

# FINDING OF NO SIGNIFICANT IMPACT

## Use of *Wolbachia*-based Incompatible Insect Technique for the Suppression of Non-native Southern House Mosquito Populations on Kauaʻi

### Summary

In compliance with the National Environmental Policy Act of 1969, as amended (NEPA), and its implementing regulations (40 CFR 1500-1508) as revised by the Council on Environmental Quality in 2022, as well as Department of the Interior NEPA Regulations (43 CFR 46), the U.S. Fish and Wildlife Service (USFWS) and State of Hawaiʻi Department of Land and Natural Resources (DLNR), as a joint lead agency, prepared an Environmental Assessment (EA) to examine alternative actions and potential impacts to the human environment associated with the use of the *Wolbachia*-based incompatible insect technique. The purpose of this project is to substantially suppress or eliminate nonnative southern house mosquitoes (*Culex quinquefasciatus*) and, thus avian malaria, in threatened and endangered forest bird populations in the Kōkeʻe and Alakaʻi Wilderness areas on Kauaʻi, thereby reducing extinction risks and contributing to the recovery of these species. To prevent the extinction of threatened and endangered forest birds on Kauaʻi, timely management action needs to be taken to control avian malaria. The statements and conclusions reached in this Finding of No Significant Impact (FONSI) are based on documentation and analysis provided in the EA. Relevant sections of the EA are summarized and incorporated by reference below. Although the EA was a cooperative federal and state compliance document satisfying both NEPA and the Hawaiʻi Environmental Policy Act (HEPA) regulations, this FONSI analyzes only the impacts under current NEPA standards.

### Preferred Alternative

The USFWS and DLNR analyzed two alternatives in detail in the EA. Based on this analysis, the USFWS selected the Proposed Action as the alternative for implementation because it best meets the purpose of, and need for, the goals and objectives of the project, without causing significant impacts on the human environment. The preferred alternative is described in detail in Chapter 3 of the EA. This finding is based on consideration of CEQ criteria for significance (40 CFR 1501.3 (b)), regarding the potentially affected environment and degrees of effects of the impacts described in the EA. Additionally, a reasonable range of alternatives were considered but dismissed from detailed analysis because they did not meet the purpose and need of the proposed action (see Section 3.3 of the EA).

Under the preferred alternative, the USFWS and DLNR along with other non-governmental partner organizations will attempt to reduce threatened and endangered forest bird mortality from avian malaria by suppressing mosquito populations on Kauaʻi. This consists of repeatedly releasing incompatible male mosquitoes to reduce the reproductive potential of mosquitoes in the project area. This approach employs an Incompatible Insect Technique (IIT), which uses a naturally occurring bacteria termed *Wolbachia* that is present in the eggs and sperm of many insect species, including the southern house mosquito. When male mosquitoes with an incompatible strain of *Wolbachia* are introduced to a population of female mosquitoes, mating is unproductive, thereby substantially suppressing mosquito populations. Releases under the preferred alternative

will be conducted repeatedly over time to achieve and maintain significant suppression of the mosquito population. Monitoring mosquito populations will guide the frequency, number, and location of the proposed releases, and will need to continue for as long as the preferred alternative is implemented. The preferred alternative will begin with small-scale on-the-ground or aerial releases of incompatible male mosquitoes within the project area, where field teams will be able to monitor effectiveness of IIT implementation. The majority of the project area is inaccessible by ground, and thus will require aerial applications (i.e., helicopters and UAS/drones) to implement large-scale mosquito releases throughout the project area. Releases will be expected to continue until nonnative mosquito populations are significantly reduced and the status of threatened and endangered forest birds stabilizes, or until new mosquito population suppression techniques are developed. Release efforts may be concentrated within smaller management areas if there are limitations in the availability of aerial resources, personnel, or incompatible mosquitoes, and then scaled up throughout the project area once additional resources are available. In addition, the uppermost elevations in the project area may have even fewer mosquitoes than estimated by Samuel et al. (2011) and population suppression in these areas may only require infrequent releases of incompatible mosquitoes. Alternatively, suppression at lower elevations may be sufficient to reduce or eliminate the threat of disease at the higher elevations by eliminating the individuals that could disperse uphill.

