

Control of *R. sieboldii* by KISC began in 2009 with a total of 614 work hours contributed so far. However, control has only been applied to the Lawai valley location as the original intent of targeting this plant was not to eradicate it from the entire island. An assessment of herbarium records did not reveal any additional locations that are not already in the KISC database. The distribution of this plant is currently restricted to the Koloa and Kawaihau judiciary districts and it is present in 5 out of 74 watersheds (Lawai, Kalihiwai, Kilauea, Kuapea and Kulihaili) (Figure C37- 1).

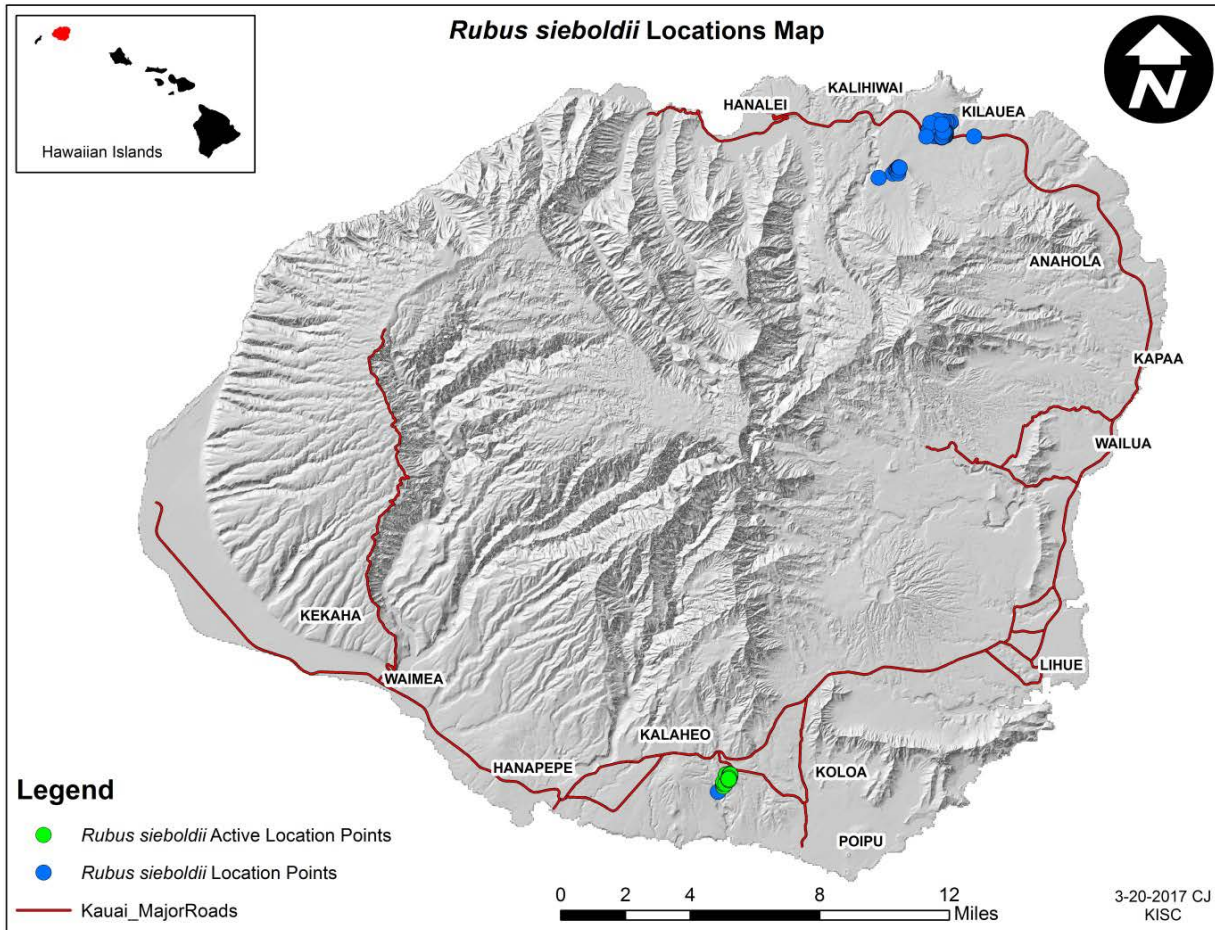


Figure C37- 1. Locations of *R. sieboldii* on Kauai with green circles representing sites that were treated by KISC and blue circles representing known locations that have never been treated.

Hawaii Pacific Weed Risk Assessment (HPWRA) Score

R. sieboldii is designated as “High Risk” (HPWRA 2012d), listing the following biological traits as contributors to its high risk status:

Likelihood and Consequences of Invasion

- Grows in subtropical to temperate climates
- Naturalized on Hawaii and Kauai islands
- A disturbance weed with potential negative impacts to natural areas
- Other *Rubus* species have become invasive weeds
- Stems and leaves covered with prickles
- Unpalatable to browsing animals (prickles deter browsing)
- Tolerates many soil types
- Forms thickets & can potentially smother other vegetation
- Reproduces by seeds (at least within native range)
- Able to spread vegetatively by root suckers & rhizomatous canes
- Seeds, when produced, dispersed by birds, mammals & intentionally by people
- Seeds, if produced, may persist in the soil
- Able to resprout after cutting

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

Invasive Impacts Score

1. Impact on natural community structure and/or composition

Score: 3 = Moderate impacts

R. sieboldii was assigned a score of 3 in the “Impacts to Natural Communities” category due because of its ability to form impenetrable thickets (HPWRA 2015). Impacts are predicted based on naturalized populations on Kauai in alien dominated habitats (occasionally mixed with some native wetland species in Kilauea), which have been present for at least 47 years. In both the Kilauea and Lawai locations, *R. sieboldii* has been observed forming thickets of 100% cover that eliminate other plant species. Locations of *R. sieboldii* overlap with one pop ref (LAW) also containing PEP plants.



