Best practice guidelines for orangutan wild-to-wild translocation

IUCN SSC Primate Specialist Group (Section on Great Apes)

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Executive summary

Conservation translocation is the human movement of organisms from one site to another for conservation purposes. Wild-to-wild translocation is a type of conservation translocation that involves the capture and movement of individual wild animals between natural habitats. The priority of conservation translocations is protecting wild populations of the species and the preservation of natural ecosystem functionality. The International Union for the Conservation of Nature (IUCN) general guidelines for conservation translocations (IUCN SSC, 2013) and for great ape translocations are based on the **precautionary principle** wherein "**protection of wild populations is always the priority**" (Beck et al., 2007). The precautionary principle stipulates that when there is a lack of evidence demonstrating that an action will not harm the individual orangutan or the species, it should be assumed that the action could cause harm, even if unlikely, and should therefore be avoided.

Precautionary principle for great ape translocations

"[Translocation] should not endanger resident wild great ape populations by threat of communicable disease, unintended hybridization, extreme social disruption, crowding, or exaggerated resource competition. [Translocation] should not endanger populations of other interacting native taxa, or the ecological integrity of the area in which they live. The conservation of the taxon as a whole, and of other great apes already living free, must take precedence over the welfare of individual apes in captivity."

Best Practice Guidelines for the Re-introduction of Great Apes (Beck et al., 2007, p. 5–6)

Critically Endangered orangutans are wild-to-wild translocated for many reasons, including to facilitate land conversion, prevent confirmed or potential crop foraging, move orangutans away from people who may harm them or out of habitats perceived as unsuitable, and to move orangutans affected by fires. Although fires, flooding, and land-use changes can pose an immediate threat to orangutan survival, orangutans encountered in plantations, agricultural landscapes, natural resource extraction areas, and human settlements are often translocated because people believe the animals would be safer if relocated to large forests. Orangutans are thus frequently wild-to-wild translocated without deeper consideration of potential harm to the individual, population, or species.

Determining whether wild-to-wild translocation is an appropriate action requires sound assessment of an individual orangutan's characteristics, the circumstances surrounding its detection, and in-depth analysis to identify suitable release habitats. This guidance document follows the precautionary principle in prioritising the in situ protection of wild orangutans and their forest habitats, whether large tracts or small fragments. This document helps users determine if wild-to-wild translocation is appropriate for their specific circumstances. Available tools to aid in the decision-making process are a decision tree diagram (Appendix I, pp. 47-49), a step-by-step written process (5.3 Guidelines for orangutan wild-to-wild translocation, pp. 31-41) and an interactive online decision tool (available at https://forms.gle/prxX3A5jFLJgu4pG8).

In some circumstances, wild-to-wild translocation can be a valuable tool to save the life of an orangutan facing immediate threats. However, translocation also creates considerable welfare risks for the translocated individual due to stress during capture, social pressures and potentially competition for or exclusion from food resources in unfamiliar habitat populated by unrelated orangutans. Translocation can potentially compromise the long-term viability of a resident orangutan population through social disruption, potential for disease transmission, or negative genetic effects. It can also perpetuate the unrealistic perception that it is not necessary for humans to coexist with orangutans because the animals can simply be moved away. For these reasons, orangutan wild-to-wild translocations should be undertaken only as a last resort, when the individuals' lives are in immediate danger and all other alternatives to protect them have been exhausted.

Wild-to-wild translocation is appropriate in the following situations:

- The orangutan appears to be suffering from a potentially life-threatening human-caused injury.
- People are determinedly trying to capture or kill the orangutan despite action to enforce conservation laws, and there is no possibility of ensuring the protection of the orangutan in place.
- The orangutan has no path to escape on its own from fires or flooding in its habitat.
- Interventions to halt habitat clearing have failed and the orangutan has no path to escape.
- Confirmed reports of unprovoked orangutan attacks on people.

Wild-to-wild translocation is not appropriate in the following situations:

- **Addressing threats to entire groups or populations of wild orangutans (individuals living in the same geographic area).** The priority should be to preserve the remaining habitat and protect wild orangutans in situ. Removing individuals, groups, or populations decreases population numbers and may extirpate orangutans from some areas of their geographic distribution and is thus contrary to the precautionary principle of doing no harm.
- **Enabling or offsetting clearing of orangutan habitats.** Translocating wild populations to enable clearing is contrary to the precautionary principle and diminishes available habitat and species recovery potential.
- **Moving wild orangutans who visit crops adjacent to or very near (a few kilometres or less) a forest.** Orangutans will regularly visit such crops because it is a natural behaviour for them to move back and forth between their forest habitat and the plantations or crop areas.
- **As a long-term solution for human-orangutan conflicts.** Translocations will not resolve human-orangutan conflicts. Orangutans will continue to find their way to appetising crops even after they, or other individuals from their metapopulation, have been translocated to other sites. Persistently removing all orangutans that visit crops or human-use areas will drain the local metapopulation of resident female clusters and ranging males, dramatically diminishing its genetic fitness and long-term viability.
- **Supplementation of viable populations.** Individuals should not be translocated into viable wild populations unless they are known to have originated from this population and are being returned to it following displacement.

Analysis of available data on wild orangutans captured for translocation shows the vast majority were relatively healthy, did not need rescue for medical care, and likely could have survived if protected from harm or killing by humans. Few data are available on the long-term survival of wild-to-wild translocated orangutans, because post-translocation monitoring rarely occurs. The only way to be certain that translocated orangutans survive is to track and detect them after their release, ideally for several years. Without evidence of long-term survival, it must be assumed that many translocated orangutans failed to thrive, or were killed, injured, or driven out of release areas due to social conflicts. Bodies of dead orangutans are rarely encountered, hence the lack of detected dead translocated orangutans is not evidence that these orangutans are alive.

Protecting orangutans in situ instead of translocating them requires understanding orangutan ecology and behaviour and appropriate management of human-orangutan interactions. Females have strong ties to the areas where they were born, and where they overlap with female relatives. They are generally intolerant of unrelated females. They can survive for decades and raise offspring in small forest fragments in agricultural landscapes. Adult flanged males are also generally intolerant of each other. Males range widely to find dispersed food resources and to breed with females residing in forests and forest fragments. Males will nest and forage in plantations, farms, or gardens along their journeys. While considered primarily arboreal, orangutans will also sometimes travel on the ground. Although orangutans may appear isolated, lost, or desperate for food when encountered in forest fragments, crops or gardens, around human development, or on the ground, they are likely part of a regional metapopulation. The lives of these orangutans are not at risk unless humans injure or kill them. These roaming males and dispersed females are critical to the social and genetic function of the metapopulation. Translocating these orangutans disrupts their social and breeding patterns and worsens the genetic fragmentation of the overall population, reducing population viability.

Forest clearing and fragmentation in the orangutan range continue to decrease available habitat for orangutans, leading to rising human overlap with orangutans and posing a major threat to the species. Plantations, other agribusinesses and natural resource extraction industries operating in the orangutan range should follow sustainability standards to protect natural forests and prevent orangutan killing. Although orangutans cause relatively little crop damage, enabling local communities to coexist with them may require mitigation or livelihood and well-being interventions to facilitate protection of orangutans, natural forests and forest fragments. This approach is an opportunity to benefit social justice while improving biodiversity conservation, which should be increasingly possible since overall deforestation rates in orangutan habitat are much lower now than in past decades. Orangutan rescue, conservation and community development organisations, and ecology research centres working in orangutan habitat are well-placed to lead this approach. Governments, law enforcement authorities, and businesses in the orangutan range also have crucial roles to play in promulgating, publicising, and enforcing regulations that protect orangutans and their habitats.

These guidelines complement national and regional policies and standard operating procedures for conducting orangutan translocations, together with the *Best Practice Guidelines for the Re-introduction of Great Apes* (Beck et al., 2007), *Guidelines for Reintroductions and Other Conservation Translocations* (IUCN SSC, 2013), and best practices for coexisting with orangutans in mixed landscapes and oil palm plantations (Oram, 2023)

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Definitions of key terms

Capture (of wild orangutans) – intentional pursuit, immobilisation (chemical or physical) and restraint of a wild orangutan by veterinarians, government authorities, or conservation or sanctuary staff for the purpose of translocation

Conservation translocation – the intentional movement and release of a living organism where the primary objective is a conservation benefit: this will usually comprise improving the conservation status of the focal species locally or globally, and/or restoring natural ecosystem functions or processes (IUCN SSC, 2013).

Harassing or hazing – any human action aiming to drive an orangutan away, such as making noise or chasing it, or in any other way purposely disturbing the orangutan to make it move away.

Held or kept (by humans) – an orangutan is considered illegally held or kept by unauthorised humans if he or she is physically restrained by a rope, chain, or contained in a cage or fenced area, or inside a home or other human-made setting, other than authorised person in the process of conducting a capture for translocation.

Irresponsible translocation – any translocation that does not follow the precautionary principle and poses more than minimal risk to wild conspecifics, other wildlife, ecosystems or humans, or higher than acceptable risk to the translocated orangutan itself.

Past-prime flanged male – a flanged male orangutan that is no longer in prime physical condition. This condition is visibly characterised by poor body condition (e.g. underweight) and noticeably shrivelled cheek pads or impaired locomotion (Knott, 2009).

Recipient population – the wild orangutan population into which a translocated individual is released.

Rehabilitation – for non-human animals, the process by which captive individuals are treated for medical and physical disabilities and psychological trauma until they regain health, are helped to acquire natural social and ecological skills, and are weaned from human contact and dependence, such that they can survive independently (or with greater independence) in the wild (Beck et al., 2007).

Reinforcement – the intentional movement and release of an orangutan into an existing population of conspecifics. Reinforcement aims to enhance the population's viability, for instance by increasing population size, by increasing genetic diversity, or by increasing the representation of specific demographic groups or stages (IUCN SSC, 2013).

Reintroduction – the intentional movement and release of an orangutan in a part of its indigenous range from which it had been extirpated. Reintroduction aims to re-establish a viable population of the focal species in its indigenous range (IUCN SSC, 2013).

Release – the act of "opening the cage" and letting a translocated orangutan loose in the release habitat.

Release candidate – an individual orangutan that is being considered for release (see also, "Translocation candidate").

Reasonably healthy – a certified veterinarian considers that the orangutan appears to be in sufficient physical and psychological condition to survive in the short-to-medium term without medical intervention. This can be judged via observation or direct examination by a veterinarian.

Rescue – the action of securing an orangutan by removing it from illegal captivity, from people harassing or harming it, or from a situation where its life is in immediate danger from fire, flooding, dogs, electrical infrastructure, or other threats. Rescue is commonly used to describe any removal of wild orangutans from areas where people do not expect or do not want to see them; in nearly all of these cases the orangutan has travelled to the area of their own volition and is not in danger unless moved or harmed by people. In these guidelines, rescue is used only to denote situations where the life of the animal is in immediate danger due to human causes.

Resident orangutans / resident populations / resident wild orangutans – wild orangutans living in habitats of their choosing. This includes resident related adult females, dependent and semi-independent offspring, and both resident and travelling males that use the area.

Responsible translocation – translocations that maximise the health and survival of released orangutans and avoid unacceptable risks to resident conspecifics, other wildlife, ecosystems, or humans. These translocations follow the precautionary principle, meaning that there is minimal risk that released individuals and their future offspring will cause harm to resident conspecifics, other wildlife, ecosystems, or humans. Responsible translocations adhere to the *Guidelines for Reintroduction and Other Conservation Translocations* (IUCN SSC, 2013) to conduct pre-releases studies to identify suitable habitat, assess conservation risks and risks to human communities, and undertake post-release monitoring. Responsible translocations also take into consideration the well-being of released individuals and wild populations, and should release only suitably rehabilitated individual animals that have undergone appropriate screening for health, and diseases of concern, and exhibit age-appropriate adaptive behaviours if they have been in captivity.

Seriously injured – an orangutan with severe or life-threatening injuries. These injuries can be caused directly (guns, knives, explosive devices) or indirectly (snares, pit traps) by people or as a result of an accident, encounter with another animal or more rarely a fight with another orangutan. If human-caused, these injuries are of such severity that the orangutan needs to be captured and transported to a wildlife care facility for medical treatment.

Source population – the wild population or metapopulation from which an orangutan was captured and removed.

Translocation – the human-mediated movement of orangutans or other living organisms from one area, with release in another (IUCN SSC, 2013).

Translocation candidate – an individual orangutan that is being considered for translocation.

Translocated individual – an individual orangutan that has been captured and moved by humans.

Wild-to-wild translocation – the intentional capture of an individual wild orangutan from an area where it is considered at risk and its prompt relocation to a natural habitat. Wild-to-wild translocation does not involve the animal spending time in captivity excepting for brief emergency medical care when necessary.

Purpose of these guidelines

This document is designed to complement existing guidelines published by IUCN (Beck et al., 2007; IUCN SSC, 2013), by providing evidence, decision-making tools, and best practices for wild-to-wild translocation of orangutans.

Orangutan wild-to-wild translocation is recognised as a last resort in the *Orangutan Indonesia Conservation Strategies and Action Plan 2007-2017* (Ministry of Forestry, 2009), while the need to re-assess the function of wild-to-wild translocation as a possible conservation tool is listed as Objective 4 in the *Orangutan Action Plan for Sabah 2020-2029* (Sabah Wildlife Department (SWD), 2020). Nonetheless, wild-to-wild translocation is a common intervention when orangutans are found in or near crops or human-use areas, or even when they are detected outside protected areas or known large populations. Wild-to-wild translocations of large numbers of orangutans have caused changes to orangutan occupancy in some areas in their range, but these impacts are little studied. Limited empirical evidence is available to understand the impacts of wild-to-wild translocations to orangutan conservation, welfare, and habitats, but existing data suggest there is an urgent need to better monitor, evaluate, and manage wild-to-wild translocations to prevent negative effects on species, habitat conservation and translocated individuals, and to ensure alignment with IUCN best practice guidelines.

These guidelines aim to provide a tool for practical assessment, decision-making, and responsible implementation of orangutan wild-to-wild translocation for all practitioners, decision-makers, and funders of orangutan conservation. Decision-making, planning, and management of wild orangutans can be improved to better identify situations where responsible translocations, which avoid unacceptable risks and improve the likelihood of individual survival, welfare, and overall species conservation outcomes, are feasible. This document provides guidance on how to determine whether a situation and the orangutans involved are suitable for responsible wild-to-wild translocation, and what to do to ensure responsible translocation if such an action is determined to be necessary. These guidelines complement national and regional Standard Operating Procedures (SOPs) that detail technical aspects of orangutan rescue and release, capture, transport, and health management.

Section 1. Introduction

Wild-to-wild translocation of orangutans is the capture of wild Sumatran orangutans (*Pongo abelii*), Bornean orangutans (*Pongo pygmaeus*), or Tapanuli orangutans (*Pongo tapanuliensis*) in one location and their transport and release into another area. Across their species ranges, orangutans have been wild-to-wild translocated for more than five decades for a variety of reasons: 1) to facilitate land conversion for agriculture and other human uses; 2) when the orangutans safety is considered at risk from human attacks; 3) when the orangutans or their habitat are impacted by forest fires; 4) when the orangutans are found in habitats perceived as unsuitable, such as small or isolated forest fragments in agricultural landscapes; 5) if the orangutans are observed or assumed to be responsible for damaging crops or property, or are presumed to be at risk of doing so; 6) when their presence causes humans living in the area to fear for the safety of themselves or their property; or 7) when they are suspected to be suffering from disease or malnutrition and thought to require medical intervention. Overall, when people detect orangutans in or near the areas where they live or work (agricultural lands or human settlements), they think that these animals would be better relocated to a "forest". Orangutans are thus frequently wild-to-wild translocated without deeper consideration of the costs and benefits of such action to the individual, population, or species.

As the human footprint expands throughout the orangutan range, people are increasingly reporting orangutans in or near farms, gardens, plantations, infrastructure developments, and other human-use areas (Schreer, 2023; Simangunsong, 2022). **Threats to orangutans and their habitats – notably land-cover changes and conflicts with humans – are present across the orangutan range**. An important distinction is whether these threats are human-caused and pose immediate risks to the orangutan's survival, or if instead they involve potential but not immediately life-threatening risks, or are part of the animal's natural life cycle (such as illness or injuries from other wild animals). Immediate risks to the individual orangutan's life are an understandable rationale for their capture and translocation. However, concerns for the well-being of orangutans whose lives were not at immediate risk have driven the unnecessary removal of hundreds of orangutans from the wild, culminating in potentially significant risk to the functioning of orangutan metapopulations. Orangutans may appear to be isolated, lost, or desperate for food when they are found in small forest fragments, inside plantations, or foraging in farms or gardens, but most of the time, their presence is opportunistic – travelling and foraging – and they are not at risk in these scenarios unless humans injure or kill them. Similarly, although people may perceive it as remarkable or wrong to see orangutans on the ground, they are not exclusively arboreal and travel significant distances on the ground, even in natural habitats (Ancrenaz et al., 2014; Spehar et al., 2018). There is considerable evidence that orangutans can adapt to and survive in these situations. Orangutans can travel several kilometres into plantations or to farms and gardens to forage, and also nest in oil palm and other cultivated crops (Ancrenaz et al., 2015; Ancrenaz et al., 2021; Oram et al., 2022).

Females are known to live in small forest fragments and can find sufficient food entirely within these patches or augment their diets by travelling small distances across deforested areas to access other nearby forest resources (Ancrenaz et al., 2021; Oram et al., 2022). Because of what we now know of orangutan female philopatry and site fidelity (Arora et al., 2012; Ashbury et al., 2020), it is improbable that these females or their maternal line are lost, lonely, or in need of rescue. Rather, they are likely the survivors of land clearance that occurred all around them up to 40 years ago (Oram et al., 2022; Oram, 2023). These females not only have survived, usually undetected, but most have healthy dependent offspring living with them, and in some patches, semi-independent offspring are also present (Oram et al., 2022). Given that females and dependent immature orangutans display an exceptionally high level of site fidelity, it is safe to assume a preferential loss of these age-sex classes occurs when land is converted (Ashbury et al., 2020). In contrast, males are the dispersing sex and, as adults, travel across more expansive regional areas delineated by large rivers (Arora et al., 2010; Nietlisbach et al., 2012). Thus, orangutan population viability is maintained at the regional metapopulation level by related females raising offspring on ancestral land that has historically proven adequate for this purpose. At the same time, males travel across and between the patches of forests where clusters of related females live and raise their offspring (Knott et al., 2008; Oram et al., 2022; van Noordwijk et al., 2012). This system not only prevents inbreeding, but also assures the population's core reservoir is maintained in areas where the local microhabitat best supports this large primate that depends on diverse natural forest resources (Delgado & van Schaik, 2000). Hence, to maintain the metapopulation functionality necessary for orangutan population viability in increasingly fragmented forest conditions, it is necessary to retain females and offspring in situ regardless of the protected status of the forests where they live and support the natural movement of males across these mixed-use landscapes (Oram, 2023). Therefore, the current practice of pre-emptive wild-to-wild translocation is incompatible with the maintenance of viable metapopulation dynamics,

especially under current circumstances where the forest is increasingly fragmented for human use (Ancrenaz et al., 2021). This document serves to guide the re-evaluation and modification of wild-to-wild translocation practices towards prioritising conservation of orangutans based on current habitat use and distribution (Ancrenaz et al., 2021; Oram, 2023; Seaman et al., 2021; Seaman et al., 2024).

The first component of deciding whether an orangutan may benefit from translocation is determining whether the survival and well-being of that individual are at immediate risk due to human actions.

Characterising risk from human actions

Risk to orangutans falls into one of four categories: 1) the orangutan's life is in immediate danger and wild-to-wild translocation is recommended, 2) immediate intervention is needed but the orangutan can be released in place and not translocated, 3) intervention is needed but the orangutan requires additional care and is not suitable for immediate release, and 4) situations where alternative actions are recommended instead of translocation.

