



2017 HAWAI‘I FOREST BIRD SURVEY REPORT – EAST MAUI

In spring 2017, numerous agencies conducted the Hawai‘i Forest Bird Surveys in East Maui under the guidance of the State of Hawai‘i Department of Land and Natural Resources (DLNR). Maui Forest Bird Recovery Project (MFBRP) led the coordination of most of the surveys and staff acted as primary counters for the majority of the transects. A number of organizations supported the surveys by clearing and flagging transects and providing staff support as counters. These organizations included Auwahi Wind (AW), the Division of Forestry and Wildlife (DOFAW) – Forestry, DOFAW – Na Ala Hele (NAH), DOFAW – Native Ecosystem Protection and Management (NEPM), East Maui Watershed Partnership (EMWP), National Park Service (NPS), Natural Resource Data Solutions, Leeward Haleakalā Watershed Restoration Partnership (LHWRP), Maui Invasive Species Committee (MISC), The Nature Conservancy (TNC), US Geological Survey (USGS), and US Fish and Wildlife Service (USFWS). Additionally, several unaffiliated people volunteered their time as primary and secondary counters.

In total 27 transects were surveyed including 18 legacy transects and nine newly installed transects (Figure 1). Six of the 18 legacy transects had not been conducted in at least twenty years. The remaining legacy transects were all conducted most recently in 2011/2012 on the regular state five-year cycle. In a few cases, legacy transects were expanded to include stations that had not been surveyed for more than a decade. The newly created transects were mostly placed in areas that are the focus of forest recovery efforts. As a whole, the surveys conducted in 2017 were the most comprehensive forest bird surveys conducted in East Maui since 1980.

WINDWARD TRANSECTS:

The windward Haleakalā transects have historically been the most consistently surveyed transects on Maui. Between DLNR and the National Park Service, all or part of Transects (TR) 2-10 and 16-18 (Figure 1) have mostly been surveyed on a five-year cycle. The four transects in Haleakalā National Park (TR10 and TR16-18) were previously surveyed in 2012 as part of the NPS Pacific Island Landbird Monitoring Program (Judge et al. 2013). The remaining eight transects (TR2-9) are primarily on either state managed conservation lands or TNC Waikamoi Preserve. This group of transects was last surveyed in 2011 as part of the HFBS. It was great to have the opportunity to collaborate with the NPS Inventory and Monitoring Program to ensure that all the windward transects were done in the same year in 2017. All the windward transects, state and national park, have not been surveyed in the same year since 2001 (Camp et al. 2009).

The majority of windward transects outside of Haleakalā National Park (NP) were cleared and flagged prior to the surveys. Transects 5 and 6 were surveyed without prior clearing and reflagging. Similarly,



some of the National Park transects were cleared prior to counts and some were cleared on the same trip as the counts. With few exceptions, at least some flagging remained on all of the windward transects.

The windward transects were conducted using the same stations as were planned for the 2011/2012 surveys. The one exception was that TR18 was expanded from the 2012 extent, which stopped at the fence marking the approximate southern boundary of Haleakalā National Park. The expansion followed the original TR18 route down to 4000' in elevation into what is now Kipahulu Forest Reserve (FR). Even though this section was part of the original TR18, this lower section will be known as TR18B to avoid confusion with naming changes to other sections of the transect.

LEEWARD TRANSECTS:

Nine transects were originally established on the leeward slopes of Haleakalā for the 1980 surveys. These are on lands now managed by DOFAW (Kahikinui FR and Kula FR), NEPM (Nakula NAR), Department of Hawaiian Home Lands (DHHL), Haleakalā NP, and Ulupalakua Ranch.

The primarily non-native forests of Kula FR are home to four species of honeycreepers including the only known East Maui populations of Maui 'Alauahio and 'I'iwi outside of those found on the windward slopes. Three transects were originally established in Kula FR (TR29, TR30 and TR31). These were last surveyed as part of the HFBS in 1996. A series of additional temporary transects were established in 2013 by Peter Motyka, a graduate student at the University of Northern Arizona (Motyka 2016). Motyka surveyed the legacy transects and his newly established transects in 2013 and 2014. In 2017, we surveyed the three legacy transects and two of Motyka's transects (A and F, now dubbed TR43 and TR44) within Kula FR. These collectively provided more comprehensive coverage of Kula FR. This was particularly important given that Motyka's research indicated patchy distributions of many forest bird species within the reserve.