### **Rationale**

This Proposed Action alternative is the Service's preferred alternative because it best meets the purpose and need and provides the most effective and feasible solution to suppress nonnative mosquito populations to reduce transmission of avian malaria to threatened and endangered forest birds on Kaua'i. The threat that introduced species pose to habitat and native wildlife makes addressing their impacts one of the USFWS's top management priorities. Numerous other potential alternatives were considered but dismissed from further analysis as described in Section 3.3 "Alternatives Considered but Dismissed" of the EA.

### **Avoidance and Minimization Measures**

The USFWS places strong emphasis on avoiding and minimizing potentially adverse environmental impacts. Therefore, the USFWS and DLNR will implement avoidance and minimization measures and best management practices to protect Federal and State listed plants and animals, non-listed flora and fauna, cultural/historic/ethnographic resources, public health and safety, and recreation. These measures and practices are described in detail in Tables 4 and 5 and Appendix D of the EA and are hereby incorporated by reference. As stated in the EA, these avoidance and minimization measures are included as integral parts of the preferred alternative.

### **Other Alternatives Considered and Analyzed**

#### **No Action Alternative**

The EA considered the preferred alternative described above and a no action alternative. Under the no action alternative, releases of incompatible male mosquitoes would not occur. Although ongoing conservation and other management activities would continue in the project area (e.g., fencing, construction of field camps, removal of nonnative ungulates and predators, and invasive

plant control), native forest birds would continue to be adversely affected by their primary threat, avian malaria, because the mosquitoes that carry this disease would remain uncontrolled and are anticipated to continue to spread into the remaining forest bird habitat. Under the no-action alternative, the ‘akikiki is predicted to go extinct by 2025 and the ‘akeke‘e by 2034 (Paxton et al. 2022). The ‘akikiki and ‘akeke‘e have experienced 11% and 15% yearly declines, respectively, since the 1980s and currently have very limited ranges, and therefore could be extinct sooner than projected (Paxton et al. 2020; Paxton et al. 2022).

## **Significance Criteria Review**

### **Potentially Affected Environment**

The project area is comprised of 59,204 acres (23,959 hectares) of Kaua‘i (Figure 1 in the EA). This area encompasses the Kōke‘e State Park, Hono o Nā Pali Natural Area Reserve, Ku‘ia Natural Area Reserve, Nā Pali Coast State Wilderness Park, Nā Pali-Kona Forest Reserve, the Alaka‘i Wilderness Preserve, and private lands (see Table 1, Figure 2 in the EA). The Kōke‘e State Park, Nā Pali-Kona Forest Reserve, and the Alaka‘i Wilderness Preserve overlap with extant native forest bird habitat, including critical habitat for ‘akeke‘e and ‘akikiki on the island of Kaua‘i (Paxton et al. 2016). Designating the project area was developed collaboratively between USFWS, KFBRP and the DLNR. The project area includes a buffer zone to account for mosquito dispersal and incorporates lower elevation areas outside the current range of forest birds to target mosquitoes that may emigrate from these lower elevation areas into this forest bird habitat.

### **Degree of Effects of the Action**

The USFWS considered the following actual or potential project effects in evaluating the degree of effects (40 CFR 1501.3(b)) for the preferred alternative. No significant impacts to resources were identified that would require further analysis in an Environmental Impact Statement (EIS). Whether taken individually, or as a whole, the impacts of the preferred alternative, including direct, indirect and cumulative effects, do not reach the level of a significant effect because most adverse impacts associated with implementation will be minimal or temporary, lasting only as long as actions are being executed. The preferred alternative will result in substantial long-term beneficial impacts to threatened and endangered bird species. Best management practices measures, as mentioned above (and described in detail in Tables 4 and 5 and Appendix D of the EA), will further avoid and minimize any potential adverse impacts. It is expected that the frequency of actions and any associated adverse impacts will decline as nonnative mosquito population suppression is achieved over time.

