 KISC KAUAI INVASIVE SPECIES COMMITTEE	Kauai Status	KISC Status	HPWRA	Invasive Impacts Score	Feasibility Score	Combined Score
<i>Heritiera littoralis</i> (looking-glass tree)	NATURALIZED	EARLY DETECTION	LOW RISK (-2)	3	7.5	10.5

Initial Prioritization Assessment Report completed: December 2017

Report updated as of: N/A

Current Recommendation for KISC: pending scoring rank and committee review

Knowledge Gaps and Contingencies:

- 1) Delimiting surveys surrounding known locations are required to gain knowledge of the extent of the population
- 2) An assessment of outreach efforts are needed to detect plants prone to naturalize on private lands
- 3) An invasive plant prevention plan designed to encourage collaboration between Botanical Gardens and local conservation agencies should be considered.

Background

Heritiera littoralis (Malvaceae), or “looking-glass tree”, is a tree (growing up to 25m tall) sometimes planted in Hawaii as a street tree (Staples and Herbst 2005). The assessment of this species is unique in that it received a “Low Risk” ranking according to the Hawaii-Pacific Weed Risk Assessment (HPWRA 2012). Although a “High Risk” ranking by the HPWRA is usually required to warrant a full Prioritization Assessment report (See Appendix A), naturalization of this plant in a state park in Kauai indicates that some Hawaii-specific impacts may be possible. *H. littoralis* 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 *H. littoralis* to other “Early Detection” species known to Kauai (See Table 5 in KISC Plant Early Detection Report for status terminology).

Detection and Distribution

Herbarium vouchers of *H. littoralis* were first collected on Kauai from a cultivated specimen at NTBG in 1986 (T. Flynn 1717, PTBG), but later it was deemed naturalized at Haena State Park in 2004 (T. Flynn 7122, PTBG). Statewide, it is only considered naturalized on Kauai (Imada 2012), but it appears to be naturalizing along streams in Manoa valley in Oahu as well. On Kauai, the population of *H. littoralis* in Haena State Park appears to be growing where over 65 small trees and numerous saplings are now scattered within lowland alien forest. Additionally, a cultivated tree is present in the National Tropical Botanical Garden’s (NTBG) living collection. The naturalized trees in Haena State Park are distributed sporadically throughout the forest adjacent to Limahuli stream; thus, flooding of the stream may be dispersing the seeds, which are buoyant and adapted to coastal mangrove habitats in the tropics (Van der Stocken et al. 2015, Mangora et al. 2017). These data show that *H. littoralis* is naturalizing within the Hanalei judiciary district (and cultivated in the Koloa district) and naturalized within the Limahuli watershed (and cultivated in the Lawai watershed; Figure C23- 1).

