	<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>Cissus nodosa</i> (grape ivy)	NATURALIZED	EARLY DETECTION	HIGH RISK (8)	5	7	12

Initial Prioritization Assessment Report completed: January 2018

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 population extent.
- 2) Public outreach is necessary to detect plants that may have sold through the nursery industry.

Background

Cissus nodosa (Vitaceae), or “grape ivy”, is a vine occasionally cultivated as an ornamental (Staples and Herbst 2005). Control of two populations of *C. nodosa* by KISC was initiated after they were recommended as potential Target species after 2010 early detection surveys. Additional population and control information has been acquired since these efforts and thus, the purpose of this prioritization assessment report is to re-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. nodosa* 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 known record of *C. nodosa* on Kauai is a herbarium voucher collected from a naturalized population in Kalaheo in 1986 (T. Flynn 1944, PTBG). Statewide, it is considered naturalized on Kauai, Oahu, and Hawaii Island (Imada 2012). On Kauai there are two known naturalized populations of this plant, one in Lihue and one in northern Kalaheo (Figure C9- 1). Herbarium records indicate that these populations have been present for at least 30 years (T. Flynn 1944 & 2888, PTBG). Seeds are thought to be dispersed by birds (Staples et al. 2000). 2015-2017 surveys did not detect any additional populations; however, plants are easily mistaken for other vines, particularly the closely related *C. verticillata*. These data indicate that *C. nodosa* is currently naturalized in two judiciary districts (Lihue, Kawaihau) and two watersheds (Kalaheo, Nawiliwili).

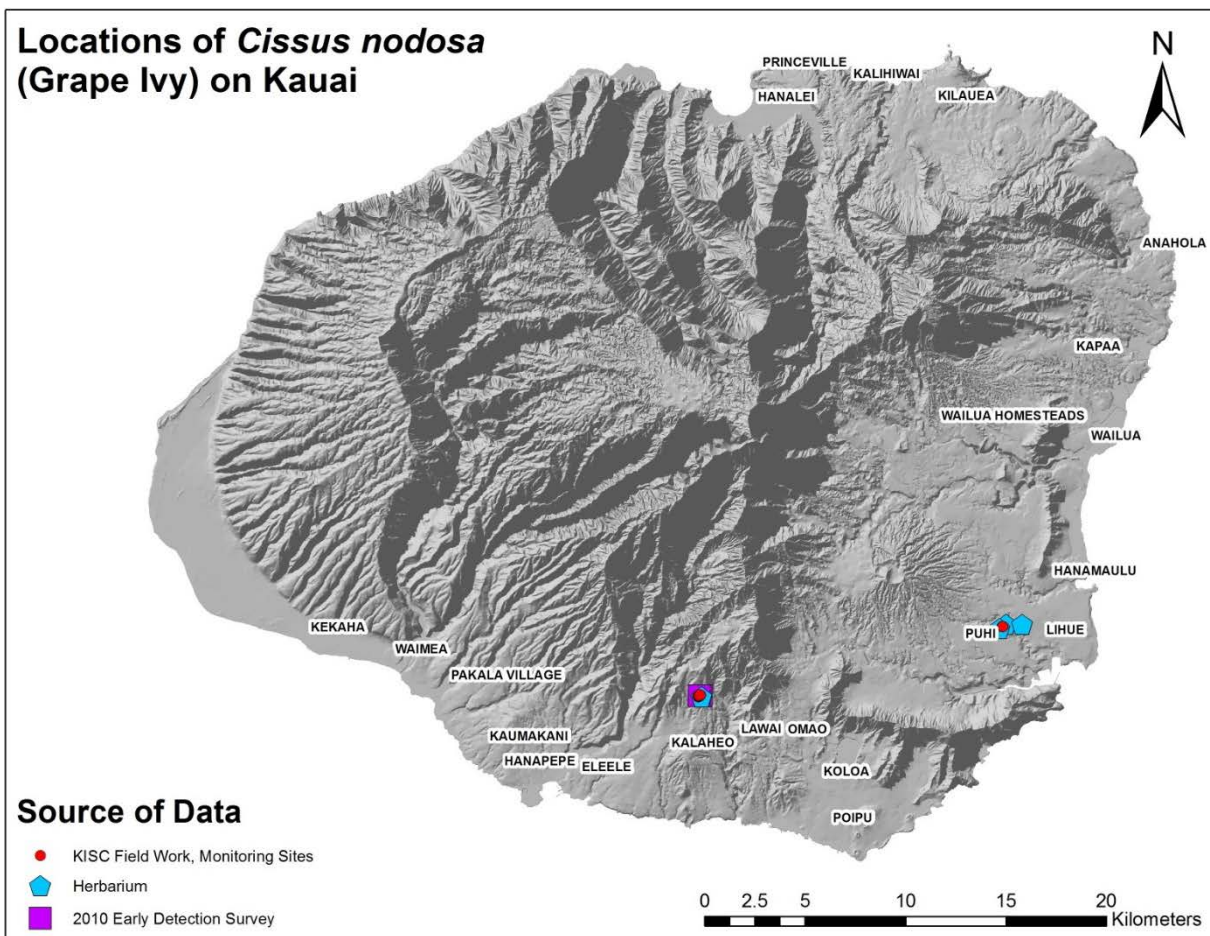


Figure C9- 1. Locations of *C. nodosa* on Kauai.

Hawaii Pacific Weed Risk Assessment (HPWRA) Score

C. nodosa is designated as “High Risk”, receiving a score of 8 (Daehler et al. 2004, HPWRA 2008). 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.