Although there could be intermittent disturbance to some listed species from drone and helicopter use, the preferred alternative will result in long-term beneficial impacts to threatened and endangered bird species. The project will substantially suppress or eliminate nonnative southern house mosquitoes (*Culex quinquefasciatus*) and, thus avian malaria, in threatened and endangered forest bird populations on Kaua‘i, thereby reducing extinction risks and contributing to the recovery of these species. The preferred alternative, therefore, will primarily benefit federally listed species and will not result in significant adverse effects.

### ***Threatened and Endangered Species***

The impacts from the preferred alternative and the foreseeable actions can be effectively reduced to negligible levels using the avoidance and minimization measures outlined in Tables 4 and 5, and in Appendix D of the EA. Although there would be temporary and localized impacts to wildlife and plants from mosquito release activities, the population and health of rare and listed species and their habitats would improve or remain stable. As previously described, the preferred alternative would directly reduce mortality of listed Hawaiian forest bird species due to the suppression of mosquitoes that spread avian malaria. The preferred alternative along with other planned foreseeable state and private management actions, including invasive plant control, feral ungulate control, and predator control would enhance survival of native forest bird species by reducing stressors. Over time, the populations of these listed bird species may increase due to the combined actions of the agencies and private partners to manage for avian malaria and other threats. Therefore, the overall cumulative increment of the proposed action would be substantially beneficial.

### ***Wildlife Resources***

As described in Section 4.1.4 of the EA, the preferred alternative would not contribute additional significant impacts to the wildlife species beyond that of the ongoing and future known activities. Trends and impacts from planned foreseeable actions would be expected to remain the same, or similar to, what is currently occurring.

The *Wolbachia* bacteria used to generate incompatible male mosquitoes occurs in Hawai'i in the Asian tiger mosquito (*Aedes albopictus*), introduced to Hawai'i in 1896. Additionally, the southern house mosquitoes released through the proposed action would be obtained from Hawaii and bred in captivity. IIT technique does not modify any or part of the genome of either mosquitoes or the *Wolbachia* bacteria. Therefore, no new organisms would be introduced to Hawai'i by the proposed action.

The DLNR, USFWS and partners participating in this project will comply with all State and Federal requirements relating to biosecurity for mosquito rearing and the movement of invasive species. Invasive species biosecurity protocols are provided in Appendix D of the EA help the project avoid or minimize the inadvertent transportation or spread of other invasive species that could potentially impact plants, fish, wildlife, and their habitat within the project area.

Although the project would cause minor, periodic, and short-term adverse impacts (e.g. increased air and foot traffic), success of the project would reduce the prevalence of nonnative *Culex* mosquitoes in the Kaua'i wilderness environment. Suppression of nonnative mosquito populations in turn, indirectly impacts the transmission rate of avian malaria infection among native birds. The indirect impact would result in long-term beneficial indirect impacts to general wildlife or wildlife habitat. Successful implementation of the proposed action would result in cumulative impacts that will not significantly affect and are beneficial to wildlife resources that occur within the proposed project area.