1. **An orangutan's life is at immediate risk from human actions only in the following circumstances (one or more of these circumstances may apply). In these circumstances, wild-to-wild translocation is an appropriate action:**
   - The individual's **habitat is on fire or is flooding**, and there are no means for the orangutan to move into another area to escape the threat.
   - The **habitat the orangutan is using is actively being cleared**, and any interventions to halt the clearing process will not happen in time to protect the animal from being killed as the trees that he or she is using are felled. The first priority is to work with landowners to set aside habitats for orangutans and to protect orangutans in place instead of moving them. If this has already been tried and failed, or cannot occur in time, wild-to-wild translocation is recommended.
   - People are **determinedly trying to capture or kill the orangutan and cannot be dissuaded** from these illegal actions. The first priority is to address the illegal action against the orangutan and to find an immediate de-escalation strategy that protects the individual in place rather than translocating it. If this has been tried and failed, or enforcement action cannot happen in time, wild-to-wild translocation is recommended. It is important that any such orangutan translocation be followed up by investigation and appropriate action to enforce conservation laws.
   - Confirmed reports that the **orangutan has attacked people** and will not move away from people even when given time and space to do so. The first priority is to work with landowners and managers and local residents to keep humans, pets, and livestock away from the orangutan and give him or her time to move away. If this is ineffective, wild-to-wild translocation is recommended.
2. **There are circumstances where intervention is needed and the orangutan should then be immediately released in place.** If the orangutan is **caught in a snare and is not seriously injured**, he or she should simply be set free (or treated on site and then set free) rather than translocated. The orangutan should not be moved and released elsewhere, as he or she will likely then be in an unfamiliar area with unfamiliar orangutans.
3. **In the following situation, intervention is needed but the orangutan requires additional care and is not suitable for immediate release.** If observation of an orangutan reveals clinical signs of suffering from serious human-induced injury likely to threaten his or her life if not treated, the individual should be captured and transported to a care facility – if it is possible to safely conduct a capture without causing additional harm or injury.
4. **In many situations, orangutans face potential but not immediate life-threatening risks or have an illness or injuries due to natural causes, in which case it is not recommended to capture and translocate them.** The priority for these cases is to implement immediate actions to protect the orangutan in place while working towards long-term solutions with local communities, plantations or other agricultural or natural resource extraction businesses, individual landowners and managers, and government authorities to address underlying habitat management and human-wildlife conflict situations. Veterinary specialists should be involved to assess the condition of the orangutans.
   - **A local community member or an agribusiness or natural resource extraction company has alerted government authorities or a rescue non-governmental organisation (NGO) about an orangutan that is crop foraging or has been seen in or near crops, plantations, or resource extraction operations**

Recommended action: *First assess the extent and type(s) of damage, if any. Work with the community and/or companies or concession holders to protect and monitor the orangutan (from at least 50 metres away) to ensure it remains safe. Immediate actions may be needed to offset local community members' crop and income losses and to prevent the orangutan from being hurt or killed. It is important to sensitise people to the fact that crop foraging, including returning repeatedly and seasonally to feed on fruiting crops, is a normal behaviour for orangutans, and will only increase as humans and orangutans share more habitat. Orangutans are a legally protected species: their habitats should be conserved, and the individuals protected in place rather than moved out of their home ranges, even when these include croplands and other human-use areas.*

- **An agribusiness or natural resource extraction company has alerted government authorities or a rescue NGO that it plans to clear forested areas where orangutans have been seen**
  Recommended action: *Work with the company to protect the orangutan habitat patch and provide movement corridors for resident orangutans. Orangutans are a legally protected species, and their habitats should be conserved and the animals protected in place rather than moving them out of their home range.*
- **The orangutan is seen outside natural forest habitat in what is perceived as a disturbed habitat: in a cleared area, in or near human habitation, a logged area, in a plantation or natural resource extraction area, or crossing roads or other infrastructure (Figure 1)**
  Recommended action: *Monitor the individual. If he or she appears reasonably healthy (i.e. not seriously injured by humans to a degree that requires removal to a care facility for medical treatment), assume they will travel on their own to a tree to nest. Do not capture and move the individual unless he or she is trapped in an area from which escape is not feasible. The orangutan travelled on his or her own accord to the area where sighted and can travel on if left undisturbed by humans. Note that orangutans travel on the ground and can cross open areas or plantations, and even roads and other infrastructure to get to forests they know.*

Figure 1. Orangutan that appeared stranded but did not need translocation. This orangutan is seen in a single large tree in a village oil palm plantation. He nested overnight then came to the ground, crossed the road, and travelled back to the forest the next day. Images and story from Forum Konservasi Leuser Facebook page https://tinyurl.com/ywpfrfwa. © Leuser Conservation Forum (FKL)

- **The orangutan is located in an isolated fragment of forest**
  Recommended action: *Monitor the orangutan. Do not capture and move this individual unless people try to kill or injure him or her. It is known for certain that orangutans can survive for decades in small forest fragments, find sufficient food to survive, breed, and raise infants. It is important to remember that the orangutan lives in or travelled on its own accord to the area where he or she has been sighted, and can continue to live or travel on as needed if left undisturbed by humans. Orangutans will travel long distances on the ground and can cross open areas or plantations – and even roads and other infrastructure – to reach additional foraging areas.*
- **The orangutan is ill or has injuries that do not appear to be caused by humans or are not severe or life-threatening if left untreated**
  Recommended action: *Monitor the orangutan. Wild animals sustain many injuries and, in many cases, can thrive despite them. They can also become ill and either recover or die, which is part of a natural cycle. Illnesses and injuries from natural causes are not reasons for capturing and translocating wild orangutans.*

Humans should not intervene in these natural processes; they should instead leave wild animals to fend for themselves.

- **The orangutan appears underweight or malnourished**
  Recommended actions: *Monitor the orangutan and work with local communities to protect him or her in place. Orangutans are attracted to many human foods and agroforestry crops and will temporarily leave forests to obtain them. This does not necessarily mean they are starving or that food resources in their home range are insufficient. It is normal for orangutans to lose significant body weight and even to begin catabolising muscle during low fruiting seasons. It is likely to make it harder for the orangutan to find sufficient nutrition if he or she is moved to an area they are unfamiliar with. It is best to leave wild animals to fend for themselves unless their lives are in immediate danger, and to promptly implement alternative actions needed to offset local community members' crop and income losses and prevent the orangutan from being hurt or killed. It is important to sensitise people to the fact that crop foraging, including returning repeatedly and seasonally to fruiting crops, is normal behaviour for orangutans and may be necessary due to fluctuations in natural food source availability, particularly if their native habitat has been damaged or destroyed. Orangutan foraging on cultivated crops is increasing as humans and orangutans share more habitat.*
- **The orangutan is in an area that has uninsulated electrical wires or junction boxes, or where dogs are roaming**
  Recommended actions: *Monitor the orangutan and work with local communities, dog owners, and utility managers to protect the orangutan in place. Utility wires and other electrical infrastructure should always be insulated to protect people and wildlife. In the case of electrical infrastructure installed by local communities, contributing to or offsetting these costs may be necessary. Public or private utility companies should perform this service on behalf of the public and wildlife. Insulation and other electrocution protections can be done piecemeal and can focus on specific sites where animals are regularly seen. IUCN has published guidelines on preventing wildlife mortality from electrical infrastructure* (Martín Martín et al., 2022).

1.1 Responsible translocations, best practice guidelines, and the precautionary principle

Responsible translocations for conservation purposes follow the **precautionary principle** to prevent harm to wild conspecifics, other wildlife, ecosystems, domesticated animals, and humans (Beck et al., 2007; IUCN, 2007; IUCN SSC, 2013). Responsible translocations follow the IUCN best practice guidelines for wildlife translocations that require pre-release studies to identify suitable habitats, assess risks to species and habitat conservation, individual animals' welfare, and human communities, and monitor translocated individuals and the resident wild population in the release habitat (Beck et al., 2007; IUCN SSC, 2013).

The precautionary principle is a decision-making tool to avoid potential risks to biodiversity and the environment (IUCN, 2007). Where evidence is lacking or there is uncertainty about whether a human action will cause harm to the target species, other wildlife, or the environment, the precautionary approach assumes that it will cause harm. This means that if there is uncertainty as to whether a translocation could cause harm to translocated individuals, the resident orangutan population, other wildlife, or the release ecosystem, the translocation should be avoided, even if negative outcomes are unlikely. The precautionary principle also applies to potential negative effects of translocation on human health and safety through disease transmission or conflicts.

There are four criteria that need to be considered to meet the precautionary principle:

- Scientific studies of wild conspecifics populations and the release habitat indicate that adding individuals through translocation is unlikely to cause significant behavioural, socioecological or genetic disruptions to these populations or to the ecosystem.
- Translocation candidates have been examined by a certified veterinarian, tested, and found free of communicable diseases or potential pathogens of concern for orangutans, other wildlife, and humans in the release area.
- Major threats to orangutans in the release habitat have been addressed or managed to an extent that released individuals are unlikely to be harmed.
- Released orangutans are unlikely to pose significant risks to human or animal health, safety, and well-being.

Orangutans are a Critically Endangered species, and, as such, the priority is protecting wild orangutan populations, including maintaining the dispersed metapopulation breeding structure of females residing in forest fragments and roaming males. Translocating orangutans into a population outside their original home range may pose disease, genetic, and social risks to wild orangutans resident in the receiving population. Generally, threatened species are best translocated into depleted wild conspecific populations ("reinforcement translocations"), or into areas where wild populations have been extirpated ("reintroduction"). Healthy or viable wild populations of threatened species do not need to be supplemented, and adding translocated individuals that did not originate there violates the precautionary principle because this action creates competition with the resident wild individuals for food and other habitat resources and may depress the breeding success of the individuals in the wild population. This may hurt rather than help efforts to recover the species. Maintaining genetic integrity is crucial, and thus orangutans should only be translocated into areas with the same species (and subspecies in the case of Bornean orangutans). Careful assessment is needed to determine the relative risks and benefits of translocation compared to other conservation actions. If translocation is likely to negatively impact the translocated individual(s) or the recipient wild orangutan population, as per the precautionary principle those individual(s) should not be translocated and alternative conservation actions such as habitat protection and conflict mitigation should be pursued instead.

Translocation involves more than the individual being translocated. By moving an orangutan, we also move his or her behaviour and potential diseases, as well as creating increased demand in the release habitat for resources that sustain the individual and the recipient population. In addition, any translocation creates a vacuum in the source population that needs to be accounted for as part of the assessment and decision-making.

> ***"Any proposed translocation should have a comprehensive risk assessment with a level of effort appropriate to the situation. Where risk is high and/or uncertainty remains about risks and their impacts, a translocation should not proceed."*** – IUCN SSC, 2013 p. VIII

1.2 Risks of wild-to-wild orangutan translocation

Risks to wild populations that arise from translocation, which include excessive social disruption, exacerbated competition for resources, hybridisation, and transmission of communicable disease, must be avoided to uphold the precautionary principle (Beck et al., 2007; IUCN SSC, 2013). Translocations that pose excessive risks to the welfare and survival of translocated individuals must also be avoided. Published guidelines further stipulate that individual welfare benefits alone are not considered a valid rationale for a conservation translocation (IUCN SSC, 2013).

When applied to orangutans, the IUCN principles identify several primary risks of translocation:

Welfare, social, and disease risks

1) Translocation candidates face risk of stress and/or injury, heat stress, and pathogen exposure during capture
2) Wild orangutans at the release site face social disruption, aggression, competition for natural resources, and risks of communicable diseases from translocated individuals
3) Translocated individuals face aggression, competition for natural resources from resident orangutans, and threats from unfamiliar local predators
4) Translocated individuals may have difficulty finding sufficient food or other resources in the unfamiliar forests where they are released, especially in forest types different from those in their original home range.

Genetic risks

5) Hybridisation if a different species or subspecies is released into a wild orangutan population.

Species conservation risks

6) Disruption to metapopulations through the removal of roaming males or females resident in small forest fragments, or
7) Continued loss of forests and forest fragments following removal of orangutans (resident or foraging)
8) Perpetuating misconceptions that humans can simply move orangutans out of the way rather than learn to coexist with them.

Welfare risk

While removing orangutans from small forest fragments or croplands and translocating them into protected areas is generally perceived as a positive action that will result in improved welfare for the individual, many translocations actually have the opposite effect (Harrington et al., 2013; Oram & Segaran, 2023). Capture and translocation are stressful events for wild animals that can trigger or transmit disease or result in harm or death (Breed et al., 2019; Teixeira et al., 2007). As examples, translocating orangutans into unfamiliar habitats with unrelated orangutans, or into populations where they will cause social disruption or competition, may result in lowered reproductive success of both wild conspecifics and released individuals, and suffering or death of released individuals (Grundmann, 2006). Social stress and competition for food, territory, or mates also decrease the welfare of both released individuals and members of the resident population, and exacerbate risks for the individuals, the metapopulation, and the species.

Social disruption and competition risk

Orangutan populations can be harmed by adding translocated individuals that can cause social disruption or increased competition for limited food, home ranges, mates, or other habitat resources (Ancrenaz et al., 2021; Sherman et al., 2020). Orangutans tend to avoid orangutans they are not closely related to as a means of preventing competition for food resources (Knott et al., 2008; Sugardjito et al., 1987; van Schaik 1989). Orangutans may become aggressive and can injure or even kill one another, with both flanged males and unrelated females being intolerant of each other – particularly during times of low fruit availability (Ashbury et al., 2021; Knott et al., 2008; Utami Atmoko et al., 2008; van Noordwijk et al., 2012). Female orangutans contest food resources and will avoid other females that are not closely related to prevent competition, and can exclude unrelated females from accessing these foods (Knott et al., 2008; Sugardjito et al., 1987; Utami et al., 1997). Researchers found that encounters between flanged males are “invariably antagonistic” and sometimes result in injury or death (Utami Atmoko et al., 2008). Unflanged males have been known to injure or kill each other, as have unrelated females, although both such instances are uncommon (Marzec et al., 2016; Utami Atmoko et al., 2008). Social disruption and competition with potentially serious or fatal consequences arising from releasing orangutans into an unfamiliar resident population is a serious but often overlooked risk of wild-to-wild orangutan translocations. Few data are available on the long-term outcome of wild-to-wild translocations and without such evidence of released animals’ long-term survival, as per the precautionary principle, it must be assumed that many translocated individuals fail to thrive due to exclusion from food sources or failure to find sufficient food, or are killed, injured, or driven out of release areas due to social conflicts.

It has been noted by translocation practitioners that released orangutans are seldom or never found dead, but, importantly, this is not evidence that they survived. Dead orangutans in general are rarely encountered, even by field researchers who have closely monitored wild populations for decades. Likewise, it cannot be assumed the translocated orangutans must be alive somewhere following release even if not seen. The only way to know for certain if translocated orangutans have survived is if they are tracked and detected again after their release. Tracking translocated animals over many years following their release is crucial to understanding the outcomes of wild-to-wild translocation. Based on decades of population monitoring we know that orangutan populations are in decline (Galdikas et al., 2023; Santika et al., 2017; Utami-Atmoko et al., 2017; Voigt et al., 2018; Yuliani et al., 2023), and that they are being killed or captured by humans at rates exceeding natural mortality rates for the species (Sherman et al., 2022).

Disease risk

Infectious disease transmission from wild or ex-captive released great apes to conspecific populations can pose serious sanitary and disease risks (Köndgen et al., 2008). The risk of pathogen and disease transmission cannot be entirely eliminated, so it must be carefully managed to avoid negative consequences for wild populations. Translocation of wild orangutans is often perceived as having a low disease transmission risk because the individuals typically spend minimal or no time in captivity. It is also frequently assumed that orangutans have lower communicable disease transmission risk than other great apes because they are more arboreal and more solitary, and there are no clear examples of disease wiping out orangutan populations following releases (Carne et al., 2014; Kilbourn et al., 2003; Mul et al., 2007). However, pathogen transmission between humans and orangutans or among orangutans is possible via direct and indirect contacts (abiotic transfer via fomites and other transmission pathways) and animal vectors, and can occur during wild orangutan encounters with humans (e.g. during crop foraging), and the capture, transport, and translocation of wild orangutans (Sherman et al., 2021). Information on disease risk in orangutan translocations is limited due to the lack of surveillance for disease in wild orangutan populations, zoonotic pathogen transfer, disease spillover, and emerging diseases. This lack of evidence is not evidence of low risk, but instead points to an urgent need for improved surveillance.

Individual orangutans can serve as superspreaders of disease among conspecifics, for example, as males travel through the metapopulation in search of females (Ancrenaz et al., 2021; Carne et al., 2013; Marshall et al., 2021). Wild orangutans are not exclusively arboreal: terrestrial locomotion is a part of their normal behaviour and they can travel and spend considerable time on the ground (Ancrenaz et al., 2014). With increased fragmentation of forests, orangutans are forced to use terrestrial locomotion more often to cross more and larger canopy gaps. Thus, anthropogenic habitat modification has increased the potential for exposure to zoonotic pathogens of human and domestic animal origin. Orangutans captured for translocation because they are crop foraging or found in human-use areas may already have been exposed to such pathogens (F. Oram, unpublished data; Nurcahyo et al., 2017). Habitats shared with local communities and exposure to humans through tourism, monitoring, and field research activities are also potential pathways for pathogen exposure (Dunay et al., 2018; Kilbourn et al., 2003; Mul et al., 2007; Mynářová et al., 2016). Translocation of each individual orangutan poses real risks of pathogen and disease transmission, and risks are compounded as additional animals are translocated (Sherman et al., 2021). Diseases of concern that cause orangutan morbidity or mortality and have been recorded as transmitted to wild orangutans and identified in captive orangutans include *Mycobacterium tuberculosis* complex (Dench et al., 2015), malaria (Nurcahyo et al., 2017; Sanchez et al., 2022), simian foamy virus (Orangutan Conservancy, 2010), and several parasite species (Nurcahyo et al., 2017).

Genetic risk

Translocating individuals of a different species or subspecies into the resident orangutan population at the release site can produce hybridisation between orangutan species and subspecies (Banes et al., 2016; Benjamin-Fink & Reilly, 2017). Hybridisation between Sumatran and Tapanuli orangutans may have occurred in the past because Tapanuli was only recently recognised as a separate species; similarly, past translocations of Bornean orangutans led to some mixing of the three Bornean subspecies (Banes et al., 2016). Indonesian government mandates require that species and subspecies be released only into their respective conspecific populations (Decree No. 280/KPTS-II/1995 as cited in Banes et al., 2016). Per IUCN guidelines (IUCN SSC, 2013), the genetic integrity of these Critically Endangered species and subspecies must be protected and not further compromised by translocations into populations of different species. It is also generally problematic to translocate orangutans between subpopulations, as this can introduce deleterious genetic effects or problematic behaviours to the recipient population. Genetic considerations are particularly important for Tapanuli orangutans given their small population size and fragmented habitat; any further mixing of Sumatran genes into the Tapanuli population compromises the Tapanuli orangutan's genetic integrity. Similarly, the Northwest Bornean orangutan subspecies is in steep decline (Yuliani et al., 2023), highlighting the importance of not compromising its genetic integrity through release of other Bornean orangutan subspecies into its habitat, or vice versa.

Species conservation risk

Removing orangutans to enable forest clearing, such as for agricultural expansion or other human development, is harmful to the conservation of orangutan populations. Nonetheless, this strategy is commonly used to prevent these fully protected species from being killed or displaced (Sherman et al., 2020). It is critical to keep in mind that their capture and wild-to-wild translocation, even if intended to prevent harm to these orangutans, may lead to negative outcomes for the remaining individuals in the forest patch, the metapopulation, and the translocated individuals. Researchers and rescue centres reported first-hand knowledge of many cases where forest fragments or forest edges were cleared following removal of the orangutans (Sherman et al., 2020; Sherman et al., 2022). Once the orangutans are removed, forest patches can be cleared with impunity because they no longer contain this high-profile protected species. Facilitating this continued removal of wild animals and potential forest clearing makes the overall landscape less suitable for orangutans and other wildlife.

A 2020 investigation of orangutans in forest patches found orangutans present in more than 120 small forest fragments of less than 500 hectares that were isolated in extensive oil palm plantations across several surveyed landscapes (Ancrenaz et al., 2021). Adult females with dependent young were found in 42% of the fragments assessed over 10 years, and males were regularly seen travelling across the landscape (Figure 2). The fragments with orangutans were often tiny, as small as a single large tree, or totalling only a few hectares in size (Ancrenaz et al., 2021; Oram et al., 2022). Orangutans using or living in small, isolated forest patches maintain gene flow in the metapopulation. Removing individuals from these dispersed metapopulations could inadvertently decrease the critical functionality necessary for long-term viability. Forest fragments, even those of only a few hectares or more, can complement conservation areas and help maintain orangutan metapopulation functions if they are well distributed, connected and managed, and if orangutan killing is prevented. (Ancrenaz et al., 2021).

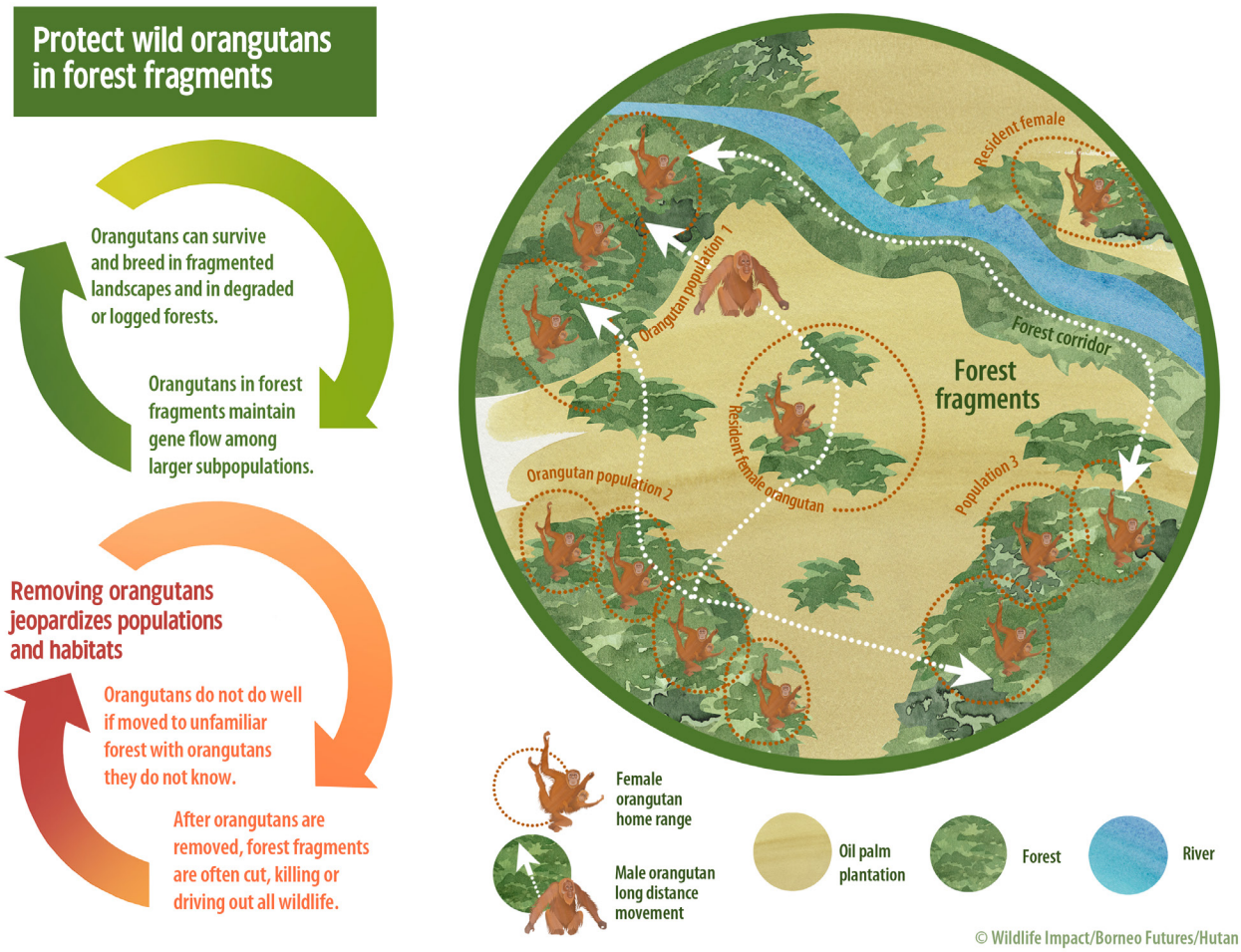

Figure 2. Example of orangutan habitat use and metapopulation dynamics in mosaic landscapes of agriculture, forests, and forest fragments. Figure © Wildlife Impact, Borneo Futures, and Hutan. Illustration by Lucy Molleson.

The long-term viability of orangutan populations is compromised by offtake of individuals through hunting, retaliatory killings, and captures for wild-to-wild translocation (Seaman et al., 2024). Seaman et al. (2021) found that small forest fragments facilitated orangutan dispersal, increasing the number of individuals settling in non-natal patches. These fragments also likely support a substantial number of orangutans, and these populations can also grow and expand to increase the occupied orangutan range under all levels of fragmentation, provided individuals are not translocated or killed. Orangutan populations appear to be highly sensitive to offtake, and even small levels markedly affect the population size. An estimated 1% offtake rate resulted in an average 20% decline in the population size regardless of fragmentation level, while offtake levels between 2% and 4% led to drastic declines in orangutan abundance under any fragmentation scenario. A 4% offtake rate led to a 99.9% orangutan population decline (Seaman et al., 2024).

