KISC KAUAI INVASIVE SPECIES COMMITTEE	*Kauai Status*	*KISC Status*	*HPWRA*	*Invasive Impacts Score*	*Feasibility Score*	*Combined Score*
Vicia sativa (black-pod vetch)	**NATURALIZED**	**EARLY DETECTION**	**HIGH RISK (16)**	**6**	**8**	**14**

Initial PFC report completed: November 2017
PFC report updated as of: N/A
Current Recommendation for KISC: Consider eradication pending scoring rank and committee review
Knowledge Gaps and Contingencies:
1) Delimiting surveys surrounding known locations are required to confirm that the population is confined to Camp 10 road.

Background

Vicia sativa (Fabaceae), or "black-pod vetch", is a herbaceous vine that is sometimes cultivated as a nitrogen-fixing and weed suppressing cover crop (Randall 2017). *V. sativa* 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 *V. sativa* 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 voucher of *V. sativa* was collected about 1.5 km up camp 10 road in 2006, when it was deemed naturalized on Kauai (K.R. Wood 11915, PTBG). Statewide, *V. sativa* is considered naturalized on Kauai, Maui and Hawaii Island (Imada 2012). 2015-2017 surveys have confirmed that *V. sativa* is still present on camp 10 road, and no other sightings from the island have been recorded. Interestingly, surveys of camp 10 road in 2016 prior to bridge construction failed to detect the species, while a second survey after construction completion observed the plant obviously spreading along the roadside. This indicates that construction equipment either spread the seeds or disturbed an existing seed bank that initiated germination. Only two data points exist for this species on Kauai, indicating that *V. sativa* is spread along at least 0.8 kms of roadway. Combined, these data indicate that this plant is naturalized only in the Waimea district, occupying one watershed (Waimea; Figure C41- 1).