### ***Vegetation Resources***

As outlined in Section 4.1.4 of the EA, the preferred alternative would result in limited cumulative impacts to native vegetation that would be short lived and intermittent in nature. There is potential under the proposed action, existing actions, and foreseeable future actions for minimal adverse

impacts to vegetation from localized plant removal or disturbance along trails, fencelines, and at landing zones and camps by ground crews. These impacts would be temporary in nature and largely occur in previously disturbed locations. To help minimize any vegetation or ground disturbance, monitoring efforts and the dispersal of incompatible male mosquitoes via ground based pedestrian releases would be conducted on existing resource management trails and fence lines to avoid disturbance of soils and plant communities. Additionally, best management practices (Appendix D of the EA) would be implemented to reduce or remove the threat of introducing invasive plants within the project area; however, a risk of introduction still exists. Crews would be trained to follow best management practices (BMPs) to minimize this risk (see Table 4 and Appendix D of the EA), thus, effectively reducing anticipated effects to negligible. Other management actions that are ongoing or that may occur in the project area are identified in Appendix E.

### ***Cultural Resources***

The potential physical impacts that the proposed action would have on the landscape, both archaeological and cultural, would be minimal and no greater than the current level of use by the public, the DLNR, and its management partners in maintaining the State Parks, Forest Reserves, and Natural Area Reserves located within the project area.

Given that not all of the project area has been archaeologically surveyed, it is possible that previously unrecorded sites could be present in the vicinity of the access routes where project activities would take place. To avoid and minimize effects, project personnel would stay on designated roads and trails. Project related activities would be limited to existing routes of travel (fence line corridors, trails, and roads), established helicopter landing zones, and field camps already utilized for other resources management activities. No new roads, trails, landing zones, or camps would be created to support this project (see the cultural resources section of Table 4 in the EA).

Incompatible male mosquito releases, monitoring, and other project related activities would be limited to existing routes of travel (e.g., fence line corridors, trails, and roads), established helicopter landing zones, and field camps already utilized for other management activities. No new roads, trails, landing zones, or camps would be created to support this project. Most of the known archaeological sites and culturally significant places within the project area are located far from the trails and areas where the project activities would take place. No archaeological or cultural sites have been recorded near planned project access routes, landing zones, or field camps. As has previously been mentioned, archaeological surface structures are relatively rare in the forested uplands where most incompatible male mosquito releases would occur. For these reasons, it is expected that the project would have no adverse impact on archaeological sites or culturally significant places.

The findings of the cultural impact analysis (CIA) (see Appendix B of the EA) indicate that the proposed action is unlikely to adversely impact cultural resources, practices, and beliefs. While cultural practitioners may make use of roads or trails within the project area to gather forest plants, hunt, or to carry out other cultural practices, incompatible male mosquito releases and monitoring activities are unlikely to interfere with their access.

One of the primary impacts of the proposed action on cultural resources is the anticipated positive outcome that reduced mosquito populations would have toward protecting and preserving native forest bird populations. Their existence and presence within the forest environment are important for maintaining cultural continuity between traditional and contemporary cultural customs, practices, and beliefs and therefore, overwhelmingly benefit cultural resources within the proposed project area.

### ***Public Health and Safety***

The preferred alternative considers public health and safety during project implementation; there is no evidence that release of incompatible male mosquitoes on Kaua‘i would have human health impacts.

Only incompatible male mosquitoes will be released and only female mosquitoes bite animals or humans. Employing this and other available sorting methods, Crawford et al. (2020) estimated that the risk of releasing a female is 1 out of 900 million released *Aedes aegypti* mosquitoes. The proposed action would use *Culex quinquefasciatus*, a different species of mosquito, and while the methodology is very precise the estimated number of females released is expected to differ. There is no data suggesting that the rare and inadvertent release of mosquitos through IIT programs can result in wild populations of mosquitos.

Even if a female is released, a bite from a released female will pose no more risk to humans or wildlife than the nonnative wild female mosquitoes currently in the environment. *Wolbachia* cannot live within vertebrate cells and cannot be transferred to humans or other vertebrates even through the bite of an infected mosquito (Popovici et al. 2010).