The population benefits of forest fragments cannot be sustained unless offtake is slowed by limiting translocations to extraordinary cases where they are strictly necessary, and instead promoting coexistence between orangutans and people (Meijaard et al., 2022; Seaman et al., 2024). Current offtake rates from killing alone probably exceed 4% per year across much of the orangutan range, both in and outside protected areas (Sherman et al., 2022), strongly suggesting that the additional offtake from wild-to-wild translocations is exacerbating harm to orangutan metapopulations and is thus a serious risk to species conservation.

Section 2. Orangutan socioecology, behaviour, and habitat use

2.1. Socioecology and behaviour

Orangutans are semi-solitary but live in diffuse communities of known and related individuals, in which females are resident and philopatric, and males disperse (Arora et al., 2012). Infant and juvenile orangutans depend on their mother for an average of eight years or more, learning what foods to eat and when and where to find them (van Noordwijk, 2008). Female orangutans are strongly tied to their natal areas, and the home ranges of maternal kin often overlap considerably (Ashbury et al., 2020; van Noordwijk et al., 2012). Both male and female adult orangutans are generally intolerant of and can be aggressive toward unrelated individuals of their sex (Marzec et al., 2016, van Noordwijk et al., 2012). Females may pose a threat to the infants of unrelated females (van Noordwijk et al., 2012). Females are known to occupy small forest fragments for decades and are regularly seen with dependent infants and semi-independent juvenile offspring (Oram et al., 2022). Resident flanged adult males can aggressively defend an area with females, especially when females are sexually receptive (Spillmann et al., 2016). For all these reasons, removing orangutans from the habitat they chose to occupy has consequences for the socioecology and survival of the translocated individuals and the local population (Ancrenaz et al., 2021; Oram et al., 2022).

2.2. Orangutans and human safety

Although orangutans, especially flanged males, are large animals and can appear frightening (Schreer, 2023), wild orangutans are not naturally aggressive towards people and they do not usually attack humans unless they are cornered and directly threatened or injured and, even in these cases they act only out of self-defence. However, as orangutans are much stronger than humans, they can be both frightening and dangerous. There have been some instances of formerly captive, rehabilitated orangutans that continue to seek contact with people (e.g. BOSF, 2021), and some rehabilitants or even provisioned wild orangutans can be aggressive (Oram & Segaran, 2023). However, fully wild (unprovisioned) orangutans tend to keep their distance if left alone and given sufficient space to move away. Researchers studying orangutans in mixed-use landscapes have found that when people try to scare away orangutans by surrounding them with people and dogs and/or throwing things at them in an attempt to drive them back to the forest (sometimes called “harassing” or “hazing” the animal), it is usually ineffective for two reasons. First, the goal of managing an orangutan encounter should be to allow the orangutan to travel unimpeded to a nearby forest or other area where it came from (Oram, 2023). Second, when orangutans are harassed or hazed in this manner, they tend to freeze in place rather than move away immediately (Oram & Segaran, 2023). Oram & Segaran (2023) and Oram et al. (2022) found that if people refrain from escalating the orangutan’s distress (signalled by characteristic “kiss-squeak” vocalisations and breaking or shaking of branches and leaves), and give the orangutan space to work out how to move away on his or her own, the encounter is usually resolved more quickly. This tendency to freeze in place can be so extreme that the orangutan may lie flat on the ground if it is in the open or blocked from reaching a tree or something to climb up on (Oram & Segaran, 2023). Researchers found that if orangutans are left entirely on their own, they will leave the area by the next morning (Oram & Segaran, 2023). A crucial recommendation to mitigate an encounter is to discourage overzealous monitoring. The objective is to stay as far back as possible (200 m or more) from the orangutan and to monitor the people in the situation and clear the path for the orangutan to move away. Closer monitoring or other presence of people and/or dogs can make it take longer for the orangutan to feel he or she can safely move away.

With improved understanding of orangutan behaviour, it is possible to coexist with orangutans without significant risk for people’s and orangutans’ safety. However, this requires people’s acceptance of normal orangutan behaviours including foraging or living in local farms or orchards during the fruiting season, or in oil palm and industrial tree plantations, and acting in self-defence if attacked or threatened (Meijaard et al., 2010). It is important that everyone living, working, or active in orangutan habitat is informed on and sensitised to orangutan behaviours and ecology and provided with accurate information on avoiding conflicts.

2.3. Habitat use

Free-ranging orangutans live in undisturbed primary and selectively logged and/or otherwise damaged forests of several types—peat swamp, freshwater, and lowland dipterocarp—as well as mosaic habitats (mixed forest types or forest mixed with other vegetation types), and will use grasslands, agricultural plantations, farms, gardens, and exotic tree plantations (Galdikas, 1988; Kuswanda et al., 2021; Rijksen & Meijaard, 1999; Wich et al., 2008). Food availability and the nutritional value of orangutan foods differ markedly between forest types such as peat swamp and dipterocarp forests (Vogel et al., 2015); this poses risks for individuals translocated to unfamiliar forest types because at least some of the

food resources available in the unfamiliar forest types will be novel to them. Further, both male and female orangutans will return again and again to food sources they like, including fruit crops and tree plantations. Foods produced by people are often easier to process and higher in sugar than orangutans' native food sources, making them very attractive to orangutans even if sufficient wild foods are available in their home range (Oram & Segaran, 2023). The fact that orangutans forage in plantations and cultivated crops does not necessarily mean they are starving or malnourished. Rather, this is a predictable outcome when people grow foods attractive to orangutans in their range. Orangutans will also consume oil palm shoots if other foods are difficult to find, but do not consume large quantities of oil palm fruits or cause significant damage to established oil palm plantations (Oram & Segaran, 2023).

Orangutans have been recorded in a wide variety of landscapes outside large, intact forests:

- Mixed primary and degraded forest
- Degraded or logged forest
- Forest patches isolated from other forested areas
- Plantations with small fragments of forest, or even just a few tall trees
- Plantations without forests but near forests and forest fragments
- Industrial tree plantations
- Cropland or farms at edges of protected forests
- Cropland or farms with fragmented or isolated forest patches
- Near villages with fragmented forest patches
- Agroforest > 5 km from natural forest patches
- Boundary areas between forest and plantations, farms, infrastructure, housing, or other human development.

Translocation practitioners and stakeholders reported orangutans feeding on or encountered in many types of cropland and plantations, including:

- Banana fruits – smallholder
- Coconut palms – smallholder
- Durian fruits – smallholder
- Jackfruit – smallholder
- Jernang fruit – smallholder
- Mangosteen fruit – smallholder
- Petai fruit – smallholder
- Rubber tree plantations – smallholder and industrial
- Rambutan fruits – smallholder
- Oil palm plantations – smallholder and industrial
- Eucalyptus tree plantations - industrial
- Acacia tree plantations - industrial
- Albizia tree plantations - industrial

Considering the socioecology of orangutans, there are several reasons why orangutans are found outside large forests, seemingly isolated in tiny forest fragments, in agricultural plantations or farmlands, or in other places that may appear to be unsuitable:

- **Orangutans resident in forests neighbouring plantations and croplands (fruit orchards, oil palms, farmlands, pulp and paper plantations, rubber plantations, and other production landscapes):** The natural range of these individuals can include part of the non-forested land. In this situation, they use cultivated crops as a food source or for nesting or travel. These resident individuals will regularly commute between the forest and the plantations. Orangutan incursions into oil palm plantations usually remain close to the boundary with the natural forest (Ancrenaz et al., 2015; Oram et al., 2022). Their incursions into local orchards can involve longer distances and longer periods of time, especially during fruiting seasons.
- **Orangutans resident living in small forest fragments (especially females) that used to be part of the individual's contiguous forested range, before the forest was lost or fragmented:** These individuals have found ways to survive in fragments and have retained their range in this mosaic landscape. They live there and use the resources of these fragment "islands" and surrounding areas, including human food crops and agroforestry plantations. Some of these females are regularly seen with infants, indicating that they can breed in these fragments if they are visited by males travelling through the area (Oram et al., 2022).
- **Transient orangutans (especially males) moving through plantations and non-forested areas:** Male orangutans look for breeding opportunities with resident females that survive in forest fragments. These transient males can travel several kilometres from surrounding forests and commute between fragmented populations or sub-populations across entire landscapes (Ancrenaz et al., 2021).
- **Ex-rehabilitant or translocated orangutans new to the area are exploring the area where they were released, looking for a possible range to settle in.**

Orangutans living in mixed landscapes of forest, forest patches and agriculture or human communities and infrastructure can sometimes be seen along roads or in cleared areas (Figure 3). This does not mean they are lost or isolated. Orangutans can survive for decades in human-altered landscapes as long they are protected from humans killing, capturing, or harassing them. Capturing and removing them is more likely to cause them harm than benefit them.

Figure 3. An elderly female orangutan living in a landscape of oil palm plantations and forest fragments in Sabah, Malaysia. She frequently travels across small roads and around other human development. She is blind in one eye and was underweight when this picture was taken. Her condition is explained by her old age (HUTAN, unpublished data); she is not ill or injured and does not need rescue or medical intervention. She has been surviving in this landscape, amongst humans and human infrastructure, and has raised two infants over the past 10 years. © Hutan

The presence of resident females and transient males in a mosaic landscape is essential to maintain connectivity between isolated sub-populations and to sustain the orangutan metapopulation in the long term (Ancrenaz et al., 2021; Oram, 2023). Removing any of these individuals increases the fragmentation process and jeopardises the viability of the metapopulation (Seaman et al., 2021).

2.4. Orangutan adaptation to changing landscapes

Orangutans can adapt to habitat changes but need social community integrity and sufficient food and nest sites to survive. As a result, they can maintain viable population densities in production forests, industrial tree plantations (Ancrenaz et al., 2010; Roth et al., 2020), and diversified agricultural areas (Santika et al., 2017; Voigt et al., 2018). Areas with mixed natural forests, forest fragments, and agricultural areas or production forests are known as mosaic landscapes. Today, an estimated 10,000 orangutans live in oil palm dominated mosaic landscapes in Borneo alone (Meijaard et al., 2017). In Indonesia, more than 75% of orangutans are estimated to live outside protected areas (Ancrenaz et al., 2021; Utami-Atmoko et al., 2017). Consequently, these orangutans are increasingly found near people. This trend is expected to continue as rural populations and developments increase, and human use expands further into orangutan habitats. Although the total rate of deforestation has slowed in recent years, particularly in Indonesia (Gaveau et al., 2022), continued decline in forest cover in the orangutans range is decreasing the distance between human settlements, croplands, and orangutans (see for example: Rainforest Action Network, 2022).

It would be logistically and financially impossible to translocate all orangutans using croplands and/or living near humans. Importantly for species conservation, releasing so many individuals into protected areas with resident wild orangutans would cause extreme social disruption and likely result in increased competition for food resources, poorer nutrition, increased social stress, lowered birth rates, poor welfare, and increased mortality for both translocated and resident orangutans.

Section 3. Orangutan wild-to-wild translocation in context

What drives translocations, and what are the circumstances around captures of wild orangutans for translocation?

To better understand the context and outcomes of orangutan wild-to-wild translocation, the authors collated data on wild orangutans captured for translocation in Indonesia between 2005 and 2022 from practitioner publications (including scientific articles, annual reports, grant reports, news blogs, charity commission reports, conference presentations), newspaper articles, and other direct communications with practitioners. This dataset underestimates the total number of orangutans captured from the wild for translocation since 2005, as it includes only those rescues for which data were available and which could be confirmed as unique instances (i.e. so no rescue was counted more than once). Many wild-to-wild translocations are not publicly reported (Sherman et al., 2020). For example, there were no records available of wild-to-wild translocations in Sumatra before 2012, although it is highly unlikely that none occurred. Not every capture resulted in translocation, as some individuals died or were not released for other reasons, such as lack of suitable release sites, or the individual's unsuitability due to physical impairment or disease. In other cases, data on whether and where individuals were released were unavailable or unclear. This dataset covers rescues and translocations in Kalimantan and Sumatra, Indonesia. Few data were available for Sabah and Sarawak, Malaysia. Hence translocations in these two Malaysian States are not part of the dataset, but published and anecdotal accounts of orangutan translocations in Malaysia are discussed throughout these guidelines. Trends in the annual number of orangutans captured for translocation were tested using the Mann-Kendall trend test (McLeod, 2022), with serial autocorrelation in annual numbers checked by Ljung box test (Lemon, 2006). Both tests were run in RStudio 2022.12.0 (R Core Team, 2022).

Some spatially specific data (GNSS coordinates, such as GPS or GLONASS coordinates) were available for captures and translocations in Indonesia. Translocation practitioners often collect GNSS coordinates at orangutan capture sites, but do not always report them. No GPS coordinates were available for Sarawak or Sabah captures for translocation.

The authors also developed a translocation survey tool to better understand stakeholder perspectives. The survey was distributed to 180 translocation stakeholders. Survey respondents (n=21; a 12% response rate) represent primarily NGO translocation practitioners and conservation scientists working on projects related to or involving translocation in Sarawak and Sabah (Malaysia), and Kalimantan and Sumatra (Indonesia)

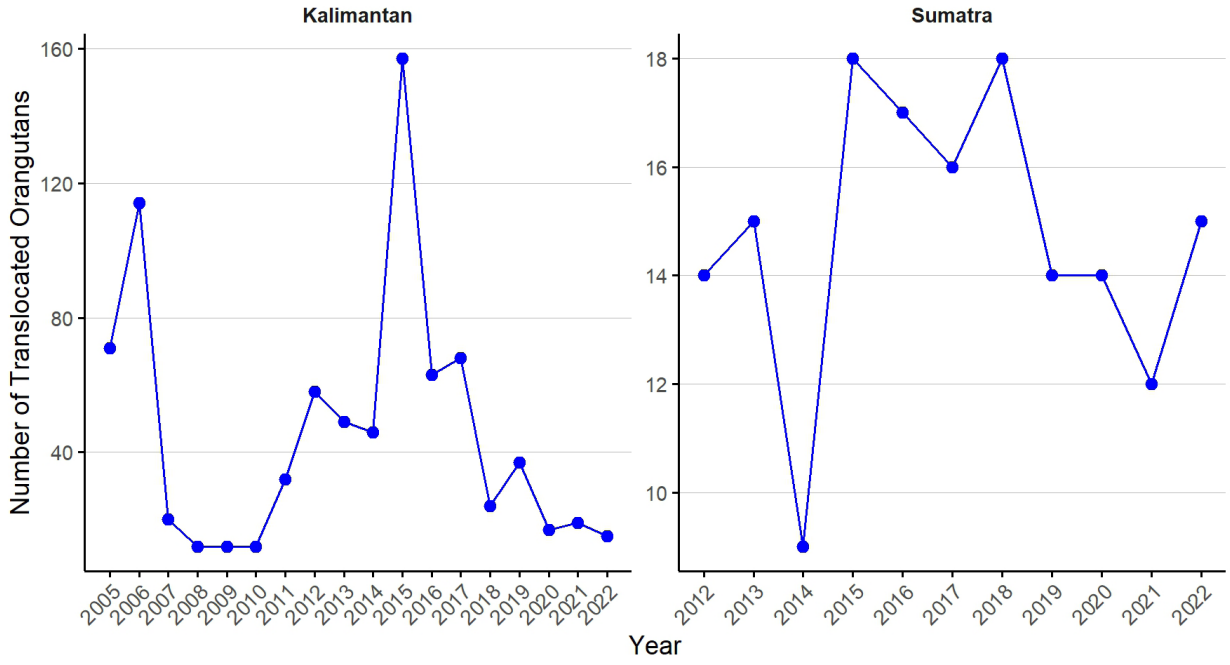

Figure 4. Number of wild orangutans reported captured for translocations in Kalimantan, Indonesia 2005–2022 (left panel) and Sumatra, Indonesia 2012–2022 (right panel). No data were available on wild orangutans captured for translocations in Sumatra between 2005–2011, hence these years are excluded here (Sherman et al., 2025).

A review of the data since 2005 showed that at least 988 wild orangutans were reported as captured for translocations in Indonesia (Figure 4). Annually, an average of 55 orangutans were reported as captured for translocation in Indonesia every year since 2005. Annual numbers of orangutans captured for translocation did not show a declining trend overall during the study period in Kalimantan. Peaks in translocations in Kalimantan are associated with forest clearing for agricultural expansion (2005–2007), and the record fire years in 2015–2016 (Figure 4). Annual orangutan captures for translocation have risen slightly since 2020 in Sumatra (Figure 4), although they do not show an increasing trend overall across the study period. The number of reported captures for translocation (66 animals annually since 2015) remains remarkably high for a Critically Endangered species that is legally protected across its habitat. This is an indicator that new approaches are urgently needed to stop the destruction of orangutan habitats and improve tolerance for peaceful coexistence that leaves orangutans in place.

Translocations were undertaken primarily at the request of landowners, land managers, or local community members, who asked that orangutans be removed from areas where they had crop foraged or feared they might crop forage. The SGA survey of translocation practitioners and stakeholders showed 57% of respondents reported that local people would ask for orangutans to be moved if they crop foraged, and 43% would request removal if the orangutan was seen near crops or villages, even if it had not yet crop foraged. Only 10% of survey respondents said people would choose peaceful coexistence (leaving orangutans undisturbed) if they were crop foraging, and 33% if they were seen near crops or communities. These data represent the viewpoints and experiences of practitioners; none of the survey respondents were residents of local villages who had conflicts with orangutans. Recent ethnographic studies highlight the importance of building relationships with local residents to understand their use of local forests, their relationships with orangutans, their perceptions about the animals, and the impacts of orangutan crop foraging or presence in their area (Chua et al., 2021; Schreer, 2023).

Other reasons explaining the prevalence of orangutan translocations are that people think orangutans are lost, isolated, or stranded when they are detected in places that people consider unsuitable (i.e. outside contiguous forest), and that orangutans are often found in landscapes that people want to clear for crops or development. Less frequently, authorities or NGOs are asked to capture orangutans that appear injured or unwell.

Orangutans are known to travel not only in forested areas, but also across grasslands, fields, oil palm and tree plantations, and roads. They are also known to forage in fruit crops every fruiting season, with the same individual repeatedly returning during the fruiting season (Ancrenaz et al., 2021; Galdikas, 1988; Oram & Segaran, 2023; Seaman et al., 2021). However, despite these facts, local community members and agribusiness personnel commonly alert Indonesian authorities or NGOs as soon as orangutans are seen in or near croplands, farms, or human developments. NGO practitioners report that government authorities often require them to capture and translocate orangutans as the first intervention, rather than attempting to sensitise humans to improve their understanding of orangutan behaviours and develop conflict mitigation strategies that would enable protecting the animals in place. Although 71% of translocation survey respondents felt orangutans should not be translocated if they were healthy and could be protected in situ by land managers or community members, nearly one quarter of respondents (19%) reported that they could not refuse if the government asked them to move an orangutan. The survey found that about a third of the respondents would leave the animal alone and allow it to move away instead of trying to intervene.

3.1. The role of deforestation and orangutan habitat use in translocation

Deforestation for both industrial and smallholder agriculture and tree plantations is reported by stakeholders as the driver for most human-orangutan conflicts and the resultant demand to translocate animals. Large-scale deforestation has slowed overall in Indonesia in recent years (Gaveau et al., 2022). Deforestation has been low in Malaysian orangutan habitat due to increased habitat protection policies (Simon et al,. 2019), and relatively few orangutans are wild-to-wild translocated there. Analysis of a sample of 104 wild orangutans captured for translocation in Indonesian landscapes shows that the majority of these animals were removed from areas that did not have high forest cover losses within a 5 km radius of the capture site in the years immediately prior to their capture (Figure 6). The sample size was determined by the number of captures for which GNSS location data were available. Median forest cover loss in the year prior to capture was 3% for these 103 cases. Only 5% of the captures for translocation had deforestation rates of 25% or higher in the year prior to the capture. None had forest loss of more than 35%. Except for the few animals that had life-threatening illnesses or injuries, these orangutans could have moved on to other areas (as is normal for roaming males), returned to larger forests on their own, or lived where they were (as is normal for adult females) if they were left undisturbed by humans. This analysis seems to indicate that in many cases translocation is not directly related to high deforestation in the year immediately prior to capture.

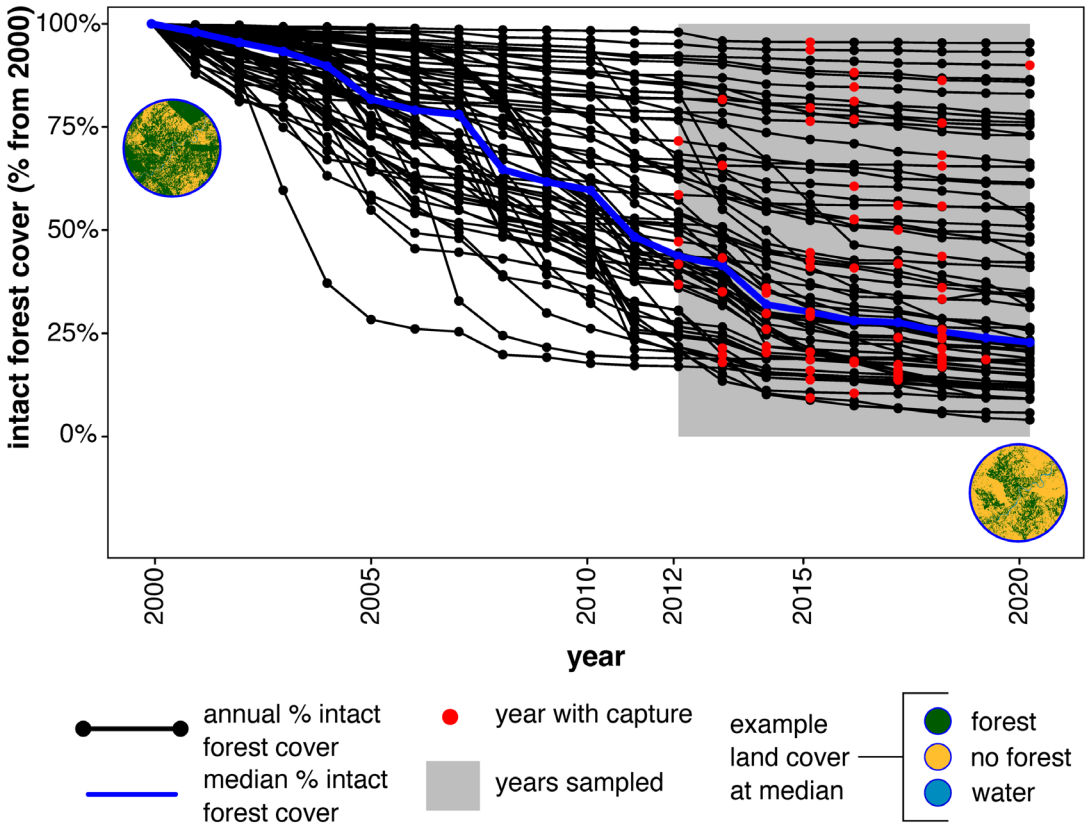

Figure 5. Percentage intact forest from 2000 to 2020 for GNSS capture sites. Percentage annual intact tropical moist forest cover (black dots) between 2000 and 2020 was derived from Vancutsem et al. (2021). Annual tropical moist forest layer (at 30 m resolution) calculated within a 5 km buffer around the capture sites (n = 104 cases) in comparison to landcover in 2000. Red dots indicate the years in which wild orangutan captures for translocation took place at that location. Grey shading of plot indicates years with capture site data available. Absence of data outside this range does not indicate absence of translocations. The blue line indicates the median percentage forest cover across all capture sites. The land cover in the circles represents an example configuration at a location with median forest cover in 2020. Intact and degraded tropical moist forest, and regrowth, were combined into a single forest class (green). Remaining areas are either not forested (yellow) or water (blue). Source for forest cover: EC JRC (Sherman et al., 2025).

