 <b>KISC</b> 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>
<b><i>Melochia umbellata</i></b> (melochia)	NATURALIZED	EARLY DETECTION	HIGH RISK (9)	7	4	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 Nuololo herbarium voucher location.
- 2) Delimiting surveys surrounding known locations are required to gain knowledge of the extent of clonal populations.
- 3) An assessment of whether climbing gear is necessary or if delimiting surveys can be conducted safely at the Princeville site is required
- 4) Investigating potential partnerships may increase the likelihood of success – scoring may increase if a committed partner is found.

## Background

*Melochia umbellata* (Malvaceae), or “melochia”, is a medium-sized tree (growing to 15m tall) sometimes planted as a fast-growing shade tree for ornamental purposes or to shade young agricultural crops as they acquire hardiness (Starr et al. 2003). *M. umbellata* 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) or joint control with partnering agencies (ie. accept as “Partnership” species status). This will be informed by scoring and comparing *M. umbellata* 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 *M. umbellata* was collected in 1979 from Nualolo valley (G. Clarke ESP340, BISH), and it was deemed naturalized on Kauai in 2012 (OED 2010021901, BISH). Statewide, it is considered naturalized on Kauai, Oahu, Maui and Hawaii Island (Imada 2012). Forest planting records for Hawaii indicate that 9 trees were planted on the Lihue-Koloa Forest Reserve (Wahiawa section) in 1927 (Skolmen 1980), although surveys failed to detect the original planting location. On Kauai, there are broadly 2 main sites of *M. umbellata* infestation: one in Princeville and one in Kalaheo. Additionally, a third location, indicated by herbarium voucher data, apparently exists in Nualolo valley although this site has never been surveyed (Figure C31- 1). Combined, these data indicate that *M. umbellata* is distributed across Koloa, Hanalei and Waimea districts and occupies 5 watersheds (Lawai, Kalaheo, Hanalei, Anini, Nualolo). In terms of area, the population in Kalaheo appears to be the largest, with approximately 50 known trees distributed over a polygon that is at least 2.3km at its widest point. The infestation at Princeville is denser, with about 250-300 trees (including immature) distributed along 1.5 km of a steep ridge. The Princeville population is spreading from an old nursery site where 30-40 once-potted trees were found in 2016, with trees immediately next to the formerly cultivated area forming monotypic stands.