Three of the five legacy transects established in the Kahikinui region were surveyed in 1996, but none have been surveyed since. Only the upper elevation (above ~6000') stations of the leeward transects were surveyed in 1996. Today, a remnant stand of montane mesic forest exists from ~3500' to ~6500' in elevation and extends from DHHL in the west to the western edge of the Kaupo Gap (Nu'u) in the east. Forest quality (species diversity, canopy cover, and density of forest "patches") generally declines from west to east. As such, the majority of the existing forest bird habitat exists in DHHL, Nakula NAR, and Kahikinui FR, in the western section of the forest band. Transects 24 and 25, surveyed in 1980 and 1996 (upper TR25 only), are the only legacy transects in the Kahikinui region that still contain significant forest bird habitat. Legacy Transect 26 now falls outside any significant forest bird habitat. By shifting



TR26 ~1 km to the east, we re-established this transect in good habitat that will also soon be within ungulate-proof fencing. This newly established (or re-established) transect was dubbed TR26A. We also established a new transect (TR42) on DHHL to survey good forest bird habitat between legacy transect TR25 and TR26A.

Restoration efforts are also taking place in a number of places that would not be covered by the legacy transects. To capture the response of the bird community to these efforts we established several new transects throughout the region. MFBRP established three transects (TR39, TR40, and TR41) in 2015 as part of a separate effort to survey bird populations in Nakula NAR. We also established one transect on Nu'u Mauka Ranch and two transects on Ulupalakua Ranch in areas being restored by LHWRP and Auwahi Wind, respectively.

In 2017, we surveyed legacy transects TR24, TR25, TR29, TR30 and TR31 as well as nine newly established transects on the leeward slopes of Haleakalā. Nearly all of the leeward transects were flagged in 2017 prior to the count as little to no sign of the original flagging persisted on the legacy transects and the remainder were newly established. The three Nakula transects were the only leeward transects that did not require flagging prior to the count as these were last surveyed in 2016.

Newly created and resurrected legacy transects consisted of survey stations placed approximately 150 m apart. Legacy stations were intended to be placed 134 m apart. However, in reality many legacy stations were spaced too close from one another to maintain independence (e.g. < 70 m). This is likely because the original stations were established using hip-chain measurements. Using modern GPS and GIS technology we were able to maintain a more consistent distance between stations. This also allowed us to use a direct distance, i.e. "as the 'Alala flies", more relevant to auditory detections rather than an along-the-ground distance. Little physical evidence of the original legacy stations were found along the resurrected transects. To recreate these transects we established new stations along the same routes as the original transects. If a newly created point fell near the GPS location of the original station, it was given the same name as the original station. However, new stations that fell between two stations or elsewhere were given new names with a letter added, e.g. TR18B, ST13A. This will allow per-point comparison with historic data from stations with the same name and full transect comparisons including all sampled stations.