Figure C37- 2. *R. sieboldii* understory, Lawaii

2. Impacts to Agriculture, Culture and other Human Systems

Score: 2 = Moderate impacts.

R. sieboldii received a score of 2 in the “Impacts to Agriculture” due to its smothering habit (ability to climb into tree canopies observed by KISC staff) and propensity to colonize disturbed ground (HPWRA 2015). Additionally, the presence of prickles on the leaves and stems alongside its ability form thickets may cause injury to animals or humans. Potential agricultural impacts may be greater, but data regarding this species in agricultural or horticultural landscapes is lacking.

3. Impacts to Biotic and Abiotic Processes

Score: 2 = Moderate Impacts

R. sieboldii was assigned a score of 2 for “Impacts to Biotic and Abiotic Processes” due to KISC staff having observed this plant colonize Kilauea stream’s banks where the prickly stems extend into the water, thereby reducing open water. Not only does this likely affect hydrological processes and soil erosion along stream banks and wetlands, but may reduce habitat and injure endangered ground nesting birds such as koloa ducks.

TOTAL INVASIVE IMPACTS SCORE: 7

Feasibility of Control Score

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

Delimiting Survey:

Score: 1 = Substantial Effort.

Feasibility of an island-wide delimiting survey for *R. sieboldii* was given a score of 1 because both the Lawai and Kilauea populations are large, with the Kilauea population being particularly difficult because of steep terrain and multiple landowners. GPS points of known *R. sieboldii* locations occur in 29 TMKs (Tax Map Keys) even though the population hasn’t been fully delimited. In particular, a dense patch of this plant is located along Kilauea stream where the landowner has refused KISC access. However, this plant is listed as a State of Hawaii Noxious Weed and thus, KISC may be able to partner with HDOA to gain land access in the future. This section may be rescored after additional attempts to contact landowners for access permission; however, based on KISC’s previous interactions with landowners, the score will likely slide to a 0.

Initial control:

Score: 1 = Substantial Effort

Feasibility of initial control for *R. sieboldii* was given a score of 1 in “initial control” due to problems with an effective control method. As much of the infestation is along waterways, Aquamaster must be used; however, previous herbicide trials conducted by KISC found that only Garlon 4 was noticeably effective. One herbarium record states that HDOA was controlling these plants near the Kalihiwai reservoir in 1982 (C.Corn 82K3, PTBG), but the current presence of these plants in this area suggests that control was ineffective or reinvasion has occurred. For properties adjacent to waterways and wetlands, a Department of Health permit is required before herbicide can be applied. Additionally, an herbicide limit per acre per watershed is enforced, and KISC’s experience with this plant suggests that the herbicide limit will be reached before control of the entire population can be achieved. It’s unknown whether the *R. sieboldii* invasion extent will “reset” due to its rapid growth if the entire population cannot be controlled within a certain timeframe. Currently, KISC understands that these permits cost over 1000 dollars and one permit must be obtained for each TMK. This section may be rescored after the number of TMKS near waterways are enumerated and a cost can be estimated for permitting; however, if a more cost efficient system with permitting cannot be achieved, the score will likely slide to a 0.

Monitoring:

Score: 1 = Substantial Effort

Feasibility of monitoring for *R. sieboldii* was given a score of 1 because KISC crew experience shows that once plants are initially treated, plants tend to reestablish. This may be due to the fact that some plants are missed during the initial treatment in thickets but also the habit of *R. sieboldii* makes it difficult to tell where the main stem originates from the ground. Applying the less effective Aquamaster to portions near waterways will result

in more regeneration and more effort required for monitoring. Additionally, the crew has observed small seedlings in clusters, which is often indicative of seeds germinating out of a dropped berry. Production of viable seed will increase the difficulty of both the delimiting survey (due to bird dispersal) and monitoring because of the unknown duration of the seed bank.

FEASIBILITY OF CONTROL SCORE: 3

COMBINED SCORE: 7 + 3 = 10

Literature Cited

- HPWRA. 2015. *Rubus sieboldii*. Hawaii Pacific Weed Risk Assessment.
- Imada, C. T. 2012. Hawaiian native and naturalized vascular plant checklist (December 2012 update). Bishop Museum Technical Report 60/ Hawaii Biological Survey Contrib. 2012-021: 29 pp. + 27 appendices.
- Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1999. Manual of the Flowering Plants of Hawai'i. Page 1918. University of Hawaii Press and Bishop Museum Press, Honolulu.
- Yamashiro, A., and T. Yamashiro. 2006. Seed dispersal by kerama deer (*Cervus nippon keramae*) on Aka Island, the Ryukyu Archipelago, Japan. *Biotropica* **38**:405-413.