However, forest loss is still happening in orangutan range. Although smaller in scale than past clearing trends, these losses are occurring in places that are critically important for orangutans, including inside protected areas (The Tree Map, 2023). Deforestation that is reducing the size of large forested orangutan strongholds, and removing forest patches and large trees in fragmented forests and agricultural landscapes, has extensively reduced the forested areas that have maintained orangutan metapopulations for several decades (The Tree Map, 2023; Voigt et al., 2022). For example, Rawa Singkil in Sumatra saw a 12-fold increase in deforestation from 2021 to 2022 (The Tree Map, 2023). Protecting remaining forest areas that have resident orangutans or are used by roaming orangutans is urgent and should remain the priority for species and metapopulation conservation. Habitat protection has also been shown to be the most effective orangutan conservation investment (Santika et al., 2022).

To further investigate the forest change context of wild orangutan captures for translocations, we visualised the forest-cover changes between 2000 and 2020 at sites where 104 orangutans were captured in Indonesia, using a buffer of 5 km around the GNSS capture coordinates. The 104 orangutans represent all instances where GNSS coordinate data were available (in many of the cases, multiple orangutans were captured at the same site). The 5 km buffer is based on the minimum distance orangutans are known to travel into plantations and other human-altered landscapes (M. Ancrenaz, unpublished data; Ancrenaz et al., 2021; Seaman et al., 2024). This investigation confirms that while overall forest cover loss has slowed, smaller-scale changes in orangutan habitats continue to decrease the amount of forest available across orangutan species distributions, and cumulatively have resulted in the clearing of many unprotected forests and forest patches where orangutans were previously resident. This forest loss in turn reduces available food resources for orangutans and other wildlife.

To examine forest change at a scale meaningful for orangutan movement, we considered nine sites with GNSS coordinates (five in Sumatra, and four in Borneo) where a total of 12 orangutans were captured. A 5 km buffer around each capture site was used to visualise the area where these animals could move prior to capture, and how that habitat changed following the animals' removal (Appendix II, Figures 1 and 2). The nine capture sites were selected based on GNSS data availability and cover all three orangutan species and the translocation scenarios described below. Tropical moist forest, degraded forest, and forest regrowth from Vancutsem et al. (2021) were combined into the "forest" class to easily visualise forested and non-forested areas. Overlapping areas hint at the extent to which multiple captures for translocation affect local orangutan metapopulations. Visualisations of sites 1, 2, and 3 are presented below. Visualisations of sites 4–9 are presented in Appendix II.

- Site 1: A smallholder oil palm and rubber plantation with a population of healthy Sumatran orangutans that had been foraging in the plantations for several years. An adult male and a juvenile male from this population were caught and translocated (Figure 6)
- Site 2: A previously translocated, healthy adult male Tapanuli orangutan was recaptured at this site alongside a road after he returned here (Figure 7)
- Site 3: A community rubber plantation where orangutans were sighted. A healthy Southwest Bornean adult female and infant were captured and translocated (Figure 8)
- Site 4: Durian (*Durio* sp.) and langsat (*Lansium domesticum*) gardens at the edge of protected forest where an adult male Sumatran orangutan was reported to be seasonally foraging. The farmers reported shooting the animal with air rifles to discourage crop foraging. The injured male was removed for medical treatment and later translocated (Appendix II, Figure 3)
- Site 5: An isolated area considered at risk for deforestation with a healthy Sumatran orangutan population. Two adult females were translocated from this site (Appendix II, Figure 4)
- Site 6: A salak fruit (*Salacca zalacca*) plantation where a seriously injured adult male Tapanuli orangutan was reported. The male was removed for medical treatment (Appendix II, Figure 5)
- Site 7: A pineapple (*Ananas* sp.) garden near Kutai National Park where an injured orangutan was reported to have been foraging. The juvenile male Northeast Bornean orangutan was gravely injured from air rifle shots and was removed for emergency care (Appendix II, Figure 6)
- Site 8: A durian garden that a healthy adult male Southwest Bornean orangutan was reported to be "disturbing". The male was captured and translocated (Appendix II, Figure 7)
- Site 9: Land near a power plant and uninsulated electrical wires where a healthy adult male Southwest Bornean orangutan was sighted. He was captured and translocated (Appendix II, Figure 8).

In each of the nine scenarios, the orangutans were in an area where they could have travelled between forest patches and intact forest, or among degraded forest landscapes in which they were currently living. Some of these forests were cleared or degraded two to four years after the orangutans were removed, suggesting that orangutan translocation may have adverse impacts on forest retention (e.g. by making it politically or morally easier to clear forest areas once the protected animals are removed). In six of the nine scenarios (67%), the orangutans were not at immediate risk, and their translocation had high risks of negative impacts for the individual orangutan's welfare and for species conservation. In these six cases, the precautionary approach would be to leave these animals in place and protect them by working with local communities and companies rather than moving them. In three other scenarios (33%), the orangutans were at immediate risk of death due to injuries caused by humans (not directly related to forest loss), and no alternative actions were feasible to protect their lives or health. In these three scenarios, the risk of leaving them in place was greater than that of capturing them to provide emergency medical treatment.

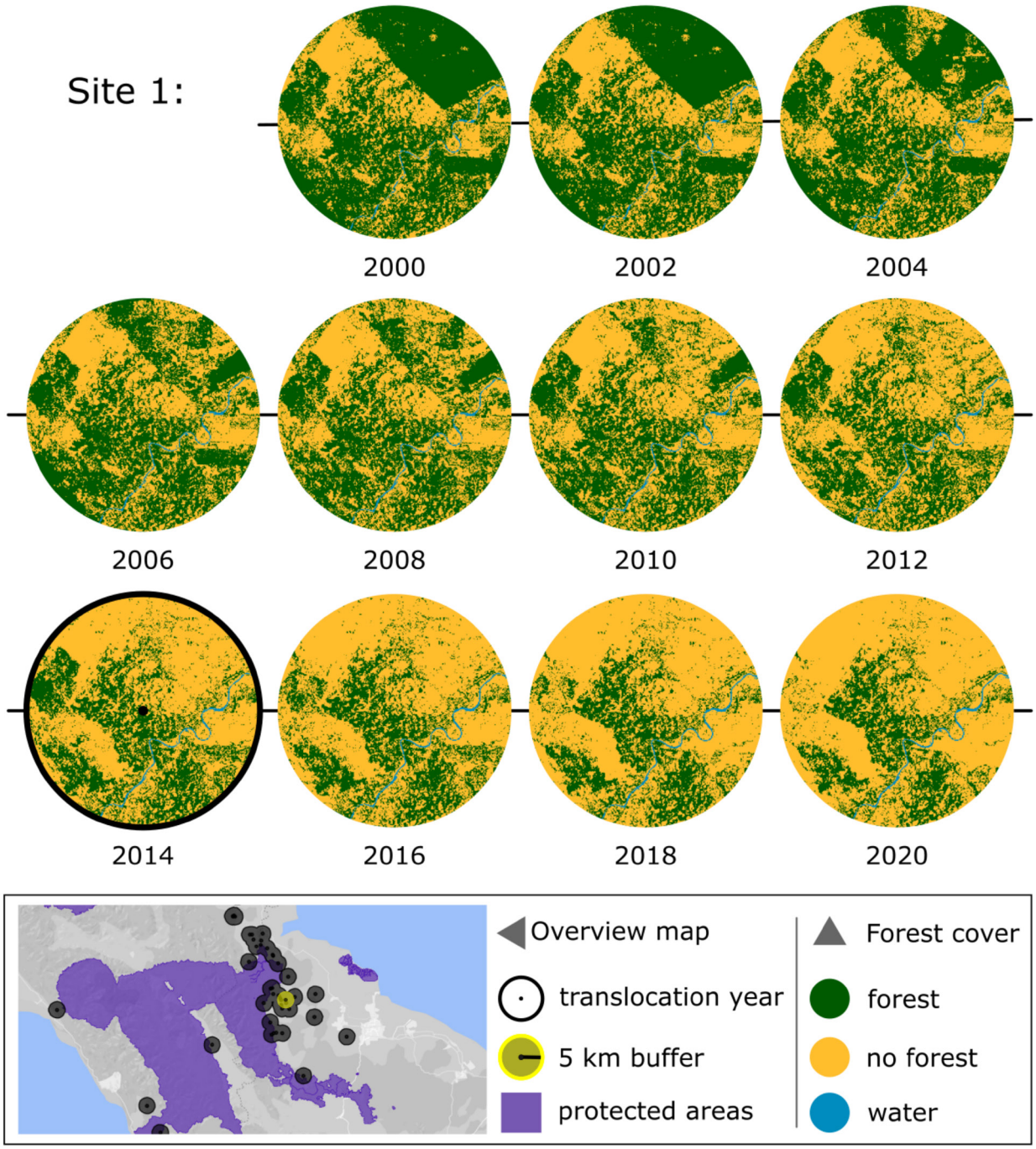

Figure 6. Forest change in area surrounding orangutan capture for translocation – site 1. A breeding population of healthy Sumatran orangutans were in a smallholder oil palm and rubber plantation; an adult male and a juvenile male from this population were caught and translocated. Year of capture (2014) is indicated with a thick-black-bordered circle. Intact tropical moist forest, degraded tropical moist forest, and regrowth are combined into a single forest class (green). The map inset at the bottom is the location of the specific capture site and buffer (yellow) along with other locations where orangutans were captured for translocation (black). Basemap: Google Earth Engine. Forest map: EC JRC (Sherman et al., 2025).

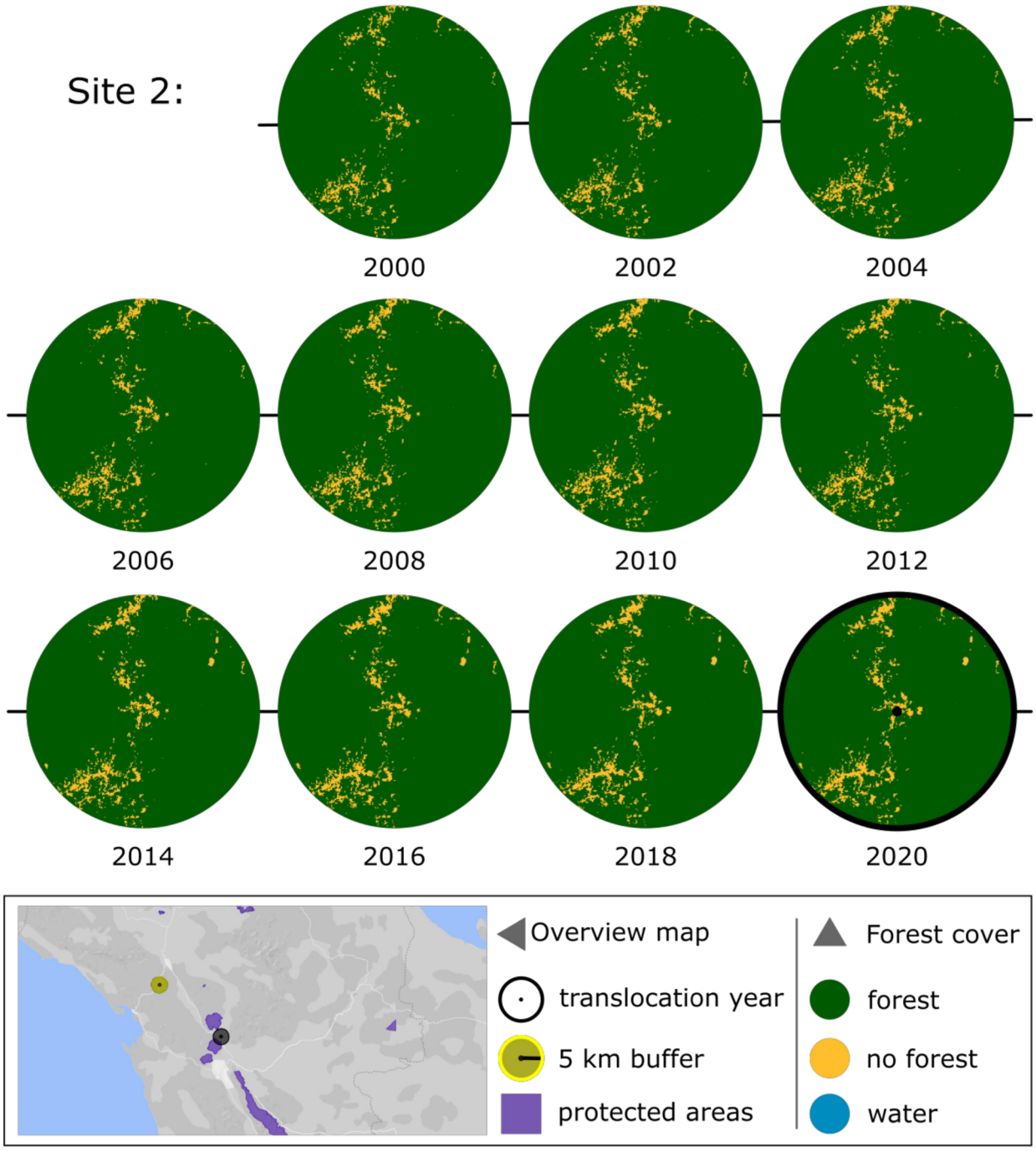

Figure 7. Forest change in area surrounding orangutan capture for translocation – site 2. Recapture of a previously translocated, healthy adult male Tapanuli orangutan that had returned to original capture area (alongside a road). Year of capture (2020) is indicated with a thick-black-bordered circle. Intact tropical moist forest, degraded tropical moist forest, and regrowth are combined into a single forest class (green). The map inset at the bottom is the location of the specific capture site and buffer (yellow) along with other locations where orangutans were captured for translocation (black). Basemap: Google Earth Engine. Forest map: EC JRC (Sherman et al., 2025).

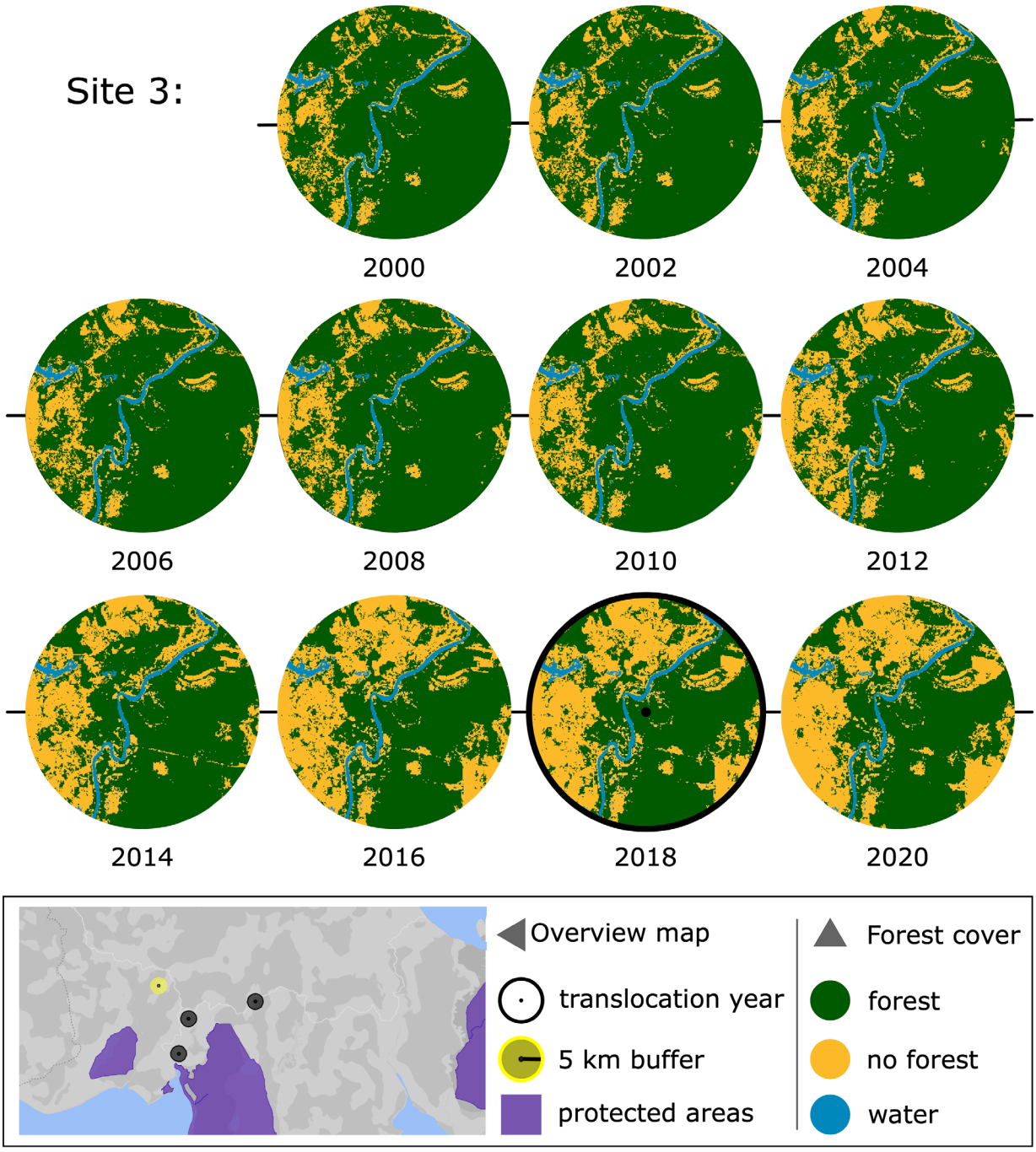

Figure 8. Forest change in area surrounding orangutan capture for translocation – site 3. Healthy Southwest Bornean adult female and infant seen in a community rubber plantation. Year of capture (2018) is indicated with thick-black-bordered circle. Intact tropical moist forest, degraded tropical moist forest, and regrowth are combined into a single forest class (green). The map inset at the bottom is the location of the specific capture site and buffer (yellow) along with other locations where orangutans were captured for translocation (black). Basemap: Google Earth Engine. Forest map: EC JRC (Sherman et al., 2025).

Translocation of healthy orangutans

At site 1 (Figure 6), two healthy orangutans were removed from a site where they had been surviving and breeding for some time. Their crop foraging in the area was long known and somewhat tolerated (although one animal had previous air rifle shot wounds when he was captured), but the local community said the foraging was escalating or no longer tolerable. Captured orangutans were separated from related females and their social connections because practitioners could not locate and capture all the orangutans in the area. The social composition of the group of orangutans was thus completely disrupted following the translocation of the captured orangutans.

The orangutan at site 2 (Figure 7) was recaptured because he was seen alongside a road in the area he had originally been translocated from. He was captured at this site for the first time due to crop foraging activities, which he was guessed to be doing because of food competition with monkeys. In fact, wild orangutans are familiar with and can manage competition with sympatric primate species, such as by having broader dietary flexibility (Marshall et al., 2009). Managing interspecific competition is a natural part of wild animals' lives and does not constitute a need for translocation.

At site 3 (Figure 8), the female and infant orangutans were removed from their social connections (related females and infants) in a large, forested area. These individuals were captured because they were reported as living in or visiting a community plantation. No alternative solutions to build coexistence and avoid translocation were reported to have been attempted prior to the removal of the animals.

At site 5 (Appendix II, Figure 4), the animals were healthy, surviving and breeding, and did not appear to be in any immediate conflicts with humans. The adult female was translocated, but the juvenile travelling with her was not because he or she was not captured. The fact that this juvenile was still travelling with an adult female (presumably his or her mother) indicates that he or she was not yet fully independent, and the female should not have been moved away from him or her.

The orangutan at site 8 (Appendix II, Figure 7) was removed from an area with significant deforestation, where he was nesting in a smallholder's durian plantation. Male orangutans are known to travel very long distances from their natal range, even 100 kilometres or more in rare cases; this individual had access to large forest patches within 5 km. Because the animal was healthy there was no indication that he needed to be moved to survive.

The orangutan at site 9 (Appendix II, Figure 8) was in a potentially risky situation because he was near a power plant and uninsulated electrical wires. Power lines and junction boxes can be insulated to prevent injuries to wildlife (and indeed these electrical infrastructures threaten many species beyond orangutans), which is the only long-term solution as electricity is a vital and ever-expanding part of human developments and increasingly encroaches on natural habitats, including those in protected areas.

Rescue of injured orangutans

At sites 4, 6, and 7 (Appendix II, Figures 3, 5, and 6), the orangutans were at immediate risk due to severe human-inflicted injuries sustained when people attempted to drive them away from crops. The orangutans from sites 6 and 7 did not survive long after their capture despite emergency medical intervention. This highlights the value of rescue centres' regular practice of prompt responses to conflict reports, and the importance of monitoring potentially injured orangutans to determine if they are at immediate risk.