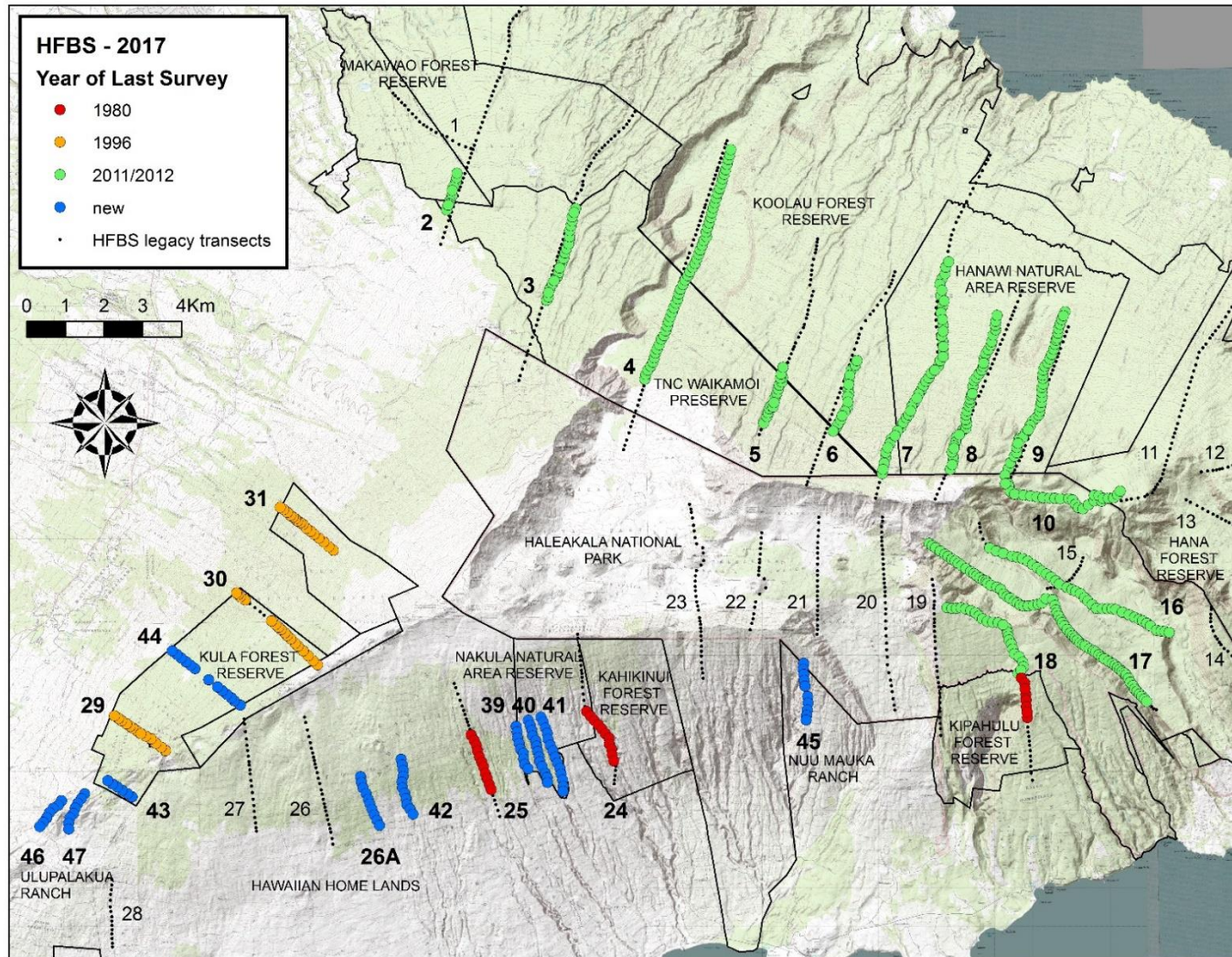


Figure 1. Hawai‘i Forest Bird Survey (HFBS) transects sampled in 2017. All colored transects were surveyed in 2017. The different colors indicate the previous year each transect was sampled. Blue transects were first sampled as part of the HFBS in 2017. Stations in black are legacy HFBS stations sampled in 1980, showing the location and extent of the original survey. Numbers indicate each transect’s designation, e.g. Transect 2.



PERSON EFFORT:

Conducting these surveys generally requires a fair amount of effort to first clear and flag transects and then conduct the surveys themselves. Many transects are in difficult to access areas, each with their own set of challenges like dense vegetation, loose footing, or feral animals. As such, these surveys would not have been possible without the support of the conservation community and landowners and managers. More than ten different agencies provided support in the form of information and/or personnel.

Each transect held its own inherent difficulties and required a varying amount of effort to complete. Most of the leeward transects required little clearing but still needed flagging and most stations were marked with PVC poles due to a lack of trees onto which flagging could be tied. These transects were short enough to be surveyed in a single morning. In contrast, the windward transects often required multiple days to complete, with separate trips of clearing or surveying. Nine transects were accessed by vehicle and on foot exclusively, while the remainder required the use of helicopters. In total, the **2017 HFBS required 159 person days** to complete, clearing and counting (Table 1).



Table 1. Person days required for clearing/flagging and surveying each HFBS transect in 2017. Agency abbreviations can be found in the text. * - DOFAW cleared the lower section (18B) only; the rest of Transect 18 was not cleared prior to the survey.

