KISC KAUAI INVASIVE SPECIES COMMITTEE	Kauai Status	KISC Status	HPWRA	Invasive Impacts Score	Feasibility Score	Combined Score
Dovyalis hebecarpa (Ceylon gooseberry)	PRESENT	EARLY DETECTION	HIGH RISK (7)	4	7	11

Initial PFC report completed: October 2017

PFC report updated as of: N/A

Current Recommendation for KISC: Accept as KISC Target pending scoring rank and committee review

Knowledge Gaps and Contingencies:

- 1) Early detection surveys should be conducted at the nursery indicated in a herbarium voucher location.
- 2) Delimiting surveys surrounding known locations are required to gain knowledge of the extent of populations.
- 3) An assessment of outreach effort towards private residences to increase detection on private lands is necessary.
- 4) An invasive plant prevention plan designed to encourage collaboration between Botanical Gardens and local conservation agencies should be considered.

Background

Dovyalis hebecarpa (Salicaceae), or "Ceylon gooseberry", is a shrub or small tree usually cultivated for its sour fruits (Staples and Herbst 2005). *D. hebecarpa* has not been considered for control by KISC in the past, although it was first detected during surveys in 2010. Thus, the purpose of this prioritization assessment report is to evaluate whether KISC should attempt eradication (i.e. accept "Target" status). This decision be informed by scoring and comparing *D. hebecarpa* to other "Early Detection" species known to Kauai (See Table 5 in KISC Plant Early Detection Report for status terminology).

Detection and Distribution

D. hebecarpa is said to have been brought to Hawaii in the 1920's where it was used as a spiny, living fence to keep cattle out of sugarcane and also as a source of tart fruit for jelly-making. However, it's unclear whether this plant was distributed to all the islands. The first record of this plant on Kauai is a herbarium voucher collected in 1986 from a nursery in Wailua Homesteads (T. Flynn 1967, PTBG). Currently it is deemed naturalized on Hawaii island only (Imada 2012), although data collected during 2015-2017 surveys demonstrate that it is naturalized on Kauai as well. On Kauai, there are two known sites of cultivation: one tree currently living in National Tropical Botanical Garden's (NTBG) living collection, and a second tree from a nursery in Wailua Homesteads recorded in 1986, the presence of which hasn't been verified since the original observation data. Additionally, there are roughly 2 sites of naturalized plants: 1) one cluster of approximately 5 individuals near an illegal green waste dumping site in northern Kalaheo and 2) a site consisting of two plants, spaced 300m apart in mesic alien forest next to a golf course in central Kalaheo. Combined, these data indicate that *D. hebecarpa* is distributed across Koloa and Kawaihau districts and occupies 3 watersheds (Figure C18- 1). Observations of weediness and frugivory of *D. hebecarpa* in cultivated settings, as well as distribution patterns central Kalaheo, indicate that seeds are being disbursed by birds (Staples et al. 2000).



Figure C18- 1. Locations of *D. hebecarpa* on Kauai. Locations where presence of the plant was confirmed during 2015-2017 surveys are denoted by red circles.

Hawaii Pacific Weed Risk Assessment (HPWRA) Score

D. hebecarpa is designated as "High Risk", receiving a score of 7 (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). Categorization of traits in this manner more accurately informs invasive impact potential scoring and prioritization of species that are already established on Kauai.

Likelihood of Invasion	Consequences of Invasion		
 Well suited to climates in Hawaii Naturalizes in areas with comparable climates Tolerates a wide range of soil conditions Produces viable seed Hybridizes naturally Propagules dispersed intentionally by people Propagules bird dispersed survive passage through the gut 	 A congeneric weed, sharing a genus with weedy <i>D</i>. <i>caffra</i> (i.e. implies inheritance of tendencies to inflict invasive impacts) Produces spines Unpalatable to animals 		
Benefits from disturbance			

Refer to the full Weed Risk Assessment for *D. hebecarpa*, including how these traits and characteristics traits affect HPWRA scoring, at https://sites.google.com/site/weedriskassessment/assessments/Download-Assessments.