Diseases transmitted to humans by the southern house mosquito includes West Nile virus. Health and wildlife agencies in Hawai‘i are actively working to prevent the introduction and spread of West Nile virus to the state (DOH 2022). An ancillary benefit of the IIT is that it will employ a promising southern house mosquito control method in Hawai‘i and help to establish infrastructure to support southern house mosquito suppression in the event of an outbreak of West Nile or other mosquito disease-borne illness.

### ***Recreation and Wilderness***

The preferred alternative would have both beneficial and adverse effects on wilderness and recreation. Although many release packages containing incompatible male mosquitos would be dropped across the project area throughout the duration of the project, the small packages would be spread diffusely, and the biodegradable material would decompose quickly given the typical rainfall patterns in the project area, making the chance of observing multiple packets unlikely. Based on the degradable nature of the delivery packages and diffuse nature of release locations, the impacts on recreationalists and the wilderness would be negligible.

The release of the incompatible male mosquitoes would not be expected to cause additional bites or nuisance to recreationalists and users of the wilderness resources. Unlike female mosquitoes that consume blood, male mosquitoes consume nectar and thus, would not be attracted to humans or pets. Localized concentrations of incompatible male mosquitoes could be expected to occur in

the immediate vicinity (1 to 2 feet) of the release package as the mosquitoes emerge, but the mosquitoes would be expected to disperse within minutes.

The preferred alternative would adversely affect the visitor experience for land-based recreationists (e.g., campers, hikers, hunters) through increased human activity and noise (e.g., from project staff, vehicles, drones, and aircraft). No changes in public use or access to state-managed recreational areas are anticipated to be required for project operations. Existing recreational uses in the project area would continue to occur in the future, and there are no reasonably foreseeable changes to the types of use or levels of use that are allowed to occur within the project area (see Appendix E of the EA). Ongoing and reasonably foreseeable conservation activities (i.e., ecological research, monitoring, and management) would continue to have both beneficial and adverse effects for recreational users. Adverse effects would result from localized increases in noise and human activity when those activities are implemented in proximity to public spaces. Because of the low use, the impacts to the public are expected to be minor.

The preferred alternative could cause intermittent, but temporary increases in overall number of aircraft operating in the project area. Commercial air tour agencies, however, are not authorized to fly their aircraft at the low altitudes necessary for release of incompatible male mosquitoes in the project area. Rather, tour operators would fly well above the height or altitude necessary for project operations. Therefore, there would be no adverse effects to commercial helicopter air tour flight routes expected to occur.

In summary, mosquito release activities under the preferred alternative will contribute periodic adverse impacts on recreationalist near landing zones (LZs), helibases, flight paths, and trails from the use of drones, mechanized equipment, and helicopters largely in the form of noise and visual intrusion. Adverse impacts from the pedestrian release method will be confined to a small portion of the overall project area. Impacts to visitor experience will not be significant because the majority of the project area is inaccessible to the public and therefore there will be only intermittent impacts during mosquito release and monitoring activities, mostly concentrated near LZs, helibases, and flight paths. These impacts will only occur during daylight hours on weekdays, as operations will not occur at night or on weekends. A permanent beneficial impact on recreationalist is anticipated under the preferred alternative, if the mosquito control effort is successful and native forest bird populations stabilize or recover. For those who are visiting portions of the analysis area to enjoy a unique native rainforest ecosystem or birdwatching, the beneficial impact could be considered substantial. Additionally, the proposed action is not expected to have adverse effects on ongoing or future hunting or resource collection activities within the project area.

Overall adverse impacts to visitor use and experience will be brief and minimal and should be outweighed by the overall benefits to wildlife and ecosystems enjoyed by visitors to the project area.

### ***Air Quality, Greenhouse Gas Emissions and Climate Change***

As discussed in chapter 4 of the EA, incompatible male mosquito transport to Kaua‘i from the incompatible male mosquito production facility would utilize existing commercial air transport services and would not be expected to increase or otherwise contribute to greenhouse gas emissions. Release methods part of the preferred alternative that produce greenhouse gas emissions include motor vehicle transport of personnel for release and monitoring activities, helicopter

transport of personnel for pedestrian release to remote sites, and helicopter or fixed wing release of incompatible male mosquitoes.