Transect	Agency Clearing	Person		Agency Counting	Person	
		Days	Days		Days	Days
2	MFBRP	1	3	TNC	1	2
3	MFBRP/MISC	2	10	MFBRP/NPS	2	4
4	MFBRP/EMWP/MISC	1	10	MFBRP/TNC	2	4
5	N/A	0	0	MFBRP/TNC	2	4
6	N/A	0	0	MFBRP	2	4
7	NEPM/MFBRP	2	7	MFBRP/USFWS	3	6
8	NEPM/NAH	1	5	MFBRP/USFWS	3	5
9	NEPM/NAH	1	3	MFBRP/USGS	3	6
10	N/A	0	0	NPS/MFBRP	4	6
16	N/A	0	0	NPS	6	6
17	N/A	0	0	NPS	8	8
18	DOFAW*	1	3	NPS/MFBRP	3	9
24	DOFAW	1	3	MFBRP	1	2
25	LHWRP	1	2	MFBRP/LHWRP	1	2
26A	LHWRP	1	3	MFBRP/LHWRP	1	2
29	MFBRP	2	6	MFBRP	1	2
30	MFBRP	1	1	MFBRP	1	2
31	MFBRP	1	2	MFBRP	1	2
39	N/A	0	0	MFBRP	1	1
40	N/A	0	0	MFBRP	1	1
41	N/A	0	0	MFBRP	1	1
42	LHWRP	1	2	MFBRP/LHWRP	1	2
43	MFBRP	1	1	MFBRP	1	2
44	MFBRP	1	2	MFBRP	1	2
45	LHWRP	1	1	MFBRP/LHWRP	1	2
46	AW	1	2	MFBRP/AW	1	2
47	AW	1	2	MFBRP/AW	1	2
Total		22	68		54	91



FUTURE SURVEYS

Many participants of the 2017 HFBS made a number of helpful suggestions for future surveys.

In general, the leeward transects were comparatively easy to conduct and have the potential to capture very interesting patterns in the bird community of this side of Haleakalā. We feel strongly that these transects should be included in future surveys.

In general, clearing the windward transects is very time consuming. In 2017, we focused on flagging and clearing the longest transects; some were not cleared in time for the survey. This was the case for TR5 and TR6, which were surveyed without prior clearing. Although these two transects are shorter, they were also not cleared in 2011. As such, by the next survey they will not have been adequately cleared for over ten years. Without prior clearing, observers also have less of a chance to make observations between points as they push and cut their way to each successive station.

Transect 5 could easily be extended down to the LZ. Currently TR5 ends at station 18 and then observers follow the legacy transect downhill to an LZ below 5000'. There is no reason why observers cannot count while on their way to the LZ unless there are time restrictions that the 2017 survey did not encounter. The 2017 surveyors noted 'I'iwi in the area of the LZ and this is possibly still in the range of the two endangered bird species.

Transect 18 (now TR18B) was re-extended into Kipahulu FR in 2017. This resurrected section goes through near-pristine native forest for several stations before entering a forest dominated by invasive plant and animal species. Future surveys should count stations 13A-16A and no further, especially if hiking back up to more pristine areas. This will reduce the threat of unintentionally moving invasive plant seeds uphill.

The Hanawi transects (TR7, TR8, and TR9) are among the most rugged; this is especially true of the top sections of the transects. The terrain has proven too difficult for many surveyors in the past and again in 2017, leading to minor injuries and early pullouts. It is highly suggested that only experienced personnel in peak condition be allowed on these transects so this pattern is not repeated. Transect 3 is comparatively easy for less field savvy surveyors and provides a good alternative.

To increase the survey period within the ranges of 'Ākohekohe and Kiwikiu it would not be difficult to repeat the first day of counts on all of the windward transects. This would likely increase a survey trip by one day. For example, surveyors on the Hanawi NAR transects are typically dropped at the top of their transects and survey 10-15 stations on the first morning. These stations account for the majority of the stations in the ranges of the two endangered bird species. If surveyors left their backpacking gear at the



top, they could take daypacks and survey downhill in the morning of the first day and then return to the top in the afternoon. Then, the following morning, surveyors could take all their gear and survey the top section again before camping lower down on the transect the following night. A similar plan could be followed for TR4, TR5, and TR6. Transect 3 is one of the most accessible transects and could easily be accessed on several successive days.

GENERAL BIRD OBSERVATIONS:

Given the extensive coverage achieved during the 2017 counts, a more complete picture of the bird community in East Maui will be seen after all the data have been analyzed. We were able to cover most areas containing extensive forest bird habitat, including several different forest types. As such, the 2017 count will provide information about variation in bird densities in many areas that have not been available for decades. Surveyors also recorded anecdotal notes that provide valuable additional information to what may come out of the analyses.