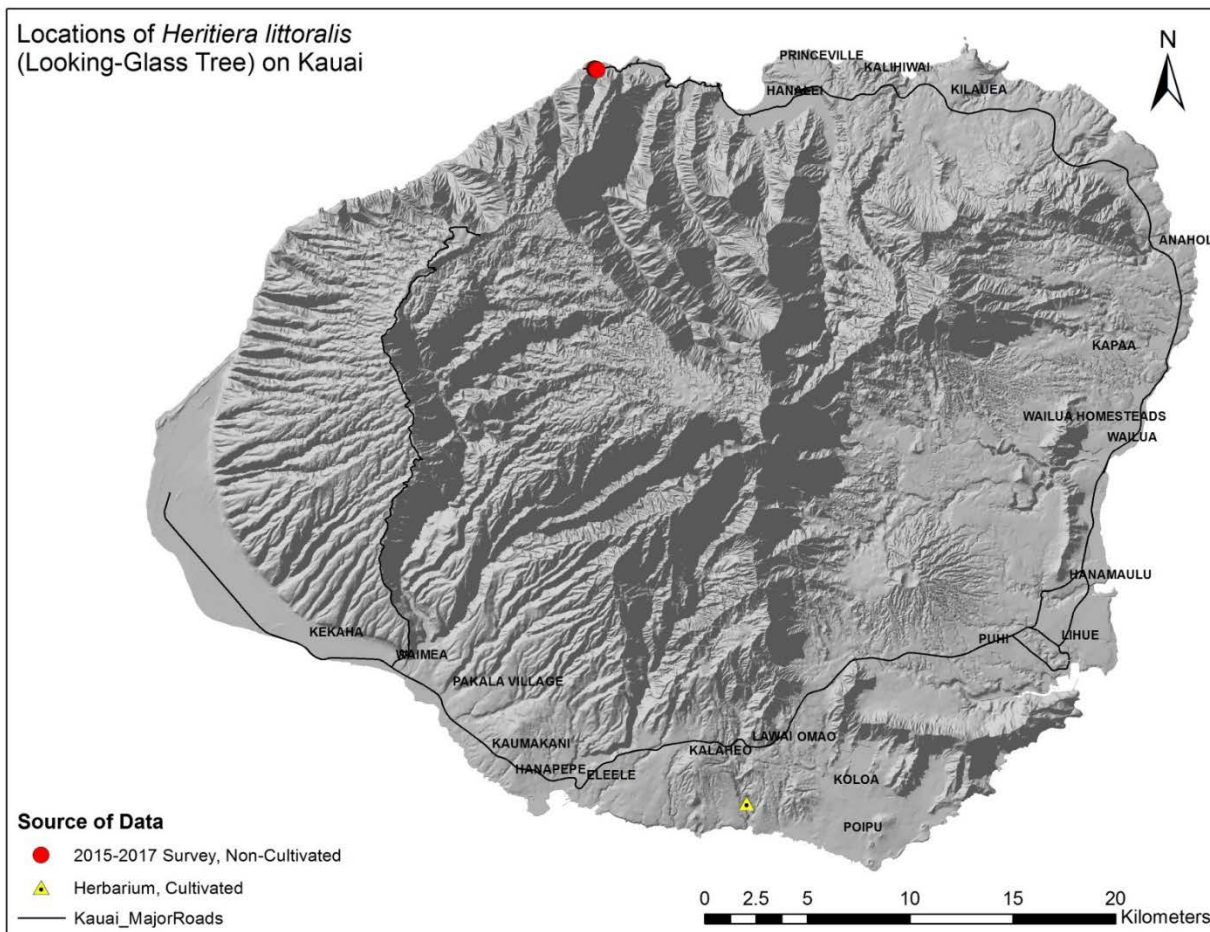


Figure C23- 1. Locations of *H. littoralis* on Kauai. Locations where presence of the plant was confirmed during 2015-2017 surveys are denoted by red circles.

Hawaii Pacific Weed Risk Assessment (HPWRA) Score

H. littoralis is designated as “Low Risk”, receiving a score of -2 (Daehler et al. 2004, HPWRA 2012). 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). As this particular assessment resulted in a “Low Risk” score, traits resulting in a low score are also listed alongside asterisks (*). 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"> • Well suited to climates in Hawaii • Naturalizes outside of its native range • Shade tolerant during some phase of its life cycle • Produces viable seed • Propagules dispersed intentionally by people • Does not reproduce by vegetative fragmentation * • Takes more than 4 years to mature * • Propagules not dispersed unintentionally by people* • Propagules unlikely to be dispersed as a contaminant* • Propagules not dispersed by animals, wind or birds* • Does not produce prolific amounts of seed * • Does not produce a persistent seed bank * 	<ul style="list-style-type: none"> • Unpalatable to grazing animals

Refer to the full Weed Risk Assessment for *H. littoralis*, 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 impacts

H. littoralis was assigned a score of 1 because as yet there are no records of invasive impacts resulting from the naturalization of this plant. However, at least minor impacts to remnant native ecosystems in riparian and wet coastal areas are likely to occur because the tree can grow > 25m, allowing it to overtop other remnant native plants that may occur in lowland riparian ecosystems. However, data regarding the behavior of this species outside its native range is lacking, which may greatly affect invasive impact scoring. Continuous monitoring of this plant on Kauai and Oahu is necessary to determine if it can form dense, exclusionary stands and how far it can spread.



Figure C23- 2. Photo of a young *H. littoralis* naturalizing under alien forest at Haena State Park on Kauai, showing the gray undersides of its leaves.

2. Impacts to Agriculture, Culture and other Human Systems

Score: 0 = No Impacts

H. littoralis received a score of 0 in this category because no impacts to human manipulated systems are expected, as the tree is reportedly slow growing and the large heavy seeds are unlikely to disperse unintentionally into agricultural or urban areas (Staples and Herbst 2005). Trees produce numerous seeds that can become a nuisance in landscaped areas (Staples and Herbst 2005), but *H. littoralis* is unlikely to naturalize immediately next to intensively cultivated areas.

3. Impacts to biotic and abiotic processes

Score: 2 = Moderate Impacts

H. littoralis was assigned a score of 2 in this category because observations from Kauai and Oahu indicate that this plant can colonize riparian and coastal lagoons. This prediction is supported by *H. littoralis* behavior in its native range, where its salt tolerance and ability to survive periodic flooding enable it to colonize areas immediately behind mangrove strands (Ye et al. 2004, HPWRA 2012, Mangora et al. 2017). Additionally, these plants can form large buttressing root systems that may change the structure of aquatic ecosystems, including lagoons edges and stream banks (Figure C23- 3). Additionally, this plant has been used in the Philippines as a fish and spearhead toxin; crude extract of the plant effectively killed tilapia in a closed experiment (Miles et al. 1991). However, it's unclear if these toxins would be able to leach into streams and effect fish populations without human influence.



Figure C23- 3. *H. littoralis* along a river in Japan, showing large buttress roots (Photo Credit: Dena Travel, Okinawa).