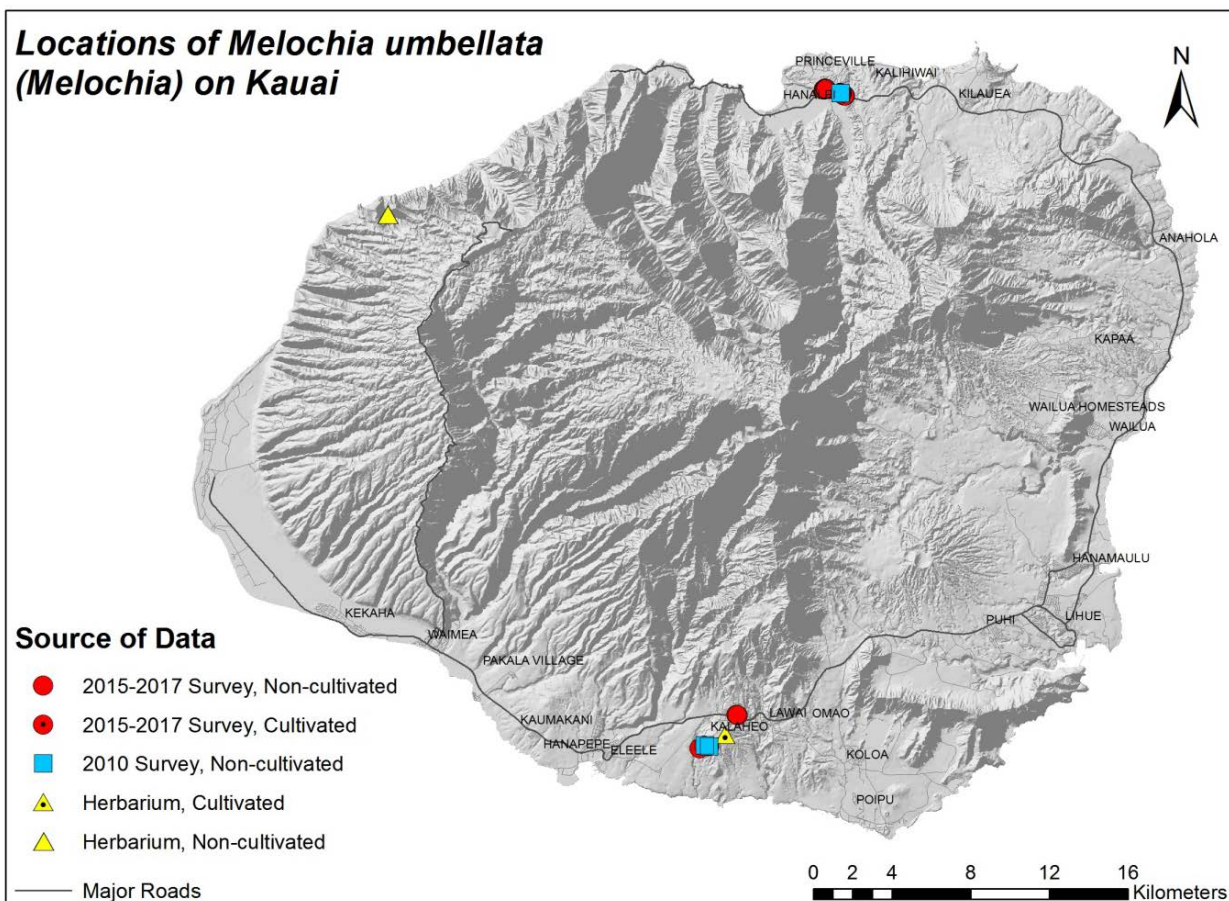


Figure C31- 1. Locations of *M. umbellata* on Kauai. Locations where presence of the plant was confirmed during 2015-2017 surveys are denoted by red circles.

### Hawaii Pacific Weed Risk Assessment (HPWRA) Score

*M. umbellata* is designated as “High Risk”, receiving a score of 9 (HPWRA 2019). 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"> <li>• Well suited to climates in Hawaii</li> <li>• Naturalizes in areas with comparable climates</li> <li>• Shade tolerant</li> <li>• Produces viable seed</li> <li>• Propagules dispersed intentionally and unintentionally by people</li> <li>• Propagules wind dispersed</li> <li>• Benefits from disturbance</li> </ul>	<ul style="list-style-type: none"> <li>• A weed of native ecosystems, agriculture and gardens/disturbed areas</li> <li>• A congeneric weed, sharing a genus with the known invasive <i>M. corchorifolia</i> (i.e. implies inheritance of tendencies to inflict invasive impacts)</li> <li>• Forms dense thickets</li> </ul>

Refer to the full Weed Risk Assessment for *M. umbellata*, 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: 2** = Moderate impacts

*M. umbellata* was assigned a score of 2 because observations of the population at Princeville and in Hilo, on Hawaii Island, indicate that formation of monotypic stands on Kauai is likely. Infestation of this species in moist areas appears rapid, with surveys conducted in Princeville in 2010 detecting 6-10 plants from the roadside, while 30-50 were visible in 2016. However, *M. umbellata* received a score of 2 instead of 3 because data collected from the Hawaiian Islands so far suggests that it is mainly an invader of moist lowland ecosystems. It may be less likely to invade stable native climax communities, especially those at higher elevations, although no data specifically states that it will be unable to. Additionally, many disturbances including invasive animals, human impacts and climate change impact Kauai's native habitats, so this score may change in the future based on field observations. Nonetheless, it is likely to out-compete both alien and native plant species in moist, lowland environments.