Invasive Impacts Score

1. Impact on natural community structure and/or composition

Score: 1 = Minor impact

D. hebecarpa was assigned a score of 1 because currently there is no evidence that this plant will impact native ecosystems. It prefers dry-mesic lowland areas, and thus is not likely a threat to high-elevation native forest. However, it tolerates a wide range of soil types, including sand, so continuous monitoring is necessary to observe whether this plant can invade native-dominated beach habitat or if it would be limited by salt exposure (Staples and Herbst 2005). It may naturalize in dry-mesic native-dominated habitats similar to those on the western coast of Kauai, but no data suggests that this plant would be more than an occasional weed. However, a score of 1 rather than 0 is warranted because it can grow to 5m tall, which is large enough to influence light availability for adjacent plants and may form an extra (albeit sparse) canopy layer in shrub-dominated habitats (Gagne and Cuddihy 1990).

2. Impacts to Agriculture, Culture and other Human Systems

Score: 2 = Moderate Impacts

D. hebecarpa received a score of 2 in this category, because it is occasionally mentioned as a weed escaping horticulture, with recommendations that it is either not planted or that special care should be taken to manage it (Staples and Herbst 2005, Staples et al. 2000). In Florida, most plantings have been eradicated because it is too aggressive to maintain in cultivation (Staples and Herbst 2005). It has naturalized on Hawaii island, Florida, New Zealand, the Cook islands and Puerto Rico but no specific impacts have been noted other than to deem it "weedy" (HPWRA 2011). Additionally, it has 2-inch long, stiff thorns along the trunk and branches and plants outside of cultivation have a sprawling habit. Even if *D. hebecarpa* naturalizes only sparingly, the presence of thorns may cause injury to humans, pets or livestock.



Figure C18-2. D. hebecarpa fruit and thorns (photo from The Cook Islands Natural Heritage Trust).

3. Impacts to biotic and abiotic processes

Score: 1 = Minor Impacts

D. hebecarpa was assigned a score of 1 because no data indicates that densities of this plant will increase to the point of noticeable effects on soil nutrient or hydrological cycling. However, it received a score of 1 because its spines could potentially cause injury to native ground-nesting birds if allowed to spread into prime nesting habitats.

TOTAL INVASIVE IMPACTS SCORE: 4

Feasibility of Control Score

Feasibility of Control Scoring and rationale for *D. hebecarpa* 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 *D. hebecarpa* was given a score of 2 because a large survey buffer (>1000m) is necessary because fruits are bird dispersed. More importantly, this plant is known in cultivation on Kauai and therefore significant outreach efforts are necessary to increase the probability that plants at private residences are detected.



Figure C18- 3. Map of *D. hebecarpa* locations near Wailua Homestead. Locations where presence of the plant was confirmed during 2015-2017 surveys are denoted by red circles.

Initial control:

Score: 2 = Moderate Effort

Feasibility of initial control for *D. hebecarpa* was given a score of 2 because although few sites (3 TMKS) are currently known on Kauai, a female tree is present within the living collection at NTBG in Lawai. *D. hebecarpa* is dioecious, requiring separate male and female plants to produce viable seed in most cases. Thus, cooperation with NTBG is required and removal or special management of plants may require additional effort.

Monitoring:

Score: 3 = Minor Effort

Feasibility of monitoring for *D. hebecarpa* was given a score of 3 because data suggests that the seeds are recalcitrant and therefore should not be able to undergo dormancy (Farnsworth 2000). Thus, the monitoring period after initial control can be short (<2 years regularly). However, assuming that *D. hebecarpa* specimens are not removed from the living collection at NTBG, continuous collaboration and monitoring for fruit production is necessary to ensure a population does not establish and spread from this site.

FEASIBILTY OF CONTROL SCORE: 7

COMBINED : 4 + 7 = **11**

Literature Cited

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