TOTAL INVASIVE IMPACTS SCORE: 3

Feasibility of Control Score

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

Delimiting Survey:

Score: 2.5 = Moderate-Minor Effort

Feasibility of a delimiting survey for *H. littoralis* was given a score of 2.5 because the population is small and plants appear to be dispersed by water. Thus delimiting searches may focus on areas prone to flooding, which reduces the search area. However, because this plant is well known to the nursery trade in Hawaii, significant outreach is necessary to detect plants cultivated on private residences, particularly near streams.

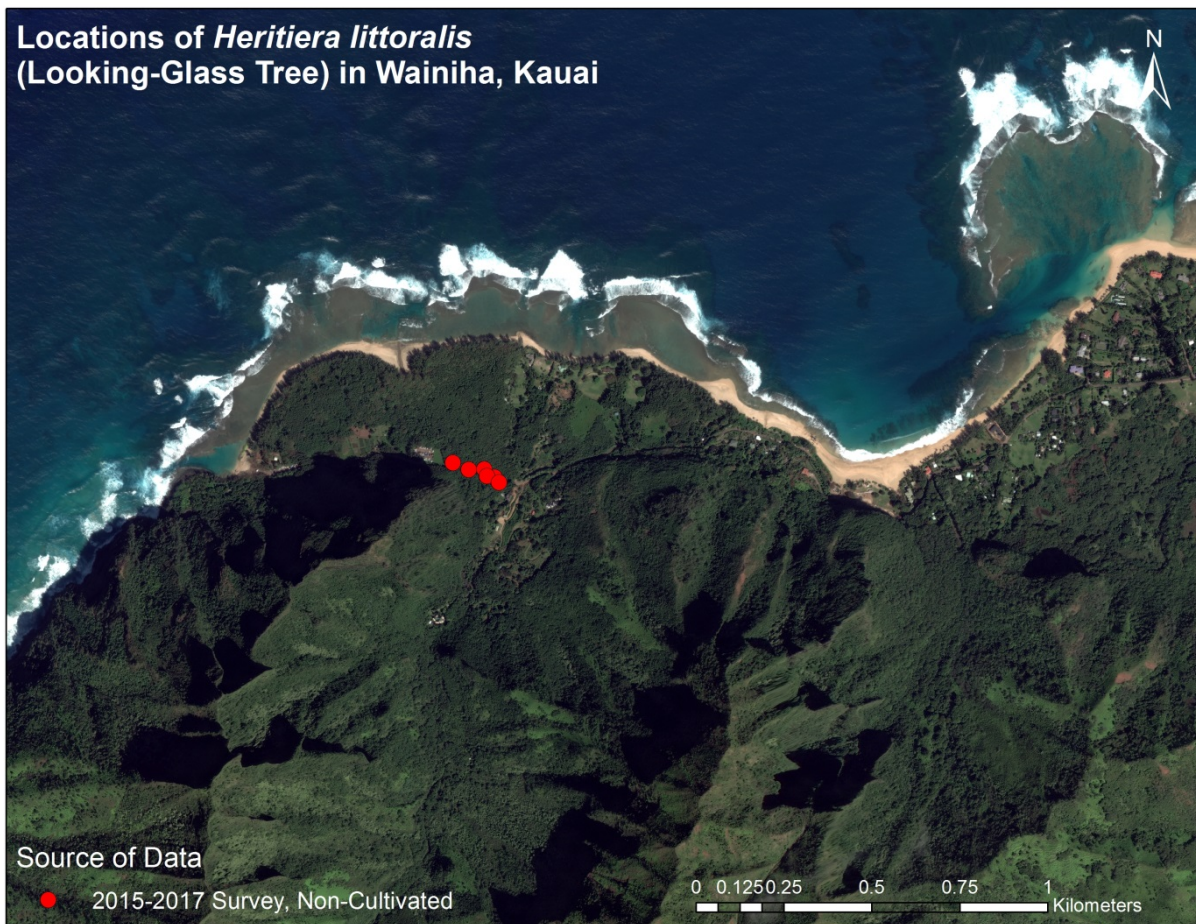


Figure C23- 4. Map of *H. littoralis* locations in Haena State Park. Locations where presence of the plant was confirmed during 2015-2017 surveys are denoted by red circles.

Initial control:

Score: 2 = Moderate Effort

Feasibility of initial control for *H. littoralis* was given a score of 2 because although control methods have not been tested on this plant, few individuals are present. However, herbicide use may be restricted for plants immediate adjacent to Limahuli stream.

Monitoring:

Score: 3 = Minor Effort

Feasibility of monitoring for *H. littoralis* was given a score of 3 because this species is not thought to form persistent propagule banks (HPWRA 2012). However, germination through the hard fruit coat can take over 130 days (Ye et al. 2004), and thus a few follow up visits to remove regenerating saplings are necessary.

FEASIBILITY OF CONTROL SCORE: 7.5

COMBINED : 3 + 7.5 = 10.5

Literature Cited

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