<i>Likelihood of Invasion</i>	<i>Consequences of Invasion</i>
<ul style="list-style-type: none"> • Well suited to climates in Hawaii • Naturalized outside of its native range • Shade tolerant • Tolerate a wide range of soil conditions • Underground storage organ • Produces viable seed • Propagules dispersed intentionally by people • Propagules bird dispersed, surviving passage through the gut 	<ul style="list-style-type: none"> • A congeneric weed, sharing a genus with other known invasive vines (i.e. implies inheritance of tendencies to inflict invasive impacts) • Climbing and smothering growth habit

Refer to the full Weed Risk Assessment for *C. nodosa*, including how these traits and characteristics 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

C. nodosa was assigned a score of 1, but this may be due to a lack of reported information regarding its invasive impacts and consequently, this species should be monitored carefully on Kauai. It has not been reported as naturalized or invasive except in Hawaii, making predictions of invasive impacts difficult. *C. nodosa* may be restricted to lowland ecosystems on Kauai as surveys of the Andabar and Nicobar islands of India suggest that its native range is restricted to below 50 m elevation (Hajra et al. 1999). However, it has been collected from naturalized populations at about 360m elevation on Kauai (T. Flynn 1944, PTBG). Additionally, surveys of Java (where it is also native) report that it is common in disturbed roadsides and urban areas but less common in native forests, which indicates that *C. nodosa* is an opportunistic, disturbance associated weed, and may not noticeably impact native habitats (Santosa et al. 2014). However, a score of 1 is warranted because the plant's ability to smother vegetation, spread quickly by bird-dispersed seeds, and withstand shade may allow it to become an occasional weed causing at least minor impacts. *C. nodosa* currently resides in two POPREF polygons known to contain PEP plants (Kalaheo–KAL, Nawiliwili –NAW).

2. Impacts to Agriculture, Culture and other Human Systems

Score: 3 = Major Impacts

C. nodosa received a score of 3 because observations from Hawaii and within its native range suggest that its dense, vining habit will likely pose a problem as it climbs cultivated trees, fences, homes, powerlines and other infrastructure. In its native range of Java, one study recommended it for control within a botanical garden to preserve biodiversity collections, exemplifying its potential to become a serious weed of horticulturists (Santosa et al. 2014). Additionally, the same study considered it to majorly detract from the appearance of the garden. This is likely due to its vining, woody habit and the production of thousands of aerial roots which give a messy appearance to non-cultivated plants.

3. Impacts to biotic and abiotic processes

Score: 1 = Minor Impacts

C. nodosa was assigned a score of 1 because no studies have investigated the effects of this plant on abiotic or biotic processes. However, its rapid growth and ability to form dense, smothering patches that may influence soil moisture and nutrient cycling. As soil moisture is often a limiting factor in dry environments, the shade provided by dense vines may increase moisture availability and facilitate the invasion of other species less tolerant of dry environments. However, this prediction is purely speculative as little is known of the effects of this plant on biotic or abiotic processes. This score may increase if more data regarding the impacts of *C. nodosa* become available.

TOTAL INVASIVE IMPACTS SCORE: 5

Feasibility of Control Score

Feasibility of Control Scoring and rationale for *C. nodosa* 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. nodosa* was given a score of 2 because although there are only 2 known locations, bird-dispersed seeds may have spread the population beyond known sites. Thus a buffer area of at least 1000 m in ideal habitat must be searched to delimit the population. The collection of multiple herbarium vouchers in the Lihue area since the 1980s suggest that additional locations immediately surrounding the active KISC control site may be present, although they may have been destroyed during road construction and clearing of right of ways since they were collected. Alternatively, these actions may have spread vegetative fragments to additional undetected locations. Outreach efforts to the public are necessary to increase detection of this plant on private land, as it is known to the horticultural trade (Staples and Herbst 2005).

Initial control:

Score: 2.5 = Moderate-Minor Effort

Feasibility of initial control for *C. nodosa* was given a score of 2.5 because control of this plant is difficult. However, as no additional populations were detected in recent surveys and headway has been made on controlling known populations since 2011, a lower score was not assigned. Although KISC has found some control by herbicide is eventually effective, control of this plant is difficult due to its growth habit. The numerous aerial roots make it difficult to select stems for treatment, and as it grows with a mass of other vines, it is difficult to determine which stems belong to *C. nodosa* vs other plants in the field. Additionally, *C. nodosa* easily regenerates from underground storage organs, and multiple treatments are likely necessary to kill the plants. Control data from the population in Kalaheo indicates that *C. nodosa* has been sporadically regenerating since the first control attempt in 2011, which may be due to regeneration from underground tubers. Alternatively, it may represent regeneration from seed (see below).

Monitoring:

Score: 2.5 = Moderate-Minor Effort

Feasibility of monitoring for *C. nodosa* was given a score of 2.5 because sites are relatively small and easy to access, making monitoring revisits simple. Although the seed longevity of *C. nodosa* has not been studied specifically, data from other species sharing the genus indicate that at least some seeds may persist in the soil (Hall and Swaine 1980, Garwood and Lighton 1990, Sanches and Valio 2002). However, seed viability may begin to decline in as little as 2 years if *C. nodosa* seed viability trends are consistent with its close relatives (Garwood and Lighton 1990). Because no data for this species exists regarding its rate of maturity, monitoring surveys should be conducted regularly to ensure regenerating plants do not set seed. However, as no additional populations were detected in recent surveys and headway has been made on controlling known populations since 2011, a lower score was not assigned.

FEASIBILITY OF CONTROL SCORE: 7

COMBINED: 5 + 7 = 12

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