KIWIKIU (MAUI PARROTBILL) – *Pseudonestor xanthophrys*

The Kiwikiu is undoubtedly the most difficult species to detect using the variable circular plot design. We expected few observations of the species based on the detection history of this species from past surveys despite good coverage of the species' range. Eleven transects were conducted within the Kiwikiu range, TR3-TR10 and TR16-TR18. We recorded Kiwikiu 7 times on five out of the 11 transects surveyed, including transects TR3 (two), TR4, TR8, TR9 and TR10 (two). Foraging signs were evident along TR5 as well, although the species was not recorded on the counts. Missing the species on TR5 and TR6 was not unexpected as the species range is narrow in this area. The species is undoubtedly present along the upper portions of TR16 and TR17, but it was not recorded on the count. We did not detect Kiwikiu, on or off the count, along TR18 and we found no clear foraging signs. This was somewhat unexpected although previous research in Manawainui found comparatively low densities of Kiwikiu in the region. The weather during 2017 survey of TR18 was also not ideal, i.e. windy, reducing the opportunity for distant detections. The habitat in this area, however, remains in excellent condition. The NPS Inventory and Monitoring Program may attempt a second survey of upper TR18 due to the marginal weather conditions during the first attempt allowing for the possibility of more detections.

‘ĀKOHEKOHE – *Palmeria dolei*

Eleven transects were conducted within the ‘Ākohekohe range, TR3-TR10 and TR16-TR18. The distribution of this species may be the most limited of all of Maui's native forest birds. The primary elevation range for ‘Ākohekohe appears to be between 5000-7000' but the highest densities seem to be in



an even narrower range, 5500-6500'. This reduces the number of point count stations that fall within the 'Ākohekohe range. Fortunately, 'Ākohekohe are a fairly vocal species and are easily detected by trained observers when present. However, the low-pitched songs could easily be missed particularly in less than ideal weather conditions. The species was recorded on all transects within its range except TR4, TR5, and TR6. These transects are in the middle of the species' range. If the species is no longer present or is present at very low densities in these areas, the population in The Nature Conservancy's Waikamoi Preserve may be effectively isolated from the remaining population(s).

The variation in vocalizations for this species was apparent to surveyors. The most common whistles heard in the different parts of the species' range were extremely variable and future surveyors should keep this in mind. 'Ākohekohe in Waikamoi and Hanawi often give a single, clear upslurred whistle as a primary contact note. This whistle was heard only rarely along TR18 (Manawainui) and had a raspier quality, more similar to 'P'iwi. The Manawainui birds also used a three-note whistle and a downslurred whistle very similar to Kiwikiu calls. These calls were the most frequently heard vocalization from 'Ākohekohe in the area and are unlike anything typically heard from the species elsewhere. This is a potential source of identification confusion.

MAUI 'ALAUAHIO – *Parareomyza montana*

The 2017 HFBS surveys were the first to incorporate the entire Maui 'Alauahio range since the original counts in 1996. This includes the windward transects, Kula, and possibly Kahikinui. Nineteen transects within the currently recognized 'Alauahio range (not including Kahikinui) were surveyed in 2017. This will provide a much more comprehensive estimate of total abundance and variation in density as any time since 1996. Two newly created transects, TR46 and TR47, cover a section of Ulupalakua Ranch being restored by Auwahi Wind. We detected 'Alauahio on TR47, which is outside of the current range map for the species. This is an exciting find although not unexpected given contiguous habitat from occupied habitat in Kula FR. Nonetheless, this shows that the restoration being conducted in this area will have an immediate positive impact on this and other species.

It has long been a mystery as to whether any 'Alauahio remain in Kahikinui. In their report, Scott et al. (1983) refer to three populations of 'Alauahio, windward, Kula, and Kahikinui. However, no 'Alauahio were recorded in Kahikinui on the official counts in 1980 or after. The precise location(s) of the supposed Kahikinui sighting(s) seems to have been lost and may have been anecdotal in 1980. The range map for the species presented by Scott et al. suggest that the species may have been present somewhere along TR26 or TR27 (Figure 2). Sadly, very little forest now exists between TR26A and Kula FR, the area covered by TR26 and TR27. If the species still exists in Kahikinui, it is likely to be in the area between

TR26A to Nakula NAR. However, the species was not recorded during the 2017 survey anywhere in Kahikinui. Only a few unconfirmed sightings of the species have been reported and observers could not eliminate Hawai'i 'Amakihi, an abundant species in the area, as a possibility. The forest at the far western edge of the Kahikinui forest band (TR26A and TR42) have some of the best forest and remains the best possibility of the persistence of 'Alauahio in the region.