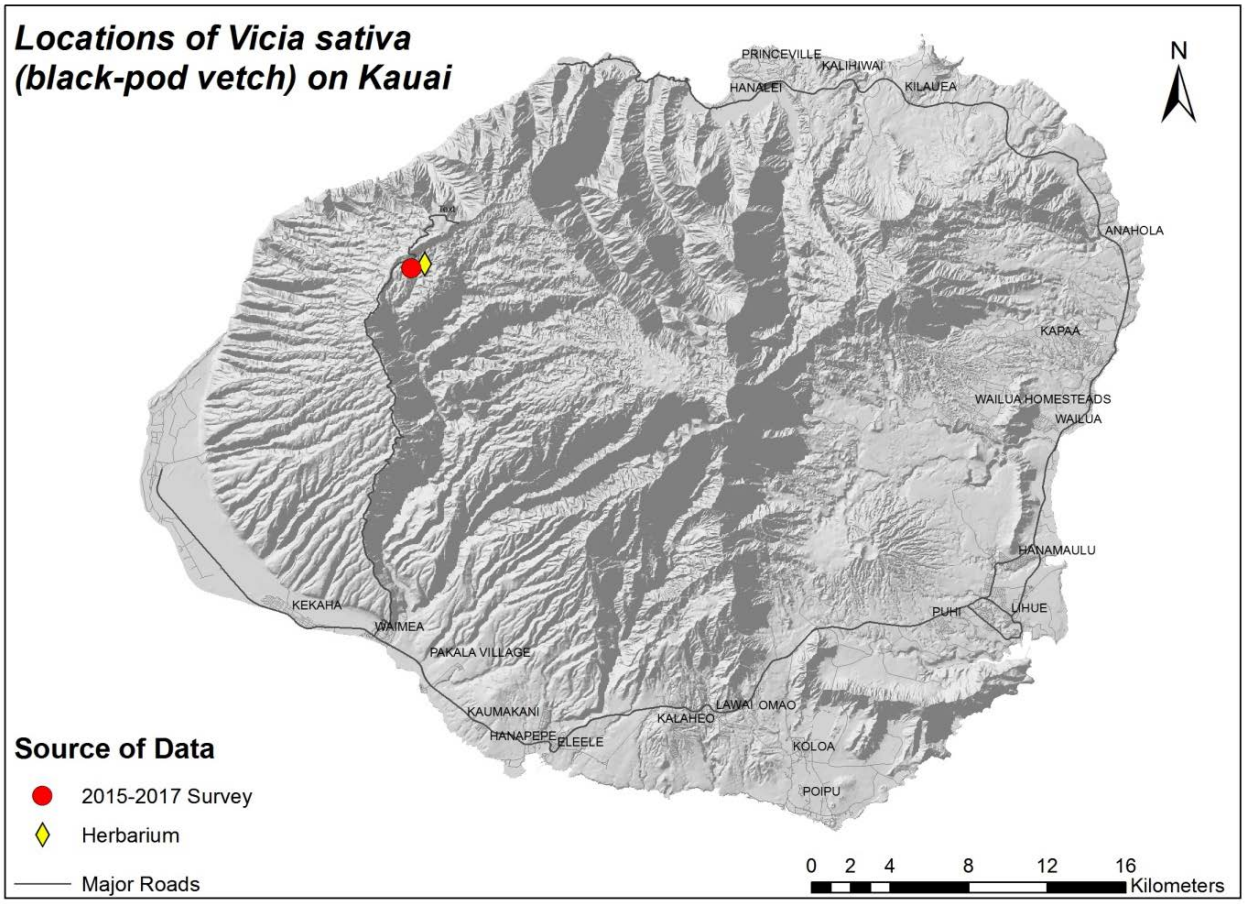

Figure C41- 1. Locations of *V. sativa* on Kauai. Locations where presence of the plant was confirmed during 2015-2017 surveys are denoted by red circles.

Hawaii Pacific Weed Risk Assessment (HPWRA) Score

V. sativa is designated as "High Risk", receiving a score of 16 (Daehler et al. 2004, HPWRA 2017). 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 • Repeatedly introduced and naturalized in areas with comparable climates • Tolerates a wide range of soil conditions • Produces viable seed • Hybridizes naturally • Self-compatible • Matures in less than 3 years • Propagules dispersed both intentionally and unintentionally by people • Propagules birds dispersed, seed surviving passage through the gut	• A weed of gardens/amenities/ disturbed areas • A congeneric weed, sharing a genus with other known invasive vines (i.e. implies inheritance of tendencies to inflict invasive impacts) • Climbing or smothering growth habit

Refer to the full Weed Risk Assessment *V. sativa* at https://sites.google.com/site/weedriskassessment/assessments/Download-Assessments.

Invasive Impacts Score

1. Impact on natural community structure and/or composition

Score: 1.5 = Minor-Moderate impacts

V. sativa was assigned a score of 1.5 because of its reputation as a weed globally (Randall 2017). Although it is considered a minor weed where it has naturalized in Hawaii, it may have the potential to occupy native plant dominated wetlands, open areas or disturbed sites due to its rapid growth and ability to tolerate a wide range of soil types (HPWRA 2017). It is regarded as an environmental weed in southern Australia because it can smother native plants (HPWRA 2017, WAH 2017). Additionally, it is capable of growing at all elevations in Kauai, indicating that it will continue to naturalize in Kokee if not controlled. However, specific impacts of this plant in native ecosystems have not been documented and its light requirements will likely prevent it from establishing in densely forested areas, precluding it from being scored higher. However, continuous monitoring of this plant is needed to discover whether Kauai-specific impacts are possible.