Conclusion and recommendations based on capture site forest cover analysis

Taken together, these nine cases underscore both the urgency and opportunity of finding locally acceptable solutions to protect orangutans in place rather than translocating them. In each of the nine cases, the orangutans were captured from a block of intact or degraded forest, or at the edge of one of these blocks, from which they could have travelled back into larger forest blocks or protected forest areas if local residents and landowners/managers were willing to accept their presence and potential impacts to crops. Creating this move towards better acceptance of coexistence will require addressing human concerns and fears about orangutans, sensitising local communities and land-owners/managers to normal orangutan behaviours including periodic crop foraging, orangutans travelling through human developments and across roads, and the expectation of these impacts continuing to increase as the human footprint expands while orangutan forest habitats decrease (Schreer, 2023; Simangunsong, 2022). Many NGOs are already collaborating with local communities and working to find means of improving community well-being while ensuring the protection of forest, orangutans, and other wildlife. Offsetting losses of smallholders' valued crops and their livelihoods will likely be a critical component of success for this effort, as many smallholders can ill afford even small amounts of crop loss due to wildlife. Tackling these challenges is an opportunity that stands to benefit social justice while improving biodiversity conservation, and one that existing organisations working at the interface of wildlife and local communities are well-placed to lead (e.g. orangutan rescue and rehabilitation NGOs, conservation NGOs, tropical ecology research centres, and community development NGOs).

This analysis shows that many orangutans have been translocated out of smaller forests and forest patches outside protected areas, such that many areas have lost reproductively valuable males and resident breeding females, seriously compromising the viability of the metapopulation. Some areas may have been largely emptied of orangutans in response to repeated requests from communities, industry, or government agencies to translocate the animals away from their properties or crops. Protecting and connecting the remaining forests and forest fragments and the small orangutan populations or individual orangutans travelling through these areas is of high priority to maintain metapopulation connectivity and gene flow.

Section 4. Wild-to-wild translocation outcomes

4.1. Post-release monitoring and survival

Orangutans are difficult to follow because they are elusive, mostly silent, and can hide well in the tree canopy. Even if they are equipped with radio-tracking devices, the limited range and relatively short life expectancy of equipment makes monitoring very challenging (Robins et al., 2019). While released females commonly display high site fidelity, males are likely to disperse from the release site or return to it only occasionally (Lokuciejewski, 2019), which makes finding them through implanted radio-tracking devices difficult.

Practitioners surveyed in 2018, reported that they did not collect long-term monitoring data on translocated wild orangutans due to the practical difficulties of following them, but assumed that these animals would do well because, as wild animals, they know how to survive. Practitioners surveyed in 2022, reported that they monitored wild-to-wild translocated orangutans daily, weekly, or opportunistically for periods ranging from two days to one year or more. Animals are tracked by opportunistic sightings or follows, as they are not typically implanted with radio-tracking devices, which require surgery and recovery time in a medical facility. Few data were publicly available on the results of such monitoring.

Between 1992 and 2002, 345 orangutans were released into Meratus, a legally protected forest in South Kalimantan, including at least 63 individuals wild-to-wild translocated in response to forest fires (Siregar et al., 2010). The majority (n=191) of these orangutans were released between 1997 and 1999 (Grundmann, 2006). A 2002 follow-up survey in Meratus located only 11 of those 191 orangutans (6%) (Grundmann, 2006). A survey in 2007 estimated that 30–40 individuals of the 345 released animals remained (9–12%) (Utami-Atmoko et al., 2017), and a 2009 survey found 16–18 individuals (4–5%) (Siregar et al., 2010), but not known is whether any of these were wild-to-wild translocated vs. rehabilitated ex-captive individuals. However, actual survival rates are unknown because survey areas were limited (Utami-Atmoko et al., 2017), and orangutans may have moved to and settled in other locations. Unchecked poaching in this forest, and lack of suitable forest survival skills in rehabilitated and released animals were considered to be major factors in why many may not have survived (Grundmann, 2006; Siregar et al., 2010).

One organisation reported trying daily follows of two translocated orangutans, but they were not able to locate the individuals following release. This is not an unexpected outcome. Public reports suggest that approximately 40% of the rehabilitated and released ex-captive orangutans are positively identified as alive two years following release in both Kalimantan and Sumatra, and only 27% of released animals were confirmed alive after three years (Santika et al., 2022; Sherman et al., 2020). It is uncommon for dead orangutans to be encountered, even where they are followed daily for decades. And it is possible that some of the individuals who disappeared were alive and had simply relocated and established home ranges outside the release or study area, or if fitted with radio-tracking implants, these had ceased to function. Survival rates for rehabilitated ex-captive orangutans may not be directly comparable to those for wild-to-wild translocated individuals.

4.2. Health and welfare of rescued animals

Data used in this analysis showed that 82% of the orangutans captured for translocation were relatively healthy at the time of capture (660 of 808 orangutans between 2005 and 2022 for which health condition information was available (Sherman et al. 2020; Sherman et al. 2021). A further 13% (n=109) were ill or had been injured by humans, other orangutans, or other wildlife. Twenty were starving or emaciated (3%) and another 19 (2%) were considered malnourished to some degree, although it is unclear whether their body condition was outside the range of normal seasonal body weight variation. Overall, these data suggest that most translocated orangutans could survive in their current habitats, including degraded areas or croplands, if protected from killing and capture. Evidence does not support the idea that orangutans seen in plantations or fruit crops are generally starving or malnourished and need to be rescued. Wild orangutan body weight and body condition fluctuate with food availability, and in lean times they may lose a notable percentage of their body weight and even catabolise muscle (O'Connell et al., 2021). Orangutans are known to forage in gardens and agroforestry plantations and may return seasonally or even nest temporarily in these croplands then return to forested areas (Ancrenaz et al., 2021; Oram et al., 2022). They spend up to nine years learning where and when to find food in their natal forest type (Schuppli et al., 2016; van Noordwijk et al., 2018), and moving these individuals means they will almost certainly have a harder time finding sufficient foods than they would have had in their current habitat, particularly if they are moved to a forest type that is unfamiliar (Marshall et al., 2021; Vogel et al., 2015).

Data on orangutan welfare during translocation and following release are rarely published, but available evidence suggests that for wildlife in general, the stress levels associated with capture, translocation and release into an unfamiliar area inhabited by unfamiliar/unrelated orangutans are considerable (Harrington et al., 2013), and can trigger disease and result in harm or death (Dickens et al., 2010; Teixeira et al., 2007). Notably, videos and reports of orangutan captures for translocation show that the pursued orangutans often show signs of extreme stress, including fleeing, screaming, and aggression towards rescuers. One translocation resulted in the captured orangutan having a dangerously high body temperature due to heat stress. Although, in this case, the animal appeared to recover, it is not known how he fared after being moved, and heat stress is known to cause serious health problems and fatalities. Available information on a sample of 166 orangutans rescued for translocation from oil palm plantations found that 19 (11%) died during or shortly after capture (in at least one of these cases, the orangutan was also injured by humans prior to his or her capture for translocation). Not all captures for translocation are successful, and even the attempt may have significant negative welfare effects. There are reported cases of orangutans being chased or even darted with anaesthetic and then ultimately not captured and translocated. The welfare risk to the animals increases if they are already stressed (such as being malnourished, dehydrated, or pregnant, all of which have been recorded in captured animals), and with each subsequent capture or recapture attempt. One orangutan that was recaptured five times required urgent medical care by the time of her fifth capture, although the specific cause for her condition was not reported.

One of the most common approaches to managing conflicts between humans and orangutans is to lure or haze the orangutans back to the forest or away from crops or humans. Researchers studying orangutans in agricultural landscapes have found that making loud noises or creating a disturbance such as yelling, shaking or beating on the orangutan's tree or firing bamboo cannons had negligible success in preventing orangutan crop foraging (Campbell-Smith et al., 2012). Throwing firecrackers or shooting pellets from air rifles can seriously injure or even kill an orangutan; it is also illegal and punishable by law in both Indonesia and Malaysia. Further, making noise, using firecrackers, slingshots, or dogs to drive the orangutan away, or surrounding the orangutan with humans and/or dogs can cause severe stress and can lead to the orangutan freezing in place or acting aggressively to defend itself, particularly if it is on the ground where it feels more vulnerable (Oram et al., 2022; Oram & Segaran, 2023). It is important to recognise that orangutans are not trying to instigate a conflict with people, but instead, for the most part are using a part of their home range or moving between areas that are part of the range they need to use.

Figure 9. Veterinarians attending to an anaesthetised wild Bornean orangutan during a translocation in Malaysia © Hutan

Orangutans may fail to thrive, or may not survive, if they are captured and translocated to unfamiliar habitats. Infants or juveniles travelling with their mothers are still learning how to find food and navigate social relationships, and they are not likely to do well if moved without their mothers before they become completely independent, or if moved into unfamiliar habitat occupied by orangutans they do not know. Adult female orangutans like to live near the range where they grew up, and with related females they know (Ashbury et al., 2020). Adult females will likewise have trouble establishing a new home range as unrelated females do not tolerate each other. During times of low food availability, tolerance is lower among orangutans, even for female kin (Ashbury et al., 2021). Adult male orangutans do not tolerate each other well in most situations, and in some cases will injure or kill each other (Utami Atmoko et al., 2008).

Researchers interviewed on orangutan translocation concurred that moving past-prime males is detrimental to their welfare (Sherman et al., 2020). This is particularly true for those that are coming to the forest edge to crop forage because younger wild males are outcompeting them. Any translocated adult male will have to establish a new home range, which is very stressful. Analysis of 2005–2022 translocation data found that of 705 orangutans captured for translocation with corresponding age and sex data, 54% were adults 15 years or older, of which 25% were adult females and 29% adult males. Even very elderly animals were captured and translocated. Thirteen percent of animals captured were 25 years or older, with the oldest record being a 60-year-old male captured and translocated to a new habitat. The previous sections note how the age-sex class of translocated animals may influence the success of a translocation.

Releasing translocated orangutans in their original home range is expected to have more favourable outcomes than releasing them into an unfamiliar habitat where they do not know when, how, and where to find food, and where the resident orangutans are unknown and probably unrelated to the translocated individual. Difficulties in finding food in an unfamiliar forest would adversely affect survival (Kaye, 2016; Sherman et al., 2020; Vogel et al., 2015).

4.3. Recaptures

Wild-to-wild translocated orangutans have been recorded returning to the areas where they were captured or travelling to other areas with food crops. Data from a one-year period (March 15 2020–March 14 2021) show that 31% of the 26 recorded wild-to-wild orangutan translocations were recaptures of previously captured and translocated orangutans (Sherman et al., 2021). Four individuals were captured, recaptured, and translocated multiple times. One male Bornean orangutan was moved three times over this one-year period. The Sumatran orangutan female that was moved twice during this period had also been captured previously and translocated at least three other times and needed intensive care by the time of the second rescue (KSDAE, 2020). A fourth individual, a flanged male Tapanuli orangutan, was moved once prior to this period and was captured and translocated again in 2020 (Gunawan, 2019, 2020). Repeated recaptures are expensive, a welfare risk for the captured orangutan, and are not a sustainable or practical means to address the conflict situation in the long term.

4.4. Harm or killing of orangutans

Translocation has not saved orangutans from being injured by humans; however, it may prevent further injury and eventual death in cases where orangutans are repeatedly attacked (e.g. shot at, chased, or otherwise threatened). Data on 808 wild orangutans captured for translocation between 2005 and 2022 showed at least 62 (8%) had already been harmed by humans at some point in their lives, generally from being shot at with air rifles, and many had multiple recent bullet wounds. Although practitioners reported that community members and landowners/managers often threaten to kill orangutans that crop foraged, or might do so, this analysis found no records of people who had reported killing an orangutan after they had alerted authorities or NGOs to request that the animal be moved. Although it is possible these animals are later killed and not reported, the willingness of people to alert authorities or NGOs and ask for the animals' removal indicates they are reluctant to simply kill the orangutan themselves to "resolve" the conflict. Additionally, in many cases authorities and NGOs cannot locate the orangutans reported and thus are not able to translocate them, leaving them on site by default.

An additional important consideration is local community perceptions of orangutans. Orangutan wild-to-wild translocations must be seen in the context of human and orangutan habitat overlap. Human-orangutan conflicts are increasing as human-driven land-use changes spread into the orangutan range (Kuswanda et al., 2021; Oram & Segaran, 2023; Simangunsong, 2022). It is not ethical, practical, or feasible to move all orangutans encountered in these mixed-use landscapes. Continued translocations from these landscapes would have serious negative conservation and welfare consequences for wild orangutan populations and the translocated individuals. In addition, a number of these animals will repeatedly return to areas and crops they have used previously and would require repeated translocations, which

is not a sustainable long-term solution. Hence, the only plausible and viable long-term solution is for the funding and effort allocated by governments, organisations, practitioners, researchers, and donors to be focused on building understanding of what is needed for people to coexist peacefully with orangutans and supporting them with the necessary information and resources to do so, while also enforcing laws, regulations, and corporate sustainability standards that prevent clearing of orangutan habitat and harming, killing, capturing or trading orangutans.

4.5. Metapopulation dynamics and conservation

Translocation of viable populations

Several large-scale translocations of wild orangutans have been reported, apparently involving wholesale movement of viable orangutan populations into unfamiliar habitats. These include 983 orangutans moved from Makin Group plantations (Asrianti, 2011), 75 from the Wilmar Group (Aji, 2011), 166 from Makin Group (rescue centre data, 2014) and 77 from the Mangkutub River (Kaye, 2016). Some formerly forested areas in Sumatra have been similarly emptied of all capturable orangutans through a series of translocations over several years, and several hundred orangutans were translocated into Tabin Wildlife Reserve in Sabah, Malaysia, from forests cleared for massive oil palm plantation expansion during the 1980s and 1990s (A. Tuuga, pers. comm.).

A 2017 population and habitat viability analysis (PHVA) estimated that populations of as few as 50 orangutans meet the minimum viable population standard if they have space to increase their numbers, their habitat is effectively protected and they are not hunted (Utami-Atmoko et al., 2017). In Kalimantan alone, at least three orangutan populations of more than 50 individuals have been moved since 2007. Moving such populations to facilitate clearing means the original habitat is lost to orangutans and other wildlife, and the total amount of available orangutan habitat is decreased. Adding orangutans to any unfamiliar habitat is also a serious concern, given the risks of decreased welfare and death of the translocated individuals. In situations where a large number of orangutans are moved into any habitat with a resident population, there are also risks of increased competition and potentially lowered birth rates of the existing resident orangutans, and/or of exceeding carrying capacity in the release habitat (Kaye, 2016).

Release of translocated orangutans into viable populations

Records indicate that wild-to-wild translocated orangutans are often released into sites with existing viable orangutan populations that do not need supplementation, including Tanjung Puting, Gunung Palung, Kutai, and Gunung Leuser National Parks and the Mawas conservation area (Utami-Atmoko et al., 2017). Releasing orangutans from other areas into these populations is likely to cause undue social disruption and competition between the translocated and resident orangutans for food, nesting locations, and mates. These translocations also have the potential to transmit infectious pathogens to the resident populations and, if the translocated orangutans are from a different subspecies, cause negative genetic effects. Unless the translocated orangutan is released back into a site that is part of its current home range or close to its capture site, the translocation poses considerable risks and thus violates the precautionary principle to prioritise the protection of wild orangutan populations.

Translocation of adult males

Adult males (15 years or older) were the most commonly translocated age and sex class in the dataset analysed for these guidelines. Male dispersal and ranging patterns make them more at risk of both conflict with humans and being captured for translocation during their travels. It is natural behaviour for unflanged and flanged males to roam widely across the landscape, avoiding competition with other males and looking for breeding opportunities and food (Nietlisbach et al., 2012; Oram et al., 2022; Utami Atmoko et al., 2008). Because flanged males are aggressive towards each other (Utami Atmoko et al., 2008), translocating flanged males puts any flanged males at the release sites at risk of aggression, injury, or death. Unflanged males are less likely to cause fights between individuals, but will still likely cause social disruption and competition for natural resources in the release habitat. These unflanged males are likely to eventually move away from the release habitat and may end up revisiting the area from which they were removed or entering other croplands. The appearance of male orangutans in isolated forest fragments, travelling across unforested areas, plantations, roads, or around human communities (including walking on the ground) does not mean these animals are lost, injured, or desperately malnourished. If an orangutan is not fleeing areas being cleared or fires in or adjacent to the site where they are encountered, we can assume that this individual came to the location on purpose, of their own volition, and is likely travelling to seek new breeding opportunities or feeding sites. Orangutans may be found many kilometres inside plantations and far from large forests when they are searching for mates. In the case of plantations with mature oil palms, forest

patches have been in place for many years so, if a resident female has been living there, it is likely that the male is entering this forest patch to check her sexual status. Disrupting the male orangutan's behaviour and moving him to an unfamiliar location will only serve to make him actually lost (Oram & Segaran, 2023). Importantly, removing these breeding males from the areas where they are ranging is likely to cause serious disruption to the metapopulation gene flow and functions (Ancrenaz et al., 2021). The precautionary principle, which prioritises the health and function of the species populations in the wild, indicates that the appropriate course of action is to protect these orangutans where they are, including in human-modified landscapes, avoid disturbing them, and enable them to continue roaming throughout their home range.

Translocations of infants or juveniles without their mothers, or translocations of mothers away from immatures travelling with them

Translocations have included the release of dependent immatures (orangutans 6 years or younger, generally) into unfamiliar habitats without their mothers, generally because the mothers could not be captured or had previously been killed, and the immature's behaviour was considered "wild" and thus deemed suitable for translocation. Although wild orangutan infants will naturally act "wild" and likely display discomfort with humans, this does not mean they can live independently – infant orangutans are dependent on their mothers for survival for the first several years of their lives, especially in unfamiliar habitats. Orangutans continue to learn from their mothers about what to eat, when, and how to process foods, and they solicit solid foods from their mothers despite being able to venture away and feed on their own until they are weaned at 5–7 years old (van Noordwijk, 2008).

Older immature orangutans travelling with adult females have also been separated by translocations. They are likely to be older offspring of the female and are relying on a relationship that is valuable to them (Oram et al., 2022). These orangutans should not be separated by translocating either the adult female or the immature(s) into separate habitats. They demonstrably have an important social relationship, and disrupting it may undermine the immature orangutan's ability to obtain adequate nutrition and learn social skills and appropriate behaviours. The principles of precaution mean that these risks should be avoided by leaving the orangutans in place and working with local communities and businesses to accept orangutan presence.

Translocation of resident females into unfamiliar orangutan populations

Adult females were the second most commonly translocated age and sex class, despite their having strong attachment to the sites where they live, and intolerance between unrelated females (Ashbury et al., 2020; van Noordwijk, 2008; van Noordwijk et al., 2012). Capturing and moving females into unfamiliar habitat occupied by unfamiliar orangutans is likely to provoke resident females to be aggressive towards translocated females at feeding sites (van Noordwijk et al., 2012). This could generate significant social stress and could result in translocated females being unable to access adequate food resources. The precautionary approach dictates that females should be protected in place where they can forage, breed, and raise infants in a familiar home range in the social groupings they have already established.

4.6. Orangutan habitat and ecosystem impacts

Removal of orangutans from forests may facilitate land clearing, as noted earlier. Although the overall amount of land clearing has slowed in Indonesia in recent years, forest loss in the orangutan range is still occurring, decreasing the total available habitat for orangutans as well as for other forest-dependent wildlife. An example from Kalimantan illustrates how translocations can result in losses of both orangutans and habitat. Nine orangutans were captured in February 2013 to address "a critical land-clearing situation" by an oil palm concession holder in a peat swamp area (FORINA, 2014). Satellite land cover photos show that a large area of forest where the orangutans used to be found was cleared after 2013. Following the removal of the nine orangutans, it was alleged that at least 13 orangutans living in this habitat patch were killed when it was cleared (COP, 2014). The total orangutan population in the area was not known. The captured orangutans were held in captivity for a full year until a release site could be identified to accommodate them (Redapes.org, 2014). This outcome calls into question the effects that removing a few orangutans from an area where they were not wanted has on the protection of the local orangutan population as well as the area's metapopulation, and to what extent removing orangutans enables companies, smallholders, and other entities to clear forests. Precaution, and the laws protecting the species, mean that the priority is conserving all remaining populations, even those found in mixed-use landscapes or dispersed across fragmented forests, rather than translocating individuals and potentially facilitating the loss of more forest habitat for these Critically Endangered species.

4.7. Human perceptions of orangutan management and conservation

The intention of wild-to-wild orangutan translocation is to protect individual animal's lives and to reduce conflict between orangutans and humans. However, in the vast majority of cases, it is doubtful that these interventions have resulted in the desired outcome of widespread tolerance for orangutan crop foraging and achieving safe coexistence with humans. Stakeholders surveyed for these guidelines indicated that local residents would prefer to have orangutans removed or scared away (57%), or even killed (5%) if they are crop foraging, while 19% said residents would report the orangutans or seek some assistance to deal with them, and only 10% said local residents would live peacefully alongside orangutans without moving them.

The dataset collected for these guidelines, which enumerated the captures of a minimum of 988 wild orangutans for translocation – including multiple translocations from the same villages or concession – underscores that translocation is draining wild populations and not resolving the root causes of conflict. Improved understanding of people's perceptions of orangutans and targeted interventions that improve human well-being while leaving orangutans in place will be critical to alleviate this major conservation concern. Studies show that local community members see crop consumption by orangutans or potential orangutan-human conflicts as problems the government is obligated to solve by moving the orangutans away (Chua et al., 2021; Sherman et al., 2020; Sherman et al., 2022) or that require interventions to reduce or mitigate economic losses incurred by orangutan crop foraging (Kuswanda et al., 2021; Maskulino et al., 2021). Interventions conducted for a short time then abandoned can stoke resentment (Chua et al., 2021) and lead to lower tolerance of the translocated animals and for conservation of the species in general, regardless of intensions. Also, the funds and efforts spent on orangutans in areas with high human poverty can lead to perceptions that orangutans are more valued than humans, unless they are balanced by commensurate endeavours to improve human well-being (Beech, 2019; Chua et al., 2021; Maskulino et al., 2021; Schreer, 2023).

Figure 10. Safe, responsible translocations require collaboration between government agencies, NGOs and local community members © Hutan

Section 5. Best practice guidelines for orangutan wild-to-wild translocation

When is translocation a responsible choice for species conservation and the welfare of the individual animals?

5.1. Determining translocation suitability

The circumstances of each orangutan should be carefully considered to determine if translocation is a responsible and appropriate intervention (Table 1). In general, orangutan captures and translocations pose high risks of poor welfare and low survival outcomes for both translocated orangutans and resident orangutans at release sites and are very likely to compromise the viability of orangutan metapopulations. Both primary forest and degraded forest areas from which orangutans are removed may be deforested following translocation, diminishing the overall amount of orangutan habitat, and destroying the breeding sites and homes of resident females plus breeding opportunities for travelling males.