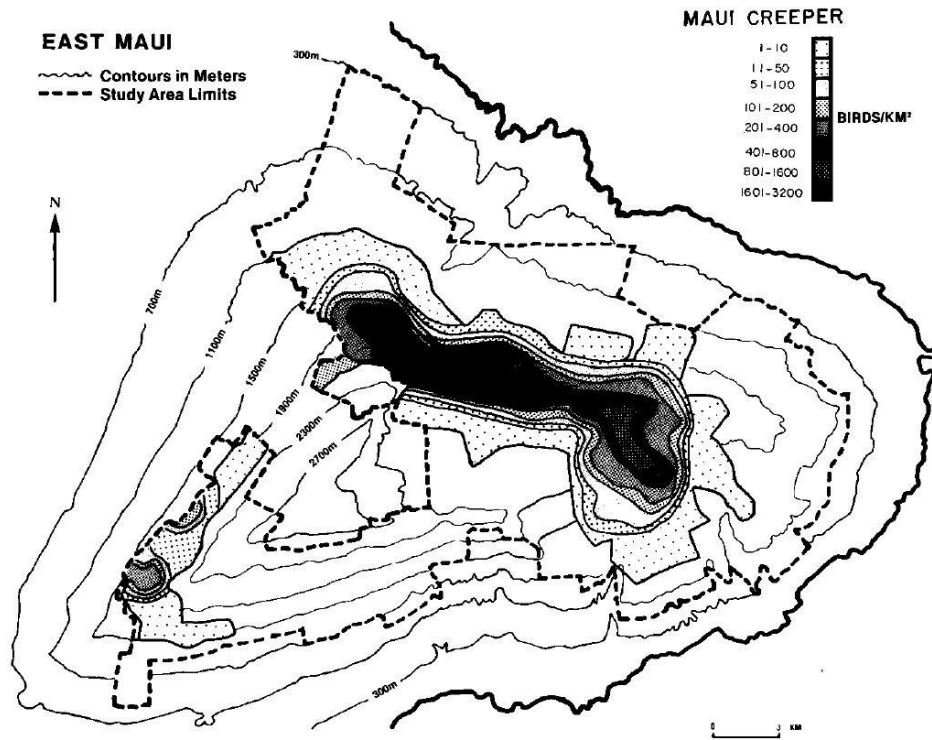


Figure 2. Figure 125 from Scott et al. 1982 showing range of Maui 'Alauahio (Creeper) in 1980. The map shows the species ranging into the Kahikinui region in the area of legacy transects TR26 and TR27.

'I'IWI – Drepanis coccinea

The recent listing of 'I'iwi as a threatened species on the US Endangered Species List has brought much deserved attention to the plight of this species as a whole. Fortunately, the population(s) on windward East Maui is among the most robust and the species appears to be stable or increasing in many of the areas covered by the 2017 surveys. As with 'Alauahio, the 2017 surveys provided the best coverage of the species' range in East Maui since 1980. Also, like 'Alauahio, these surveys provided the opportunity to search for the species in areas that they have not been recorded in quite some time. Despite the close proximity to known populations and the species' ability to disperse long distances, 'I'iwi have not been recorded from Kahikinui. During the 2017 counts we did not record 'I'iwi outside of the areas where the



species has been known to exist. Although the surveys in Kahikinui covered a lot of habitat, the potential still exists for the species to be present in low numbers given the short survey period.