2. Impacts to Agriculture, Culture and other Human Systems

Score: 3 = Major impacts

V. sativa received a score of 3 because of its known propensity to colonize disturbed sites and produce numerous seeds (Aarssen et al. 1986, WAH 2017). Particularly, *Vicia* species tend to form a strong, dense mat of vegetation as it spreads and attaches to adjacent vegetation with its tendrils (Aarssen et al. 1986). In Kokee, it may colonize access routes used by conservationists or hunters, and may cause a tripping hazard or impede access along trails. Dispersal by birds, water and boots of hikers will likely spread this plant rapidly. This plant is a known weed of pastures and gardens, and due to *V. sativa*'s ability to occur at multiple elevations, it is likely that this plant may cause problems island-wide. Although widely introduced for agricultural purposes (Wagner et al. 1999, HPWRA 2017), *V. sativa* is often considered a common weed of agricultural systems, causing yield reductions, specifically in pastures, wheat, peas, and lentils (Aarssen et al. 1986, Mishra and Bhan 1997, Mishra et al. 1997, Vashisht et al. 2008). Furthermore, *V. sativa* is notable for its known potential to host several economically important plant diseases and parasites affecting crops, including pea aphid (*Illinoia pisi*), stem rot and leaf stop fungus (*Septoria viciae*) and yellow mosaic virus (Aarssen et al. 1986). Additionally, some reports have implicated *V. sativa* in some suspected cases of livestock poisoning (Barros et al. 2001, Suter 2002).

3. Impacts to biotic and abiotic processes

Score: 1.5 = Minor-Moderate Impacts

V. sativa was assigned a score of 1.5 because of its known ability to fix nitrogen (Aarssen et al. 1986, Thorpe et al. 2013). Although it's not clear how increased soil nitrogen will affect soil microbiology and nutrient cycling on Kauai, it is possible that nitrogen fixation will facilitate invasions by other quick-growing alien species that can take advantage of high soil nitrogen stores. Ultimately, potential impacts of this plant associated with nitrogen fixation are closely tied to whether *V. sativa* will spread into sensitive native ecosystems and how densely it invades. Ultimately, future monitoring of this plant is necessary to determine whether it should be scored higher in this category.

TOTAL INVASIVE IMPACTS SCORE: 6

Figure C41- 2. *V. sativa* forming a low mat amongst grassed along roadside.

Feasibility of Control Score

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

Delimiting Survey:

Score: 3 = Minimal Effort

Feasibility of a delimiting survey for *V. sativa* was given a score of 3 because only the sites along Camp 10 road have been detected. Because it appears to be intolerant of dense shade, delimiting surveys can prioritize searches of roadsides, cabin lots and other open disturbed areas over densely forested sites (HPWRA 2017). However, seeds are thought to be dispersed by water along stream channels and birds (Aarssen et al. 1986). Thus, delimiting searches must include ideal habitat within a >1000m buffer and downstream reaches of Elekeniiki stream. As construction on Camp 10 in 2016 road may have further dispersed the seeds, detailed surveys of the entire length of camp10 road and wherever equipment was stored is necessary.