### 2. Impacts to Agriculture, Culture and other Human Systems

**Score: 3** = Major Impacts

*M. umbellata* received a score of 3 because this plant is known to rapidly colonize disturbed lowland areas. It spreads by wind-dispersed seeds and appears to reach maturity rapidly, at least within 3 years (HPWRA 2009). These traits allow it to colonize human-controlled systems including residential areas, gardens/landscapes, forestry plantations and any agricultural crops that have multi-year turnovers. Additionally, *M. umbellata* can grow up to 15m and trees may become problematic or hazardous and expensive to remove if growing under utility lines and next to buildings or highways. The density and proliferation of young, immature *M. umbellata* at the Princeville site suggests that this population may spread and become problematic more rapidly than at the Kalaheo site, despite these plants apparently being introduced more recently. This may be due to different rainfall patterns on Kauai, with the Princeville site receiving an average of 2000-2500 mm of rain per year compared with 1000-2000 mm of rain at the Kalaheo site (Giambelluca et al. 2013). On Hawaii island, this plant is common around Hilo and sometimes forms monotypic stands. Evidence from Hawaii island as well as field observations from Kauai indicates that *M. umbellata* could become a major component of lowland alien-dominated ecosystems in moist disturbed areas.

### 3. Impacts to biotic and abiotic processes

**Score: 2** = Moderate Impacts

*M. umbellata* was assigned a score of 2 because this plant forms monotypic stands (Figure C31- 4). Field surveys on Kauai have noted small, but nearly pure stands of *M. umbellata* near Princeville. Species that increase vegetation cover/density in this manner are likely to at least moderately affect soil nutrient and hydrological cycling, although no studies have endeavored to uncover the precise effects of this species on soil. Additionally, displacement of species in the mid and under story may influence soil stability.

**TOTAL INVASIVE IMPACTS SCORE: 7**



Figure C31- 2. *M. umbellata* (flowering) naturalizing along Puu Road in Kalaheo.



Figure C31- 3. *M. umbellata* comprising a large component of alien roadside vegetation near Hilo on Hawaii island (photo: Forest & Kim Starr)



Figure C31- 4. An almost pure stand of *M. umbellata* near its site of introduction in Princeville (with some *Hibiscus tiliaceus* in the foreground)

### Feasibility of Control Score

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

#### Delimiting Survey:

**Score: 1** = Significant Effort

Feasibility of a delimiting survey for *M. umbellata* was given a score of 1 because terrain may disable KISC from conducting an effective delimiting survey. The site at Princeville is located along a steep ridge, with slopes as great as 70 degrees in some areas. An assessment of whether climbing gear is necessary is required before committing to a full delimiting survey. Importantly, the location of a herbarium voucher collected from Nualolo valley in 1979 has not been surveyed and the original forestry planting site was not found. Surveys of Nualolo, a remote area, would most likely require at least boat access, if not helicopter access. Furthermore, the collector of the Nualolo vouchers notes that it was found growing near a stream, but does not give precise coordinates, which necessitates a thorough search of a larger area in order to claim it absent. However, new growth of *M. umbellata* is silver-ish, and may be taken advantage of during aerial surveys. Partnership with another conservation group to reduce cost and increase search effort may increase this score.



Figure C31- 5. Photo of *M. umbellata* invasion along a ridge in Hanalei National Wildlife Refuge with red arrows denoting trees that were confirmed with binoculars in the field. Most trees are located at the top of the ridge, close to a former nursery site.