Table 1. Recommendations for action based on orangutan age, sex, social situation, physical condition and threat status

Recommended actions based on human context and habitat threat status
• Focus on prevention rather than intervention. It is critical to identify the risk level of the situation where the orangutan is found. All efforts need to be made to maintain and protect the orangutan in the location where he or she is found, including enforcement of laws, policies and sustainable commodity production standards, improving understanding of orangutan behaviour and land use, and support for local communities affected by orangutans. Both transient and resident individuals should be protected in the areas they are using unless their lives are at immediate risk there.
• If people are actively trying to kill, injure, or capture a wild orangutan, the first course of action should be to apprise involved persons and/or businesses about the illegality of these actions, and to work with them to address the conflict in non-lethal ways without translocation. Orangutans are fully protected throughout their range in Indonesia and Malaysia, and their harm, killing, or capture is punishable under existing conservation laws. Governments have authority to enforce these laws in cases where businesses and/or individuals are unwilling to comply.
• Protect orangutans in fragmented habitats and preserve and (re)connect fragmented forests and isolated forest patches. Protect orangutans in place by preserving forested areas in agricultural or agroforestry plantations, logging concessions, cropland, farms, and community forests. Improve understanding of how orangutans use mixed landscapes, particularly that orangutans will visit crops even where corridors and large forests are available.
• Clearing orangutan habitat is illegal in many instances. Laws and local policies protecting these habitats should be enforced. Check relevant laws and policies and use legal means to prevent clearing.
• Develop suitable community-led coexistence strategies, involving regular on-the-ground monitoring and developing understanding and incentives (as necessary) for the community to accept coexistence.
• Development of new roads or infrastructure in orangutan habitat is not recommended. Instead, develop over-passes and/or aerial bridges for existing roads and other infrastructure to allow orangutan movement.
• Develop and implement suitable coexistence strategies for and with local communities, businesses and other stakeholders instead of translocating orangutans that are not at immediate risk.
• Orangutans under immediate threat from clearing that is already underway, or death/injury by humans should be translocated to a nearby safe forest area of the same type, and, if possible, into a community of related orangutans.

Recommended actions based on orangutan age, social relationships, condition, and taxonomic identity

- Infants and immatures travelling with an adult female should be kept together. Any healthy infant or juvenile orangutan is, or was very recently, under the care of their mother. If it is not certain the mother was killed, it cannot be assumed she is dead even if she cannot be found. Healthy infants or juveniles should be left in place and monitored from a distance of at least 50 metres to allow the mother to come back for them. If the mother does not appear within 24 hours, the infant or juvenile will need to be placed in an orangutan rehabilitation centre.
- Healthy adolescent or adult females should be protected in place and not translocated unless their lives are at immediate risk. Because female orangutans are strongly attached to the home ranges they have selected and are intolerant of unknown females, they that cannot be released back into or very near their home range should not be translocated into a new area where resident adult females are unrelated to the newcomer.
- Healthy males should be protected in place and not translocated unless their lives are immediately at risk. Flanged males should not be translocated into areas regularly occupied by other flanged males because they do not tolerate each other in proximity, and releasing an unfamiliar flanged male may result in aggression, injuries, or even death of the released or resident males. Unflanged males should be left alone to travel across the landscape.
- Past-prime flanged males who are crop foraging or foraging at the forest edge should be protected in place and not translocated. Past-prime flanged males should not be translocated into areas with other flanged males. If people are actively trying to kill, injure or capture a past-prime male, the first course of action should be to work with government and community members and/or businesses to address the conflict in non-lethal ways without translocation.
- Orangutans should only be translocated into a forest type that is represented in their current home range (some orangutans are from a habitat encompassing more than one forest type, but should not be translocated into a forest type that is unfamiliar to them).
- It is important to stop attempting to follow, capture, or translocate orangutans exhibiting undue stress or exhaustion. Orangutans can become seriously ill or die of stress-related illnesses or exhaustion. Abandon attempts to follow, capture, or translocate the individual and instead protect them in place. If possible, keep people and domestic animals away to allow the orangutan to move away on their own.
- Translocate orangutans only into populations of the same species (and subspecies, in the case of Bornean orangutans).
- Wild orangutans that appear ill or have injuries likely from natural causes should not be captured. Wild orangutans contract illnesses and injuries as a natural part of life and should be left alone to recover (or not). These are natural processes and are not a reason to intervene.
- Orangutans that are visibly in dire condition due to human-inflicted injuries (e.g. severe bullet or machete wounds or a cable snare) and in need of immediate medical care, should be captured and transferred to specialised rehabilitation centres. If all other conditions in these guidelines are met, translocation may be considered following treatment, recovery, and suitable disease and behavioural screenings. The orangutan should be released into the same area it was captured from, if possible. Investigation to find and prosecute perpetrators of illegal harm to orangutans is important to discourage additional crimes affecting these Critically Endangered animals.
- If an orangutan is thought to be injured by humans, they should be monitored, if possible, to assess his or her condition, for at least five days, while maintaining a distance of at least 50 metres to allow the orangutan to move. If the orangutan is mobile and eating, they do not need to be captured and treated or translocated.
- Orangutans appearing underweight or malnourished generally do not need care unless their condition seems dire. Only individuals who appear at immediate risk of not surviving should be captured and translocated. Wild orangutans naturally have fluctuating weights, including dramatic weight loss and even ketosis during times of low fruit availability. Monitor the orangutan (from a distance of at least 50 metres to allow him or her to move and feed) and assess his or her surroundings to determine if intervention is appropriate.

Source: Prepared by the report authors

In situations of existing or potential human-wildlife conflicts, priority should be given to working with local communities, plantations, corporations and other land managers to find solutions to improve their tolerance for orangutan presence and habitat use (including in crop areas) and protecting wild orangutans in place rather than removing them. In cases where removal is necessary due to immediate risk to the orangutan's life, releasing them near their home range is most likely to have conservation benefits for the species in the wild and to avoid harm to populations and ecosystems. However, it is very likely that the orangutan will continue to return to the capture area to forage if appealing foods are still available. Preventive actions and mitigation measures are the preferred solution to address such conflicts. One of the most common approaches to conflicts between humans and orangutans is to make noise or other disturbances to scare the orangutan back to the forest or away from crops or humans. Not only do these methods often become ineffective over time (orangutans are intelligent and become immune to deterrents), they can also stress the orangutans and may result in them behaving aggressively towards humans to defend themselves. It is best to give orangutans space and monitor them from a distance to allow them to move freely.

Identification of suitable release habitat should be done **prior** to capture for translocation, to avoid removing individuals from wild populations only to keep them in captivity. Suitable release habitats are: (1) in the animal's home range (if known) or five kilometres or less from where the orangutan was captured; (2) a habitat with a reintroduced population of the same species (and subspecies, for Bornean orangutans) in an area within the current species range and where orangutans were formerly extirpated; or (3) habitats that have been surveyed recently for orangutans and have either no extant or only a small resident orangutan population that would benefit from reinforcement.

In all cases of capture and translocation, orangutans should be handled and transported using appropriate disease prevention measures, such as gloves, masks and sanitation protocols, to prevent the transfer of pathogenic agents (Gilardi et al., 2015; IUCN SSC, 2021; Setchell & Curtis, 2011; Sherman et al., 2021). All orangutans that have been held or transported by humans, or confined with other wildlife or domesticated animals, need to be assessed for injuries and diseases of concern before they can be considered potential candidates for translocation (Jakob-Hoff et al., 2014).

5.2. Responsible and irresponsible translocation

There are limited circumstances where a wild-to-wild translocation will pose relatively low risk to the orangutan metapopulation and conspecific populations at the release site while also creating a higher likelihood of the individual orangutan's survival and positive welfare than leaving it in place (Table 2). In these circumstances, the life of the orangutan is at immediate risk (versus potential risk that could be mitigated or avoided with alternative interventions), and the orangutan can be released within a few kilometres of the area where it was captured. Translocation is never entirely free of risk for the translocated individual, the orangutan metapopulation it is removed from, or the orangutan population resident in the release habitat. Removal of orangutans from the habitats they know (including the sites they are found in when translocation is being considered) will always have welfare costs for the translocated individual owing to the stress of its capture and transport and, if moved to an unfamiliar habitat, the necessary learning process to find food and navigate new social situations. There is also an unavoidable conservation cost to removing orangutans from the metapopulation they are part of, unless they can be released back into the same area/metapopulation. In accordance with the precautionary principle, wild-to-wild translocations should be avoided in all but the most exceptional circumstances; the focus of effort and financial investment should instead be building the capacity of local communities to tolerate orangutan presence without removing them. In the circumstances outlined in Table 3, capturing and treating or moving the orangutan could address immediate threats to his or her life and thus provides the best likelihood for his or her survival, and releasing him or her back into their home range (if known), within a few kilometres of the capture site, or into a reintroduced population in the historic species/subspecies range (technically a reintroduction, not a wild-to-wild translocation), would pose the lowest risk to the orangutan populations.

Table 2. Responsible translocation scenarios

Source of orangutan	*Responsible wild-to-wild translocation characteristics*
Orangutan is in a life-threatening conflict situation: • Orangutan has been displaced from its habitat by a flood, fire, or immediately ongoing clearing event, in a setting where they are 5 km or more from forested habitat or • People are trying to kill or capture the orangutan despite law enforcement intervention and the safety of the animal cannot be assured	**The release habitat is one of the following:** • in the orangutan's home range or 5 km or less from where the orangutan was captured • has a reintroduced population that is being established in an area in the current species' range where orangutans were formerly extirpated • has been surveyed recently and has a very small resident orangutan population which would benefit from reinforcement
	Taxonomic identity • The orangutan is the same species (for Sumatran and Tapanuli orangutans) or subspecies (for Bornean orangutans) that is native to the release habitat
	Health and welfare • Disease assessment/examination has been conducted and determined that the orangutan is free of pathogens of concern and clinical signs of illness • The orangutan is able to move and behave normally for its age and sex • The orangutan is old enough to be independent, and is not being separated from its parent or a dependent infant by the translocation • A post-release monitoring plan is in place
	Habitat management • The release habitat is managed to prevent poaching and deforestation, and local residents and businesses are willing to tolerate orangutans without translocating, hazing, killing, or harming them • Human communities in the release habitat are aware and supportive of the translocation
	Habitat suitability • The release habitat has been studied and has sufficient foods to sustain the resident orangutan population, the translocated individual, and other sympatric species whose diets overlap, without posing undue social stresses or competition for natural resources

Source: Prepared by the report authors

Other than in the circumstances described in Table 2, or in the case of an individual with severe human-inflicted injuries that needs immediate rescue and emergency care, wild-to-wild translocation is not recommended because of its high risks to the individual translocated and to the species and metapopulation. Wild-to-wild translocations that do not meet the circumstances in Table 2, would be at odds with the precautionary principle and the tenets of conservation translocation, which require that there is benefit to the species or the ecosystem (see Table 3). Although most wild-to-wild translocations are undertaken to protect wild orangutans from potential harm from land clearing or conflict with humans, capturing and moving wild orangutans away from these threats does nothing to resolve the underlying threats to them; neither does it help people adjust to the modern reality of the overlapping use of forests and agricultural lands by both humans and orangutans. All orangutan species are threatened by forest loss and offtake through killing and capture, and these threats require changes in land-use management and human tolerance of orangutans, respectively. Removing an orangutan from his or her familiar habitat and metapopulation has more risks than benefits for that individual's welfare and for the species.

Table 3. Irresponsible translocation scenarios. Immediate risk = seriously injured by humans, imminent risk of death from fire, flooding, or immediately ongoing clearing and more than 5 km from forests or forest patches

Problematic practices	*Potential negative consequences*
Translocation into conspecific populations where released individuals could be deleterious to behaviour, breeding, and health/well-being of resident animals	• Not a long-term solution—many translocated individuals return to capture sites and resume crop foraging • High risk of social disruption and competition for resident population • High risk of disruption to the metapopulation from which the orangutan was removed
Individuals translocated without disease screening and/or after extensive physical contact or proximity with humans	• High risk of pathogen transmission to orangutans resident at the release site
Dependent infants or juveniles released without their mothers, or mothers without their dependent/semi-dependent offspring	• High risk of death and poor welfare for the abandoned infants or juveniles
Translocating healthy adolescent or adult females not at immediate risk	• Females do not tolerate unrelated females in their area • High risk of social disruption and competition with resident orangutans in the release habitat • High risk to welfare and survival of the translocated orangutans, who may be attacked or killed, or prevented from accessing necessary food resources • High risk of disruption to the metapopulation from which the orangutan was removed
Translocating healthy males not at immediate risk	• High risk to health and welfare of released and resident males • High risk of disruption to the metapopulation that orangutan was removed from
Translocating past-prime flanged males who are crop foraging or foraging in forest-edge habitats, but are not at immediate risk	• High risk to welfare and survival of the translocated males who may be attacked or killed, or prevented from accessing necessary food resources
Orangutans translocated into an unfamiliar forest	• High risk to health, welfare, and survival of the translocated orangutans, who do not know what, when and where foods are available, in an unfamiliar forest type • High risk of competition or social stress with unfamiliar residents
Orangutans exhibiting undue stress or exhaustion during capture attempts	• High risk of individuals becoming seriously ill or dying of stress-related illnesses or exhaustion
Orangutans released despite potentially poor health or welfare condition (i.e. seriously injured or ill, have tested positive for pathogens or diseases of concern for the species, or are severely dehydrated, malnourished, or starving)	• High risk to welfare and survival of the released individual • High risk for pathogen transmission to resident conspecific population
No post-release monitoring can be conducted. IUCN guidelines specify that individuals should be monitored after release to determine outcomes of the translocation	• No knowledge of released orangutan survival or welfare
Individuals released outside species range (range includes reintroduced populations of the same species/subspecies that have been re-established in areas where formerly extirpated)	• High risk of genetic and social impacts to resident population

Source: Prepared by the report authors

5.3. Guidelines for orangutan wild-to-wild translocation

Determining whether an orangutan should be wild-to-wild translocated or protected in place requires information about its **circumstances, age and sex class, taxonomic identification, health and welfare**, and the status of **suitable release habitats**. A decision tree (Appendix I), and this section, present the stepwise process for making this determination. This stepwise process is also available for users as an interactive tool for decision-making (a google form): https://forms.gle/prxX3A5jFLJgu4pG8. The online tool does not collect any user email or identification information. Its purpose is solely to provide an easy-to-use interface that guides users through the process of determining if wild-to-wild translocation is a suitable option and of additional action steps and resources needed.

The actions below comprise the IUCN Best practice guidelines for wild-to-wild translocation of orangutans. They follow the questions in the decision tree and the interactive tool for decision-making.

Step 1. Determine if suitable release habitat is available to translocate orangutans into

Has a release habitat suitable to release any captured wild orangutan(s) into been identified? Suitable habitats are those that have been studied and are within the species' range, well protected from key threats to orangutans including poaching, have a depleted orangutan population in need of supplementation, and have sufficient, appropriate food and nesting resources for the long term to support both released and resident orangutans. **If no such habitat has been identified, orangutans should not be captured unless they are in need of immediate medical treatment and can be released back into the capture site.** Capturing a wild orangutan when there is no place to release it means it will have to be kept in captivity possibly for a long time (possibly its lifetime); these actions are negative for conservation of the metapopulation from which the orangutan was removed and negative for welfare of the captured orangutan.

A. Suitable release habitat has been identified

Selecting a translocation release habitat within 5 km of the capture site, or in the individual's home range (if known) is recommended. Translocating an orangutan more than 5 km from the capture site or outside their home range (if known) is not recommended. Translocation into suitable habitat more than 5 km from the capture site may be feasible if the habitat is in the species range, has an orangutan population in need of supplementation, is of a forest type represented in the home range of the orangutan to be translocated, and has sufficient food and nesting resources for the translocated individual and the resident conspecific population.

Go on to Step 2.

B. No suitable habitat has been identified

The orangutan should not be captured at this time. Protect the orangutan in place using the following actions, as appropriate.

Actions:

1. Engage local community members, plantations and other agribusinesses, natural resource extraction concessions, and government to identify and defuse conflicts, establish mitigation interventions, and develop incentives to protect the orangutan in place.
4. Conduct studies or collate data from recent studies to identify suitable habitats.
2. Maintain or reforest corridors and "stepping stone" forest patches to allow orangutan dispersal – this can take several years. Other actions may be necessary in the short term.
3. Monitor the threat status and the orangutan's condition. Interventions to prevent conflict will not always succeed. If threats escalate to the point where the orangutan's life is in immediate danger, restart this decision tool.

C. The conspecific population and available food and nesting resources have not been studied so data are not available on these aspects of the potential release habitat

The orangutan should not be captured at this time. Protect the orangutan in place using the following actions as appropriate.

Actions:

1. Engage local community members, plantations and other agribusinesses natural resource extraction concessions, and government to identify and defuse conflicts, establish mitigation interventions, and develop incentives to protect the orangutan in place.
4. Conduct studies or collate data on recent studies to identify suitable habitats.
2. Maintain or reforest corridors and "stepping stone" forest patches to allow for orangutan dispersal – this can take several years. Other actions may be necessary in the short term.
3. Monitor the threat status and the orangutan's condition. Interventions to prevent conflict will not always succeed. If the threats escalate to the point where the orangutan's life is in immediate danger, restart this decision tool.

Step 2. Determine the orangutan's status. Has the individual been kept illegally by humans, is he or she a free-ranging wild orangutan, or has he or she been previously reintroduced?

Orangutans held or kept by humans even for a short time may have contracted pathogens of concern that are communicable to conspecifics, other wildlife, and humans.

A. The orangutan was held illegally by humans more than one day

Any orangutan held illegally by humans for more than one day should be rescued from captivity and transferred to a rehabilitation facility for behavioural and health evaluations and disease screening. The orangutan cannot be responsibly translocated without rehabilitation and screening due to health, behavioural and disease risks.

Release may be possible following these evaluations. Restart this decision tool to consider future translocation.

B. The orangutan was not held illegally by humans, or held one day or less

Go on to Step 3.

C. The orangutan is thought to be a previously reintroduced individual

To determine whether this individual needs to be recaptured, *go on to Step 3.*

Step 3. Assess the orangutan's condition through observation

Use binoculars and maintain a distance of at least 50 metres from the orangutan to avoid disturbing him or her.

A. The orangutan has clinical signs of illness or serious injuries that may threaten his or her life

Orangutans who are ill or seriously injured should first be assessed to determine if intervention is necessary. *Go on to step 3 A 1* to conduct the assessment before deciding whether to capture the orangutan.

Step 3 A 1. Through observation, assess whether the orangutan has been injured by humans

a. The orangutan is ill or has injuries unlikely to have been caused by humans

Leave the orangutan in place and monitor him or her from a distance. Wild orangutans that are ill or have injuries not caused by humans should not be captured. Illness and injuries are a natural part of wild animals' lives, and are not reasons to intervene, even if the animal might die later. If feasible, monitor the orangutan using the following steps:

1. Monitor the orangutan for at least five days (from at least 50 metres to allow the orangutan to move). Individuals that can move and eat do not need help. **Even if the orangutan is ill or injured by natural causes, we should not intervene. The priority should be to work with the local community, businesses, and government to protect the orangutan in situ and prevent translocation, further injuries, capture, or killing of the orangutan.**
2. If possible, collect urine and faecal samples during the monitoring period to gather information on the orangutan's health status. Caution: Weight loss and ketosis are likely to occur during low fruiting periods and are not reasons for intervention.

b. The orangutan has been injured by humans (i.e. people report he or she has been injured, or has visible wounds caused by bullets, machetes or wire snares)

Go to Step 3 A 2.

Step 3 A 2. Determine the severity of the orangutan's condition through observation

a. The orangutan may be seriously injured

If an individual is suspected to have been seriously injured by humans, monitor the orangutan for at least five days to determine whether intervention is appropriate. **If the orangutan can move and is eating, he or she does not need to be captured and treated or translocated. The priority should be to work with the local community, plantations and other agribusinesses, natural resource extraction concessions, and government to protect the orangutan in situ and prevent translocation, further injuries, capture, or killing of the orangutan.**

Go on to Step 3 B 1 to determine appropriate action based on monitoring results.

b. The orangutan is in dire condition due to human-inflicted injuries and in need of immediate medical care to survive

Orangutans severely injured by humans and in need of immediate medical care to survive should be captured and transferred to specialised rehabilitation centres for necessary care. Translocation can be considered following treatment, including a suitable disease risk assessment and health evaluation by a certified veterinarian, and behavioural screening as appropriate. Restart this decision tool to consider future translocation suitability if the orangutan has recovered and been deemed a suitable candidate for release.

B. The orangutan appears malnourished, starving, or dehydrated

More information is needed – monitor the orangutan to determine next steps. The orangutan might not need to be captured and treated or translocated.

Orangutans are known to lose significant body weight during low fruiting periods. Further assessment of the orangutan's condition and surrounding environment is required to determine if intervention is appropriate.

Assessment actions:

1. Monitor the orangutan as feasible for at least five days to determine whether intervention is appropriate. **If the orangutan can move and is eating, he or she does not need to be captured and treated or translocated. The priority should be to work with the local community, plantations and other agribusinesses, and government to protect the orangutan in situ and prevent translocation, further injuries, capture, or killing of the orangutan.**
2. If possible, collect urine and faecal samples during the monitoring period to check health status.

Caution: Weight loss and ketosis are likely to occur during low fruiting periods and are not in themselves reasons for intervention.

Go on to Step 3 B 1 to determine actions based on the monitoring outcome.

Step 3 B 1. Outcome of the five-day monitoring period

a. The orangutan has moved and eaten during the monitoring period

Leave the orangutan in place and follow action steps below, as appropriate. The orangutan does not need to be captured and treated or translocated. The priority should be to work with the local community, plantations and other agribusinesses, natural resource extraction concessions, and government to protect the orangutan in situ and prevent translocation, further injuries, capture, or killing of the orangutan.

Actions:

1. Keep people, dogs, and other animals away from the orangutan, do not make loud noises, and give the orangutan space to find food and move away on their own. This may take some time, even a few days, if the orangutan is exhausted, hungry, and/or afraid to move.
2. Engage local community members, plantations and other agribusinesses, natural resource extraction concessions, and government to identify and defuse conflicts, establish mitigation interventions, and develop incentives to protect the orangutan in place.
3. Monitor the situation, maintaining a minimum distance of 50 metres from the orangutan, to prevent danger to the orangutan or to people.

b. The orangutan has not moved or eaten during the five days it was monitored

Go on to Step 4 to determine if capture and translocation are appropriate.

C. The orangutan appears unharmed and healthy or appears to have only minor injuries and/or appears slightly or moderately underweight or dehydrated

Collect biological samples, if possible, without capture (faeces and urine).