Greenhouse gas emissions associated with each of these modes of transport would be intermittent and temporary in nature in the project area. Releases by fixed wing aircraft, if deployed as an application method has the potential to be the most efficient release option for the project area, resulting in diminished fossil fuel consumption and a sizable, reduced amount of time needed for applications. The proposed action would initially rely on pedestrian and helicopter or fixed-wing aircraft release, but over time would be expected to pivot to the use of drones as the primary incompatible male mosquito release method based on deployment/monitoring data. Drones, which are battery powered, do not directly burn fossil fuel and do not generate fuel emissions. Helicopters, however, would still be needed to transport monitoring and support staff to some remote locations that are inaccessible by vehicle, and for occasional incompatible male mosquito release.

Though climate change and associated adverse impacts have and will continue to affect specific resources on Kaua'i and within the project area, greenhouse gases from helicopter, fixed wing aircraft and motor vehicle emissions associated with the proposed action are not expected to have a significant effect on global climate change or local climatic conditions. Although, for example, the release of incompatible male mosquitoes would result in some fossil fuel consumption, the associated greenhouse gas emissions would be minor because of the comparatively limited number of flights anticipated, compared to ongoing daily commercial (air tours) flights on Kauai.

### ***Environmental Justice***

According to the EPA's Environmental Justice Screening and Mapping Tool, environmental justice communities exist in the study area. However, *Wolbachia* cannot live within vertebrate cells and cannot be transferred to humans or other vertebrates even through the bite of an infected mosquito (Popovici et al. 2010). The mosquitoes that would be released provide no threat to the public as they would be male mosquitoes, which do not bite and do not transmit disease to humans. Inadvertent release of females is expected to be exceedingly rare and would not result in the establishment of new wild mosquito populations.

Aerial operations associated with ongoing management already occur on state and private lands on Kauai. Areas that have high recreational use and are accessible by vehicles would use pedestrian release methods to deploy mosquitoes, which would reduce the potential for noise and visual disturbance from aircraft. Increase in noise and visual impacts would primarily affect only those members of the public that are actively utilizing the project area or those residing near the project area that may hear or see the intermittent implementation of the proposed action. Helicopter use and drone use associated with the proposed release actions would occur during daytime hours and would not occur at night.

The intent and expected outcome of this project is to avoid the extinction of Hawaiian forest birds, which are identified as an important ecological and cultural resource by the Native Hawaiian community. Native Hawaiians identify forest birds as ohana (family), kupuna (ancestors), and 'aumākuā (familial gods), and their unique habitats are revered as sacred places for the cultural



ecological services they provide. The preservation of these species has been identified as a priority by Native Hawaiian community leaders (Paxton et al. 2022).

### **Public Involvement**

The public was provided an opportunity to comment on the planning process. The USFWS and DLNR held a 30-day public scoping period from June 23 to July 24, 2023, which initiated the joint NEPA and HEPA planning process. An in-person public informational meeting was held on July 11, 2023, at the Kaua‘i Philippine Cultural Center in Līhu‘e. In total, 56 people attended the in-person public informational meeting. The comments received were reviewed by the USFWS and DLNR and considered in development of the EA. In total, the USFWS and DLNR received 887 independent pieces of correspondence during the 30-day scoping period, several with substantive comments. A summary of substantive public comments received and responses from the USFWS and DLNR is provided in Appendix I of this EA.

### **Conclusions**

Based on review and evaluation of the EA, the USFWS has determined that the Proposed Action alternative is not a major Federal action that would significantly affect the quality of the human environment, within the meaning of section 102(2)(c) of the National Environmental Policy Act of 1969, as amended. Accordingly, the Service is not required to prepare an EIS for this proposed action.

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Date

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