#### Initial control:

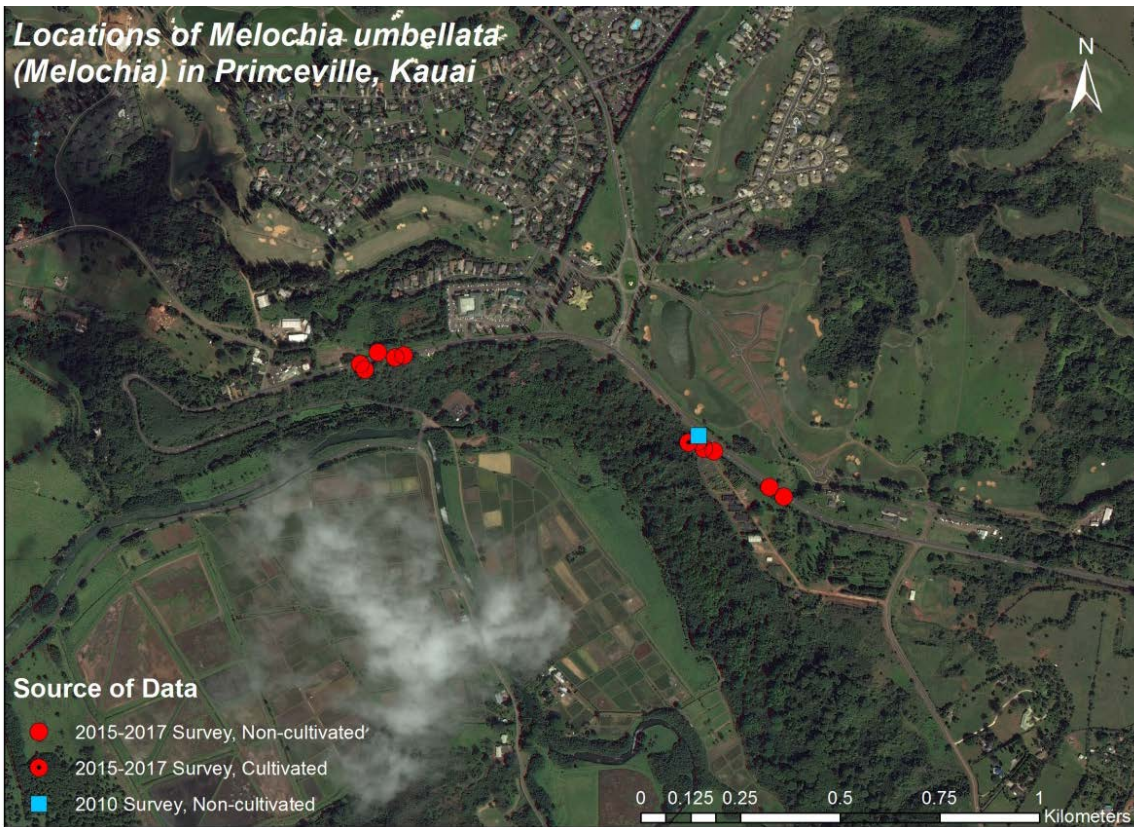
**Score: 2** = Moderate Effort

Feasibility of initial control for *M. umbellata* was given a score of 2 because control by herbicide is known to be very effective for this plant (Tunison and Zimmer 1992). However, a single tree along highway 50 in Kalaheo and at least 3 trees along Puu road may require a certified arborist to fell safely since they are located near roads and/or utility lines. As several of the plants are located within the Hanalei National Wildlife Refuge, herbicide restrictions may hinder control of plants in this location. This score may easily fall to 1 or 0 if many plants are found in Nualolo valley.

#### Monitoring:

**Score: 1** = Significant Effort

Feasibility of monitoring for *M. umbellata* was given a score of 1 because although no studies have specifically investigated the longevity of *M. umbellata* seeds, research on closely related species *M. concatenata* have revealed that at least some members of this genus form a persistent seed bank (Chauhan and Johnson 2008, Pandey and Pandey 2015, Martin et al. 2017). This indicates that a long-term monitoring schedule may be necessary to eradicate *M. umbellata* from Kauai, although field observations may better inform this timeline. Furthermore, trees are known to mature in less than 3 years and monitoring revisits must occur annually to prevent seedset. Although delimiting surveys are necessary to determine how much area would need to be monitored, current data suggests that a minimum of 35 acres would need to be monitored on an annual basis until several years after seedlings stop germinating. Partnership with another conservation group to reduce cost and increase search effort may increase this score.



**Figure C31- 6. Map of *M. umbellata* locations in Princeville. Locations where presence of the plant was confirmed during 2015-2017 surveys are denoted by red circles.**



**Figure C31- 7. Map of *M. umbellata* locations in Kalaheo. Locations where presence of the plant was confirmed during 2015-2017 surveys are denoted by red circles.**

**FEASIBILITY OF CONTROL SCORE: 4**

**COMBINED : 7 + 4 = 11**

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