Go on to Step 4.

Resources: Refer to OVAG guidance for proper collections and storage of biological samples for biobanking and disease surveillance.

D. The orangutan is caught in a snare or other restraint

Determine extent of injuries and age. If the orangutan needs medical care or is too young to be independent, transfer him or her to a rehabilitation or care facility. The orangutan is not suitable for release in either of these cases. Release may be possible in the future if the animal recovers its health. Restart this decision tool to consider future translocation suitability once the animal has recovered.

If the orangutan does not appear seriously injured and is old enough to be independent, remove the snare or restraint and release in place after taking biological samples for disease surveillance (faeces, blood, and urine if possible). Important note: Do not release the orangutan until he or she has fully recovered from the effects of any anaesthetic used during the process of freeing, examining, or taking samples.

Step 4. Determine the age class and sex of the orangutan through observation

Use binoculars and maintain a distance of at least 50 metres from the orangutan to avoid disturbing it.

When considering how to protect an entire population of orangutans from a potential or imminent threat, habitat protection and monitoring are recommended. Wild-to-wild translocation is not an appropriate tool to protect orangutan populations, except in the case where fire is destroying an entire habitat area and there is no means

for orangutans to escape (recalling that orangutans will travel across plantations, other open areas, and roads if they are left unmolested).

A. Orangutan(s) of unknown sex, travelling independently

It is critical to determine the sex of the orangutan to assess translocation suitability and options before deciding if the individual should be captured and translocated. Adult unflanged males as well as adolescent and juvenile males can be difficult to differentiate from females. Sexing an orangutan can most easily be done by waiting for him or her to urinate. The urine stream of a female will have a downward trajectory, falling almost directly under the orangutan. A male's urine stream will have a forward trajectory, arcing outward away from the body. Restart this decision tool when sex is determined.

B. An infant found without its mother

Attempt to reunite the infant with his or her mother. If the infant can be reunited with the mother, leave them both in place and work with local area residents, plantations and other agribusinesses, natural resource extraction concessions, and government to protect them without translocating them.

Infants who cannot be reunited with their mothers should be rescued and transferred to an orangutan rehabilitation centre for care. Reintroduction or reinforcement can be reconsidered when the orangutan is old enough to be independent. Follow IUCN SSC (2013) and Beck et al. (2007) guidelines to determine release suitability.

C. A flanged male

Flanged males are best protected in place and left to roam without interference instead of being captured and translocated. Flanged males roam to find mates and/or food. Older flanged males may be pushed to the edges of their habitat to find food due to competition with other resident orangutans. Flanged males may visit human crop areas repeatedly even if they reside primarily in native forest. Translocation is likely to have negative effects on the welfare of translocated orangutan and may also undermine conservation of orangutans in the source metapopulation and at the release site.

Actions:

1. Engage local community members, plantations and other agribusinesses, natural resource extraction concessions, and government to identify and defuse conflicts, establish mitigation interventions, and develop incentives to protect the orangutan in place.
2. Address existing or potential conflicts and monitor threats.

Resources: IUCN Human-Wildlife Conflict & Coexistence Specialist Group (https://www.hwctf.org)

To determine if capture and translocation is necessary to save the orangutan's life, *go on to Step 5.*

D. A female with an infant or an immature orangutan

Females and any infants or immature orangutans they are travelling with should be left in place together. This female orangutan is surviving, breeding, and raising offspring in this mixed landscape and should be protected in place rather than captured and translocated. Infants or immature orangutans travelling with an adult female should not be separated from her. Females do not like to move away from their established home range. They can survive in very tiny forest patches with a few trees, although they will forage beyond these patches to obtain food. They prefer to live near female relatives and may not thrive or even survive if moved to new areas with unknown females. Translocation may also undermine conservation of orangutans in the source metapopulation and at the release site.

Actions:

1. Engage local community members, plantations and other agribusinesses, natural resource extraction concessions, and government to identify and defuse conflicts, establish mitigation interventions, and develop incentives to protect the orangutan in place.
2. Address existing or potential conflicts and monitor threats.

Resources: IUCN Human-Wildlife Conflict & Coexistence Specialist Group (https://www.hwctf.org)

To determine if capture and translocation is necessary to save the life of the orangutan, *go on to Step 5.*

E. An immature or unflanged male or an immature or adult female, travelling independently

Males are best left alone to roam undisturbed rather than captured and translocated. Unflanged males roam to find uncontested access to food and mates and may visit human crop areas repeatedly during fruiting seasons even if they reside primarily in, or have access to, intact forest habitats. Translocation is likely to be negative for the welfare of translocated male orangutans and may also undermine conservation of orangutans in the source metapopulation and at the release site.

Female orangutans who are surviving in a mixed landscape should be protected in place. Females do not like to move away from their established home range. They can survive in tiny forest patches with a few trees, although they will forage beyond these patches to obtain food. They prefer to live near female relatives and may not survive and thrive if moved to new areas with unknown females. Translocation may also undermine conservation of orangutans in the source metapopulation and at the release site.

Actions:

1. Engage local community members, plantations and other agribusinesses, natural resource extraction concessions, and government to identify and defuse conflicts, establish mitigation interventions, and develop incentives to protect the orangutan in place.
2. Address existing or potential conflicts and monitor threats.

Resources: IUCN Human-Wildlife Conflict & Coexistence Specialist Group (https://www.hwctf.org)

To determine if capture and translocation is necessary to save the orangutan's life, *go on to Step 5.*

F. An immature orangutan travelling with an adult female

Immature orangutans travelling with an adult female are still dependent on the female to some degree and should not be separated from her. Both should be left in place together rather than captured and translocated.

Actions:

1. Engage local community members, plantations and other agribusinesses, natural resource extraction concessions, and government to identify and defuse conflicts, establish mitigation interventions, and develop incentives to protect the orangutan in place.
2. Address existing or potential conflicts and monitor threats.

Resources: IUCN Human-Wildlife Conflict & Coexistence Specialist Group (https://www.hwctf.org)

To determine if capture and translocation is necessary to save the life of the orangutan, *go on to Step 5.*

Step 5. Determine the status of the key threat to the orangutan

What is the main reason why you are considering capturing and translocating the orangutan? Many animals will be in situations with multiple threats – in this case, consider the primary reason for considering translocation.

A. The orangutan is in an area where clearing is planned

Addressing the causes of clearing and planning how to protect the orangutans in place is the best way to protect the species and the individual orangutan. Translocation is not an appropriate solution to potential or active land clearing.

Improving compliance with orangutan protection laws or establishing corridors may take significant time, so it will be important to monitor the orangutan's status and provide interim protection or offset losses to villagers from orangutan crop foraging or other damages.

Actions:

1. Work with landowners and managers to improve compliance with orangutan habitat protection policies, maintain or establish dispersal corridors and protect the orangutan in place instead of capture and translocation.
2. Monitor the orangutan's situation and threat status

If clearing is imminent and unavoidable, translocation may be necessary to save the orangutan's life.

Go on to Step 6.

B. The orangutan appears to be isolated in an area that is actively being cleared or has been affected by flooding, fires or other disasters, or he or she was found in a deforested area or site with housing infrastructure or other human developments

If the immediate area is degraded or cleared, but there are large forest blocks, several small forest blocks, or forest corridors within 5 km of the orangutan's location, it is not necessary to capture and translocate the orangutan. Orangutans will use tiny forest patches or blocks, even as small as a few trees, as long as there are other forest patches in the area. Detailed information on habitat and forest cover can be obtained from current satellite maps.

Actions:

1. Work with landowners and managers to improve compliance with orangutan habitat protection policies, maintain or establish dispersal corridors and protect the orangutan in place instead of capture and translocation.
2. Monitor the orangutan's situation and threat status
3. To assess the land cover and options for the orangutan to move away, *go on to Step 6.*

Improving compliance or establishing corridors may take significant time, so it will be important to monitor the

status of the orangutan, provide interim protection, and/or offset losses to villagers from orangutan crop foraging or other damages.

C. The orangutan is at immediate risk from forest fires or smoke/pollution resulting from fires

Attempt to capture and move the orangutan using best practices for safety and stress management.
Go on to Step 8.

D. The orangutan is eating or damaging crops or other property

Sensitise local communities, plantations and other agribusinesses, natural resource extraction concessions, and government to orangutan behaviours, including crop foraging. Removing the orangutan is not a long-term solution and poses risks to their welfare and to resident orangutans in the release habitat. Orangutans, especially adult males, leave forests to forage on crops they like. This does not mean that they are starving or in need of rescue. They are attracted to many crops and will return to these areas repeatedly. The area in which an orangutan is crop foraging or causing other damage may also have been part of their home range before humans converted the land. Education and community benefit measures will be needed to build acceptance of this natural orangutan behaviour among local communities, plantations and other agribusinesses, and government, and to develop strategies for mediating any damage.

Actions:

1. Protect the orangutan in place
2. Engage local community members, plantations and other agribusinesses, natural resource extraction concessions, and government to identify and defuse conflicts, establish mitigation interventions, and develop incentives to protect the orangutan in place.
3. If necessary to defuse conflict, lure or drive the orangutan back to the forest by keeping people and dogs away from that area so the orangutan can move freely, and safely making some noise to scare him or her away, such as beating sticks against the trunk of the tree they are in. Throwing anything or shooting at an orangutan or driving an orangutan away with dogs could seriously harm or kill the orangutan and is illegal.
4. Maintain or reforest corridors and "stepping stone" forest patches for orangutan dispersal – this can take several years.
5. Monitor the threat status and the orangutan's condition. Interventions to prevent conflict will not always succeed. If threats escalate to the point where the orangutan's life is in immediate danger, restart this decision tool.

Caution: Driving the orangutan back to the forest is a temporary solution. The orangutan is likely to return, and may become immune to further attempts to drive him or her away. If the orangutan feels attacked or cornered, he or she could become aggressive towards humans.
Conflict and coexistence resources are available at https://www.hwctf.org.

E. There is political and/or public pressure to move the orangutan away from areas of human use

The health, welfare, and conservation of orangutans should be prioritised. Education about orangutan behaviour and coexistence strategies that do not require moving orangutans should be implemented. Moving orangutans is not a sustainable solution to community well-being, livelihoods, and wildlife conflict issues.

Actions:

1. Build local acceptance of orangutan behaviours, including occasional or seasonal crop foraging, reminding local people that the orangutans are not starving and that these may be areas that were native forest and part of the orangutans' range before people settled there. Engage local community members, plantations and other agribusinesses, natural resource extraction concessions, and government to identify and defuse conflicts, establish mitigation interventions, and develop incentives to protect the orangutans in place.
2. Engage with politicians as applicable to inform them about orangutan behaviour and conservation needs, and the importance of protecting wild orangutans in place, even in and around communities.
3. If necessary to defuse conflict, lure or drive the orangutan(s) back to the forest by keeping people and dogs away from the area so the orangutans can move freely, and/or safely make some noise to scare him or her away such as beating sticks against the trunk of the tree they are in. Throwing anything or shooting at an orangutan or driving orangutans away with dogs could seriously harm or kill the orangutan and is illegal.
4. Maintain or reforest corridors and "stepping stone" forest patches for orangutan dispersal – this can take several years. Other actions including translocation may be necessary in the short term (although translocation may not be effective).
5. Monitor the threat status and the orangutan's condition. Interventions to prevent conflict will not always succeed. If threats escalate to the point where the orangutan's life is in immediate danger, or if the government will not reconsider relocating the orangutan, restart this decision tool.

Caution: Driving the orangutan back to the forest is a temporary solution. The orangutan is likely to return, and may become immune to further attempts to drive him or her away. If an orangutan feels attacked or cornered, he or she could become aggressive towards humans.

F. Humans feel unsafe and want the orangutan removed, or there is a potential for the orangutan to have negative interactions with humans

The health, welfare, and conservation of orangutans should be the priority. Education about orangutan behaviour and coexistence strategies that do not require moving orangutans should be implemented. Moving orangutans is not a sustainable solution to community well-being, livelihoods, and wildlife conflict issues.

Actions:

1. Build local acceptance of orangutan behaviours, including occasional or seasonal crop foraging, reminding local people that the orangutans are not starving. Engage local community members, plantations and other agribusinesses, natural resource extraction concessions, and government to identify and defuse conflicts, establish mitigation interventions, and develop incentives to protect the orangutans in place.
2. Engage with politicians as applicable to inform them about orangutan behaviour and conservation needs, and the importance of protecting wild orangutans in place, even in and around communities.
3. If necessary to defuse conflict, lure or drive the orangutans back to the forest by keeping people and dogs away from the area so the orangutans can move freely, and safely making some noise to scare him or her away, such as beating sticks against the trunk of the tree they are in. Throwing anything or shooting at an orangutan or driving orangutans away with dogs could seriously harm or kill the orangutan and is illegal.
4. Maintain or reforest corridors and "stepping stone" forest patches for orangutan dispersal – this can take several years. Other actions including translocation may be necessary in the short term.
5. Monitor the threat status and the orangutan's condition. Interventions to prevent conflict will not always succeed. If threats escalate to the point where the orangutan's life is in immediate danger, or if the government will not reconsider relocating the orangutan, restart this decision tool.

Caution: Driving the orangutan back to the forest is a temporary solution. The orangutan is highly likely to return, and may become immune to further attempts to drive him or her away. If an orangutan feels attacked or cornered, he or she could become aggressive towards humans.

G. The orangutan has physically attacked people

Wild orangutan attacks on humans are extremely rare but are possible if the orangutan is acting in self-defence when threatened by humans. **The best solution is to give the orangutan space and quiet to get away on his or her own.** The orangutan may be "frozen" in terror, so it is best to keep people and dogs away, keep quiet, and leave them alone.

Actions:

1. Keep people and dogs away from the orangutan, do not make loud noises, and give the orangutan space to move away on his or her own. This may take some time, even a few days, if the orangutan is exhausted, very hungry, and/or afraid to move.
2. Monitor the orangutan, maintaining a distance of at least 50 metres, to prevent risks to the orangutan or to people.

Go on to Step 5 G 1.

Step 5 G 1. Determine if the orangutan will move away from people if given time and space

a. The orangutan has left the area or has moved away from people

The health, welfare, and conservation of orangutans are the priority. Education about orangutan behaviour and coexistence strategies that do not require moving orangutans should be implemented. Orangutans that have left the area or moved away should not be pursued or captured. Translocating orangutans is not a sustainable solution to community well-being, livelihoods, and wildlife conflict issues.

b. The orangutan has not left after five days

Attempt to capture the orangutan using best practices for safety and stress management. Carefully monitor the orangutan for stress and exhaustion during capture attempts. Stress and exhaustion can pose an immediate threat to the orangutan's health. *Go on to Step 8.*

H. The orangutan's life is in immediate danger because people are attempting to kill, capture, harm or harass him or her.

Attempt to capture and move the orangutan to a suitable area using best practices for safety and stress management.

Carefully monitor the orangutan for stress and exhaustion during capture attempts. Stress and exhaustion can pose immediate threats to the orangutan's health. *Go on to Step 8.*

Step 6. Determine if the orangutan can move away from its present location

What is the area around the orangutan's location like? Detailed information on habitat and forest cover can be obtained from satellite maps.

A. The orangutan is in an area with limited natural foods and there are no corridors, forest patches, or open areas for an orangutan to travel through. Dispersal paths are entirely blocked by human developments or by large rivers

Use caution in deciding that an area is too degraded for orangutans to travel through. Orangutans will use plantations and tiny forest patches or blocks, even just a few trees, as long as there are other forest patches in the area. Except in the cases of forest fires in the immediate area or of adjacent areas being cleared when the orangutan is encountered, wild orangutans encountered in degraded areas travelled to those areas on purpose. Even if such an area may look to be some distance from a forest, the animal got there on its own and will return when it is ready. It is best to leave wild orangutans alone, prevent people from harming, killing, or feeding them, and let them make their own way back to their home range.

Actions:

1. Try to protect the orangutan in place and give them time to move away on their own
2. Engage local community members, plantations and other agribusinesses, natural resource extraction concessions, and government to identify and defuse conflicts, establish mitigation interventions, and develop incentives to protect the orangutan in place.
3. Monitor the threat status and the condition of the orangutan for at least 5 days.
4. Maintain or reforest corridors and "stepping stone" forest patches for orangutan dispersal – this can take several years. Other actions including translocation may be necessary in the short term.
5. If the orangutan does not leave the area on their own after 5 days, *go on to Step 7.*

B. Forest corridors or open space (not tarmacked or built on) are available 5 km or less from the orangutan's location and the orangutan's access to these spaces is not blocked by buildings, infrastructure, or large rivers

The orangutan can travel back to his or her home forest without human aid or can be protected in place. The orangutan does not need to be captured and translocated.

Actions:

1. Engage local community members, plantations and other agribusinesses, natural resource extraction concessions, and government to identify and defuse conflicts, establish mitigation interventions, and develop incentives to protect the orangutan in place.
2. Maintain or reforest corridors and "stepping stone" forest patches to allow for orangutan dispersal – this can take several years. Other actions may be necessary in the short term.
3. If necessary to defuse conflict, lure or drive the orangutan back to the forest by keeping people and dogs away from the area so the orangutan can move freely, and make some noise to scare him or her away, such as beating sticks against the trunk of the tree they are in. Throwing anything or shooting at an orangutan, or driving an orangutan away with dogs could seriously harm or kill the orangutan and is illegal.
4. Monitor the threat status and the orangutan's condition. Interventions to prevent conflict will not always succeed. If the threats escalate to the point where the orangutan's life is in immediate danger, restart this decision tool.

Step 7. Have local people monitored the orangutan to see if can be identified as previously found in this area

Do people recognise this orangutan? **If this orangutan has been previously seen in or captured from this area, recapture and translocation to a nearby forest is unlikely to be successful and will pose cumulative health and welfare risks to the orangutan each time he or she is pursued, immobilised, and transported.** It is best to implement actions to enable human-orangutan coexistence. Driving this individual back to the forest is also unlikely to be successful as he or she is likely to return. Translocating him or her further from their home range into an area with resident orangutans means he or she is likely to have trouble finding food and may cause social disruption or competition in the resident population.

A. The orangutan is recognised as having been seen or previously captured in this area

The orangutan is best protected in place. Capturing and translocating this orangutan is not likely to succeed as he or she may be determined to return, and repeated attempts may compromise their welfare and survival.

Actions:

1. Engage local community members, plantations and other agribusinesses, natural resource extraction concessions, and government to identify and defuse conflicts, establish mitigation interventions, and develop incentives to protect the orangutan in place.
2. Locate, then maintain or reforest, corridors and "stepping stone" forest patches to allow for orangutan dispersal – this can take several years.
3. Monitor the threat status and the orangutan's condition. Interventions to prevent conflict will not always succeed, so monitoring is needed to determine how to proceed.
4. In case of unresolvable conflicts that pose immediate danger to the orangutan's life, restart this decision tool.

B. The orangutan is not recognised as having been seen or previously translocated

Attempt to capture the orangutan using appropriate precautions.

Carefully monitor the orangutan for stress and exhaustion during capture attempts. Stress and exhaustion can pose an immediate risk to the orangutan's health.

Long-term action: Work with landowners and managers to establish dispersal corridors for orangutans and other wildlife at the capture site. Establishing suitable and effective corridors will take significant time.

Go on to Step 8.

Step 8. Attempt to capture the orangutan using best practices for safety and stress management

Carefully monitor the orangutan during all stages of the process.

When attempting to capture an adult female with a dependent infant and/or an immature orangutan travelling with her, it is critical to translocate these individuals together. If it is not possible to capture all associated individuals initially, the captured individuals should be held in an appropriate care facility until the remaining individuals have been captured and they can be translocated together. If all individuals cannot be captured, it is recommended to release those who have been captured back into the capture site and abandon attempts to capture and translocate these orangutans.

Go on to step 9.

Step 9. Monitor the orangutan for signs of undue stress or exhaustion during capture attempt

The orangutan is likely experiencing undue stress or exhaustion if he or she is displaying unexpected behaviours, dangerous aggression towards humans, or appears weak or dizzy. Stress and exhaustion can pose an immediate risk to the orangutan's health.

A. The orangutan is displaying unexpected behaviours, aggression, or appears weak or dizzy

Abandon attempt at capture and continue to monitor the orangutan, if possible, without causing further stress.

Actions:

1. Protect the orangutan in place instead of capturing and translocating him or her.
2. Address existing or potential conflicts and monitor threats.

Consult orangutan veterinarians, if at all possible, to help assess and treat the orangutan's problem(s) (see also Step 10 below)

B. The orangutan is not showing signs of undue stress or exhaustion

Proceed with capture and *move on to Step 10.*

Step 10. Have a certified veterinarian conduct a medical examination and disease risk assessment of the orangutan

A certified veterinarian needs to examine the orangutan for clinical signs of illness, conduct a rapid test for COVID-19 and any other key pathogens of concern (refer to national or regional SOPs for orangutan translocation). Use a disease risk assessment (DRA) for orangutans, conducted by a certified veterinarian experienced in orangutan care, to determine if other diseases of concern should be tested for in quarantine prior to release, and take biological samples (faeces, blood and urine if possible) and morphometrics data. Test results need to be obtained as quickly as possible, so it is best to use rapid tests that can return results quickly without sending to a lab.

Caution: People involved in capturing, handling and moving the orangutan must be regularly tested and/or vaccinated for diseases that are communicable between orangutans, and between humans and orangutans.

Resources: For DRAs, seek guidance from Orangutan Veterinary Advisory Group (OVAG), and expert opinion based on what is known for the local ecosystem. See also Jakob-Hoff et al. (2014), WOAH (2024) and the Fowler series on Wild Animal Medicine (https://www.sciencedirect.com/book/9780323828529/fowler-s-zoo-and-wild-animal-medicine-current-therapy-volume-10). For required disease tests, consult national or regional SOPs for orangutan translocation. Refer to OVAG guidance for proper collections and storage of biological samples for biobanking and disease surveillance.

A. The orangutan is free of pathogens and disease that pose medium to high risks for conspecifics, other wildlife or humans per an evaluation by a certified veterinarian

Take morphometrics data and biological samples (faeces, blood and urine if possible) for disease surveillance. Refer to OVAG guidance for proper collection and storage of biological samples for biobanking and disease surveillance. *Move on to Step 11.*

B. The orangutan is seriously injured, has clinical signs of illness, is seriously malnourished or dehydrated, or has a pathogen of concern

Transfer the orangutan to rehabilitative care with expert staff at a specialised facility. Release may be possible in the future if the orangutan recovers his or her health and is deemed free of pathogens of concern by a certified veterinarian. Restart this decision tool to consider future translocation suitability.