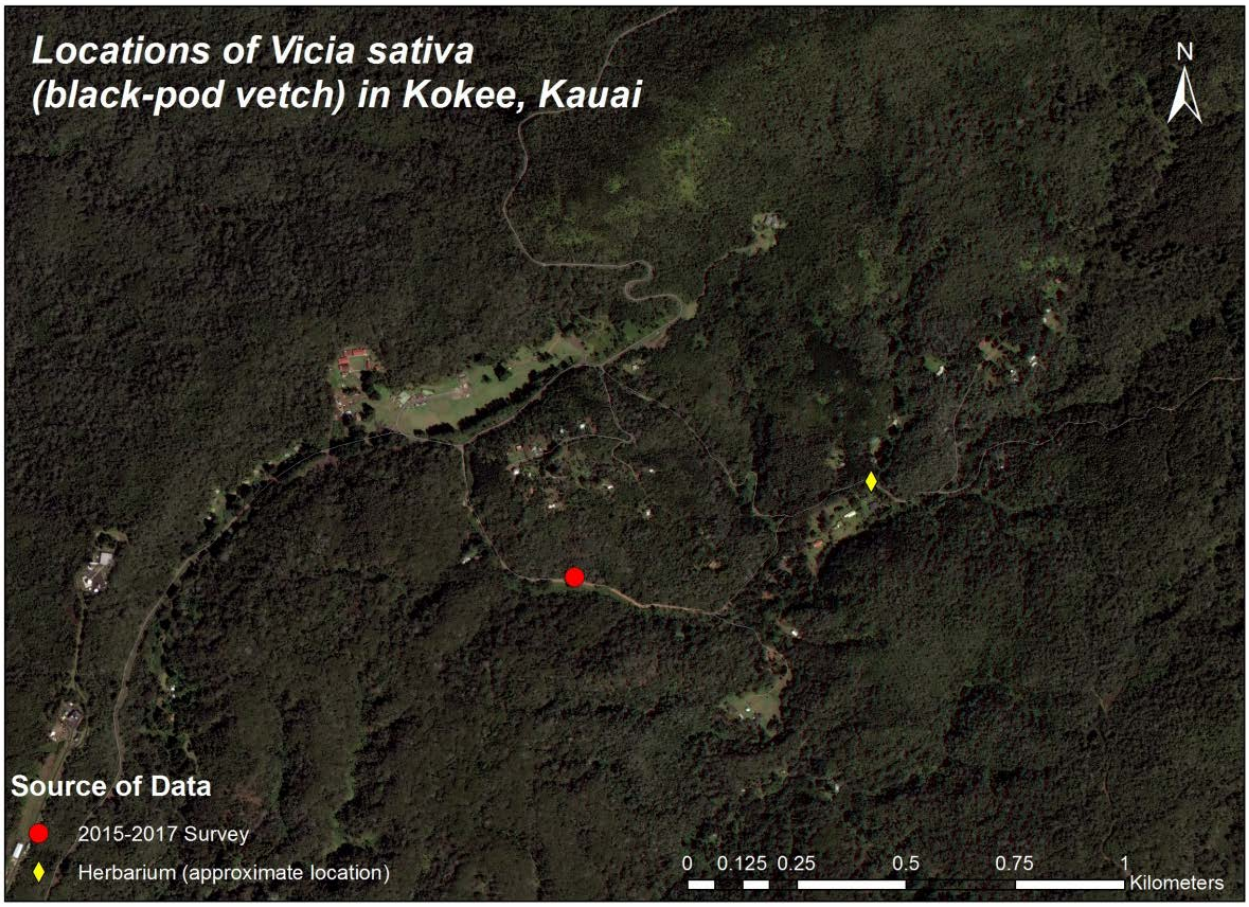

Figure C41- 3. Map of *V. sativa* locations in Kokee along Camp 10 Road. Locations where presence of the plant was confirmed during 2015-2017 surveys are denoted by red circles.

Initial control:

Score: 3 = Major Effort

Feasibility of initial control for *V. sativa* was given a score of 3 because although this weed is spread along almost 1 km of roadway, effective use of herbicide is well-reported with this species. However, the population appeared to grow much larger after bridge and road construction of Camp 10 road when it was last surveyed in June 2017. Populations may spread or become much denser if the plants are not removed quickly, which may affect scoring for this section.

Monitoring:

Score: 2 = Moderate Effort

Little research has been done on the ability *V. sativa* seeds to persist in the soil. However, many legumes have at least some ability to form seed banks, and *V. sativa* seeds have been purposefully preserved in ideal laboratory conditions for at least 10 years (Pita et al. 2005). This indicates that the site would have to monitored for regeneration for an unknown amount of time, but likely at least 5 years. Additionally, this plant matures in less than 1 year (WAH 2017), so revisit intervals would need to be short, probably every 4 months until germination ceases, to make progress towards eradication.

FEASIBILTY OF CONTROL SCORE: 8

COMBINED SCORE: 6 + 8 = 14

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