Two hypotheses may explain the absence of 'I'iwi and 'Alauahio from Kahikinui that are not mutually exclusive. 1) The remaining habitat is not yet suitable for these species. This seems unlikely, especially for 'I'iwi given that the species occupies some marginal habitat, including non-native forests. If this hypothesis is correct, we should see the species recolonize the area in the future in response to restoration efforts and natural regeneration 2) Disease may not allow the species to persist. MFBRP is currently conducting disease sampling in Nakula NAR. A full report will be available in the near future. Preliminary results suggest some endemic avian malaria above 5000'. This elevation is considered relatively safe for native forest birds on the windward slopes, as few mosquitoes are present at this elevation. Both 'I'iwi and 'Alauahio persist below 4000' on the windward slopes, albeit in reduced densities. However, birds down below 4000' undoubtedly encounter infected mosquitoes. As such, if disease is limiting in forests above 5000' on the leeward slopes, infection rates must be higher than those seen below 4000' in the windward habitat. At this point, this seems unlikely.

HAWAI'I 'AMAKIHI – *Chlorodrepanis virens wilsoni*

This species continues to be among the most widely distributed native forest bird on East Maui. Hawai'i 'Amakihi and 'Apapane were recorded on all transects surveyed in 2017. Although not captured in the surveys (that stop around 3000' at the lowest), 'Amakihi are now present at some sites below 1,000' on East Maui. Following the previously reported trend, surveyors observed a trend of increasing density of 'Amakihi at lower elevations.

'APAPANE – *Himatione sanguinea*

As the most abundant Hawaiian honeycreeper, 'Apapane were common throughout the survey area. The species became noticeably less common or absent below 4000' in some areas. However, 'Apapane were recorded all the way to the bottom of several windward transects. This includes TR4 that extends below 2000'. Along the leeward transects, 'Apapane often were not detected at the lowest points around 4000'. This may also be related to habitat as most 'ohi'a are present above 4500' in this habitat. Despite this however, 'Apapane seemed to be very abundant along the leeward transects, often seemingly more so than in the windward forests. It will be interesting to see if densities are indeed higher in the leeward forests than the windward.

NON-NATIVE SPECIES



Trends and abundance in non-native bird species have not been looked at closely. Despite this, surveyors for this and previous HFB surveys have noted several apparent trends in both range and abundance of several non-native species. The Japanese Bush-Warbler (*Horornis diphone*) is among the most commonly recorded species throughout East Maui. Quite a few researchers have remarked at the striking increase in the abundance of this species in East Maui over the past few decades. One example of this comes from Hanawi NAR where the species was so uncommon in the late 1990s that when MFBRP captured one in a mist net, researchers did not immediately recognize it. During the 2017 surveys, the species was recorded on most stations along all three transects in Hanawi. On stations at lower elevations, Bush-Warblers were among the most common species recorded. A similar pattern may be occurring with Hwamei (Melodious Laughing-Thrush, *Garrulax canoris*). At higher elevations, Hwamei remain uncommon but may be increasingly common at the lower elevations. However, MFBRP has observed and banded Hwamei in high elevation (5000-6000'), native forest in several areas in both leeward and windward forests.

Analysis of trends in non-native bird species would provide valuable insight into important ecological components of native forests. Whether we like it or not these non-native bird species are likely permanent members of the bird community in Hawai'i. Understanding the interactions these species have with the habitat and native bird species are potentially vital to conservation. These interactions are often looked at from the perspective of non-native bird species having a negative effect on native species, which is often the case. However, non-native bird species have many positive interactions in these habitats as well, e.g. seed dispersal. Non-native seed dispersers (e.g. Red-billed Leiothrix- *Leiothrix lutea*) may be extremely important to the restoration of the leeward forests. In addition, the overall bird community is, in part, reflective of the habitat and the bird community may change if the habitat changes. For example, we may see changes in the bird community in Kahikinui as forest habitat increases; decreasing numbers of open country bird species.

APPENDICES –TRANSECT NOTES

Attached are notes and maps specific to each transect.

LITERATURE CITED

Camp, R.J., P.M. Gorresen, T.K. Pratt, and B.L. Woodworth. 2009. Population trends of native Hawaiian forest birds, 1976-2008: the data and statistical analyses. Hawai'i Cooperative Studies Unit Technical Report HCSU-012. University of Hawai'i at Hilo.



Judge, S.W., R.J. Camp, and P.J. Hart. 2013. Pacific Island landbird monitoring annual report, Haleakalā National Park, 2012. Natural Resource Technical Report NPS/PACN/NRTR—2013/740. National Park Service, Fort Collins, Colorado.

Motyka, P.J. 2016. Non-native trees provide habitat for native Hawaiian forest birds. Thesis. Northern Arizona University.