Step 11. Determine the orangutan's species (Bornean, Sumatran, or Tapanuli) and subspecies (Bornean orangutans – P. p. morio, P. p. pygmaeus, P. p. wurmbii) identity

If species/subspecies is uncertain, genetic testing will be needed to confirm taxonomic identity.

A. The species (and subspecies if Bornean orangutan) identity is known

Go on to Step 12.

B. The species (and subspecies if Bornean orangutan) identity is not known

Determine precise taxonomic identity. Orangutans of uncertain species or subspecies should not be released. Releasing a non-indigenous species or subspecies may result in hybridisation with local populations, which may further result in decreased genetic fitness (breeding and survival).

Responsible release into the species' range may be possible once the species is identified. Restart this decision tool to consider future translocation suitability after taxonomic identity is determined.

Step 12. Determine whether orangutans will be adequately protected in the potential release habitat

A. The release habitat is protected from key threats to orangutans including killing, capture, and forest clearing or degradation

Go on to Step 13.

B. Orangutans in the release habitat are at risk of killing, capture, and conflicts with humans, or of forest clearing or degradation

In the immediate term, consider a different release site and restart this decision tool.

Long-term action: Develop and implement a strategy to mitigate key threats to orangutans at the targeted release site. The habitat may become acceptable for translocation in the future if threats can be adequately managed to avoid significant risk to orangutans. It can take many years for management actions to adequately control threats.

Step 13. Determine whether the resident orangutan population in the release habitat is in need of supplementation

A. The release habitat has a resident population in need of supplementation (meaning the habitat is well below carrying capacity for orangutans), and sufficient resources, so that the release will not pose genetic, behavioural or resource competition risks

Go on to Step 14.

B. The orangutan population in the release habitat is not in need of supplementation (it is at or near carrying capacity for orangutans)

Releasing orangutans into this population would pose resource competition and behavioural risks to conspecifics that cannot be mitigated.
Consider another release site and restart this decision tool.

Step 14. Determine whether local communities around the release habitat are generally accepting of orangutans

A. Orangutans are generally accepted by community members even when seen in or around community lands.
Community members are considered to "accept" orangutans if they do not attempt to harm, chase, capture, or kill orangutans they encounter, and if they are aware that orangutans sometimes consume or damage crops, but are nonetheless willing to "allow" the orangutan to use or move through their lands without resorting to having the orangutan removed by authorities or NGOs.
Go on to Step 15.

B. Orangutans are not accepted (i.e. they have been recently poached, harmed, captured, harassed or translocated from villages around the potential release habitat).
The orangutan should not be translocated to this area as it will likely create human-wildlife conflicts. Consider another release habitat or work with the local communities to address concerns. Human wildlife conflicts can turn local public opinion against conservation translocations and other conservation activities. Local communities need to be consulted and their views and needs respected for conservation translocations to succeed.
Resources: https://www.hwctf.org
Translocation may be possible following identification of an alternate release habitat or successful implementation of community-endorsed strategies to mitigate or offset human-wildlife conflict. Restart this decision tool when an appropriate release habitat can be identified.

Step 15. Have local communities in and around the release habitat been consulted to determine how they use local forests, what potential conflicts with orangutans exist, and suitable strategies to mitigate or offset these conflicts?

A. Local communities have been consulted and agree to the translocation
Go on to Step 16.

B. Local communities have not been consulted or have not agreed to the translocation
Local communities need to be consulted and their views and needs respected for conservation translocations to succeed. Human wildlife conflicts can turn local public opinion against conservation translocations and other conservation activities.
Action: Consult community members on how they use local forest habitats and wildlife, and what they would need to live peacefully alongside orangutans without conflict or translocation.
Translocation can be considered in areas where communities are accepting of living alongside wild orangutans. Restart this decision tool when appropriate practices to mitigate or offset potential conflicts are in place, or when a suitable release habitat with willing communities is identified.
Resources: visit the IUCN Human-Wildlife Conflict task force webpage (https://www.hwctf.org) and the ethnographic toolkit for community studies (https://pokokborneo.wordpress.com/2022/06/10/introducing-our-new-toolkit-using-ethnographic-research-for-social-engagement-a-toolkit-for-orangutan-and-other-conservationists/)

Step 16. Translocation and post-release monitoring

Translocate the orangutans and conduct post-release monitoring for as long as possible (for at least one year but ideally for several years) to assess survival and breeding. Evaluate the use of follows and/or available technologies. Work with partners to fund and implement this post-release monitoring.

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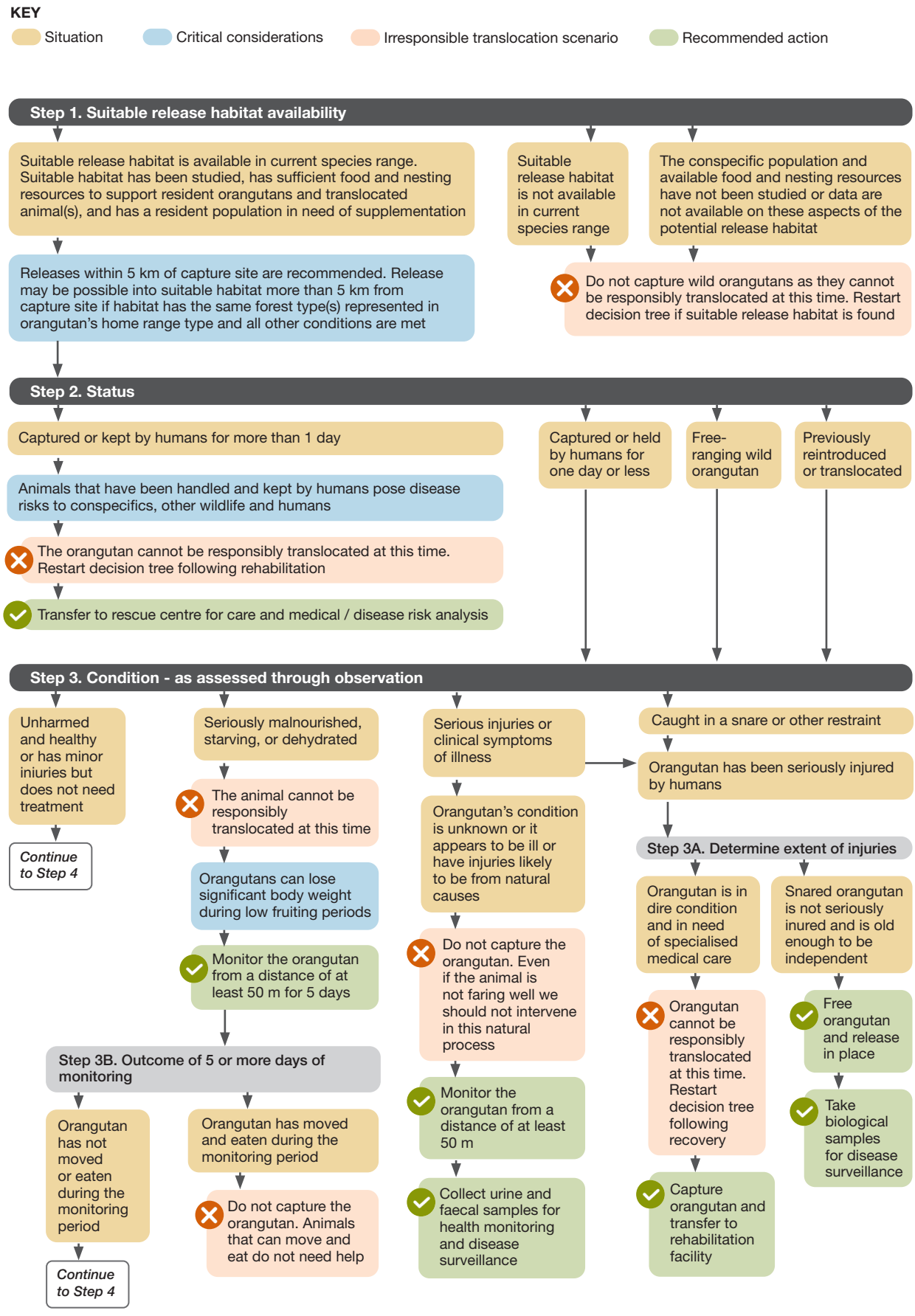
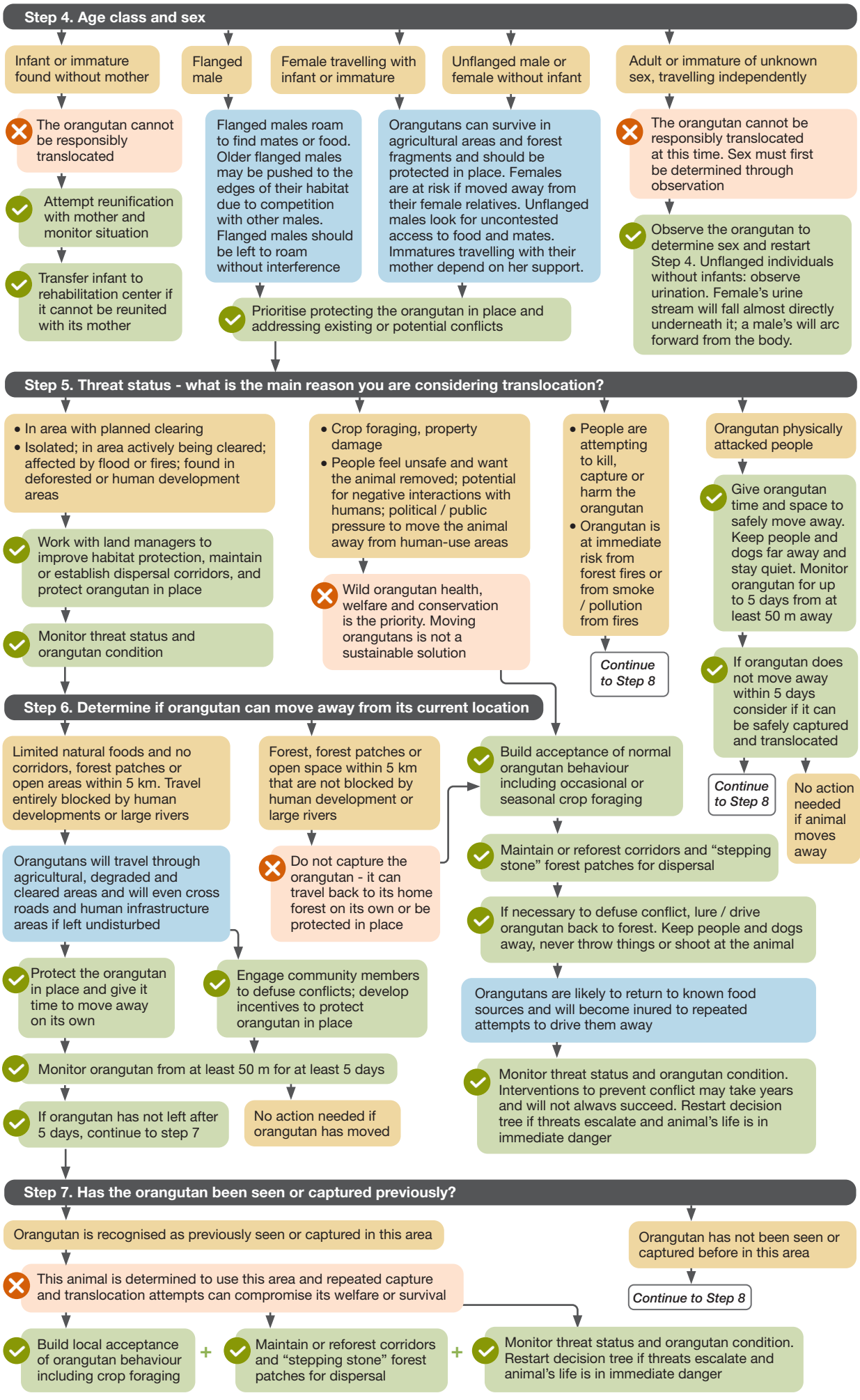
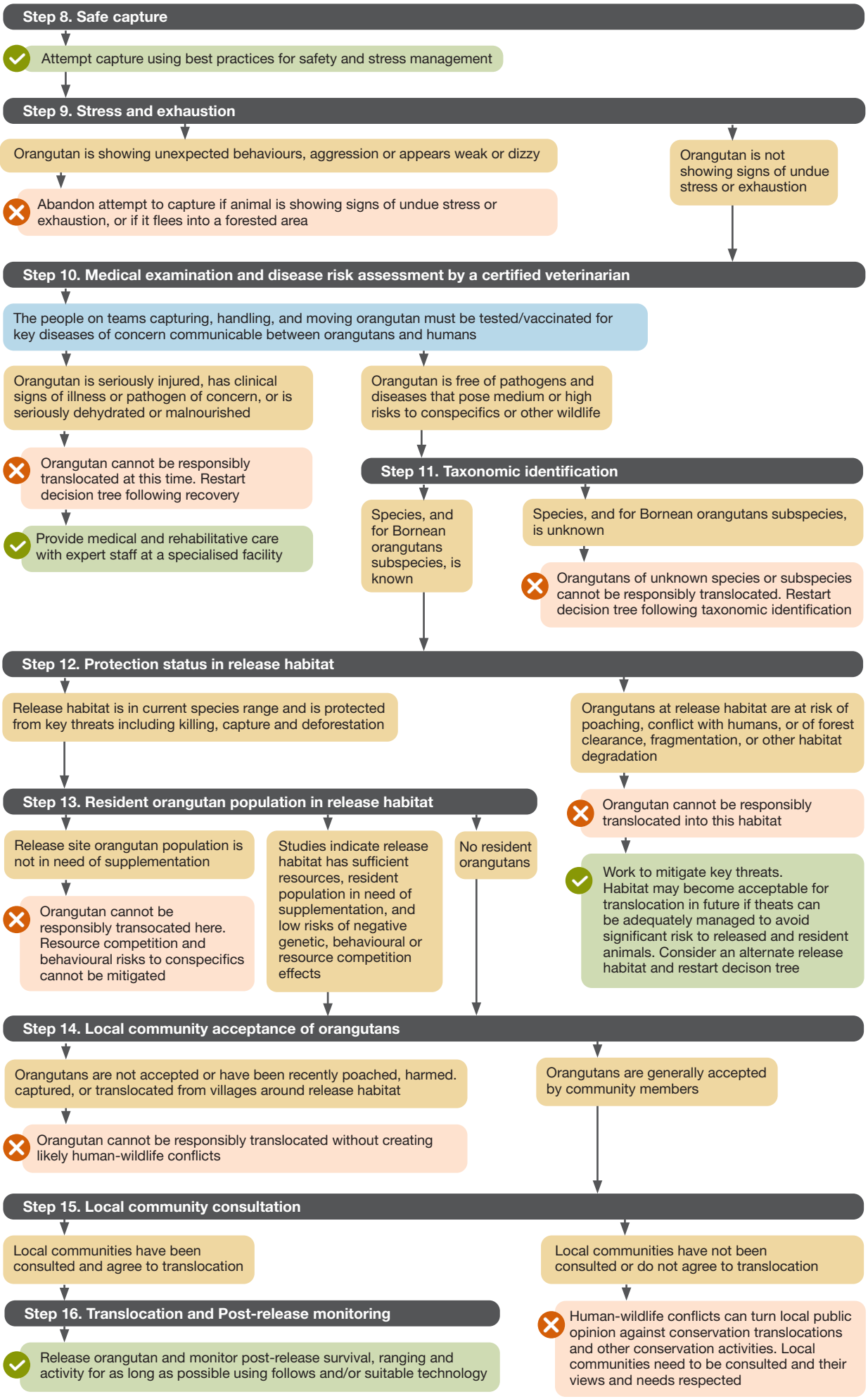
Appendix I. Decision tree




Step 4. Age class and sex
Infant or immature found without mother
Flanged male
Female travelling with infant or immature
Unflanged male or female without infant
Adult or immature of unknown sex, travelling independently
The orangutan cannot be responsibly translocated
Attempt reunification with mother and monitor situation
Transfer infant to rehabilitation center if it cannot be reunited with its mother
Flanged males roam to find mates or food. Older flanged males may be pushed to the edges of their habitat due to competition with other males. Flanged males should be left to roam without interference
Orangutans can survive in agricultural areas and forest fragments and should be protected in place. Females are at risk if moved away from their female relatives. Unflanged males look for uncontested access to food and mates. Immatures travelling with their mother depend on her support.
Prioritise protecting the orangutan in place and addressing existing or potential conflicts
The orangutan cannot be responsibly translocated at this time. Sex must first be determined through observation
Observe the orangutan to determine sex and restart Step 4. Unflanged individuals without infants: observe urination. Female's urine stream will fall almost directly underneath it; a male's will arc forward from the body.
Step 5. Threat status - what is the main reason you are considering translocation?
• In area with planned clearing
• Isolated; in area actively being cleared; affected by flood or fires; found in deforested or human development areas
Work with land managers to improve habitat protection, maintain or establish dispersal corridors, and protect orangutan in place
Monitor threat status and orangutan condition
• Crop foraging, property damage
• People feel unsafe and want the animal removed; potential for negative interactions with humans; political / public pressure to move the animal away from human-use areas
Wild orangutan health, welfare and conservation is the priority. Moving orangutans is not a sustainable solution
• People are attempting to kill, capture or harm the orangutan
• Orangutan is at immediate risk from forest fires or from smoke / pollution from fires
Continue to Step 8
Orangutan physically attacked people
Give orangutan time and space to safely move away. Keep people and dogs far away and stay quiet. Monitor orangutan for up to 5 days from at least 50 m away
If orangutan does not move away within 5 days consider if it can be safely captured and translocated
Continue to Step 8
No action needed if animal moves away
Step 6. Determine if orangutan can move away from its current location
Limited natural foods and no corridors, forest patches or open areas within 5 km. Travel entirely blocked by human developments or large rivers
Orangutans will travel through agricultural, degraded and cleared areas and will even cross roads and human infrastructure areas if left undisturbed
Protect the orangutan in place and give it time to move away on its own
Monitor orangutan from at least 50 m for at least 5 days
If orangutan has not left after 5 days, continue to step 7
Forest, forest patches or open space within 5 km that are not blocked by human development or large rivers
Do not capture the orangutan - it can travel back to its home forest on its own or be protected in place
Engage community members to defuse conflicts; develop incentives to protect orangutan in place
No action needed if orangutan has moved
Build acceptance of normal orangutan behaviour including occasional or seasonal crop foraging
Maintain or reforest corridors and "stepping stone" forest patches for dispersal
If necessary to defuse conflict, lure / drive orangutan back to forest. Keep people and dogs away, never throw things or shoot at the animal
Orangutans are likely to return to known food sources and will become inured to repeated attempts to drive them away
Monitor threat status and orangutan condition. Interventions to prevent conflict may take years and will not always succeed. Restart decision tree if threats escalate and animal's life is in immediate danger
Step 7. Has the orangutan been seen or captured previously?
Orangutan is recognised as previously seen or captured in this area
This animal is determined to use this area and repeated capture and translocation attempts can compromise its welfare or survival
Build local acceptance of orangutan behaviour including crop foraging
+
Maintain or reforest corridors and "stepping stone" forest patches for dispersal
+
Monitor threat status and orangutan condition. Restart decision tree if threats escalate and animal's life is in immediate danger
Orangutan has not been seen or captured before in this area
Continue to Step 8



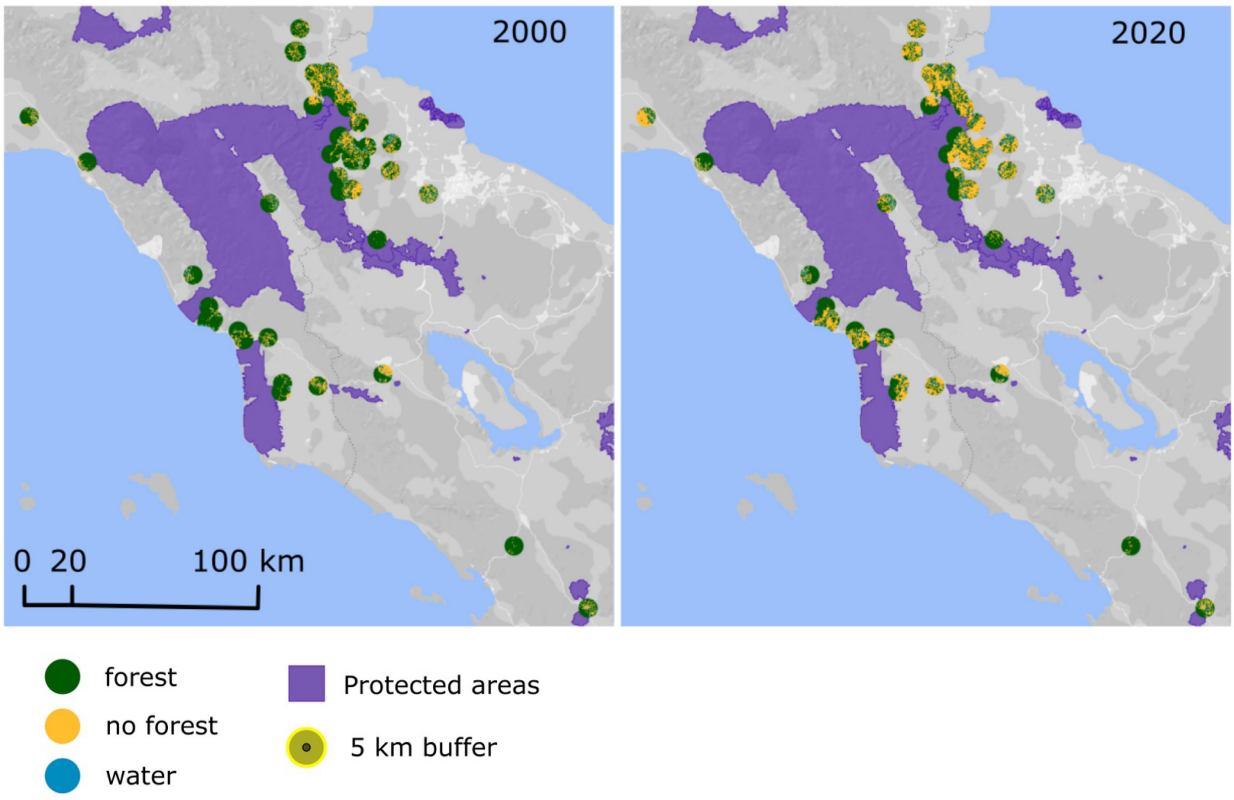
Appendix I Figure 1 Decision Tree. Source: Prepared by the report authors

Appendix II. Visualisation of capture sites

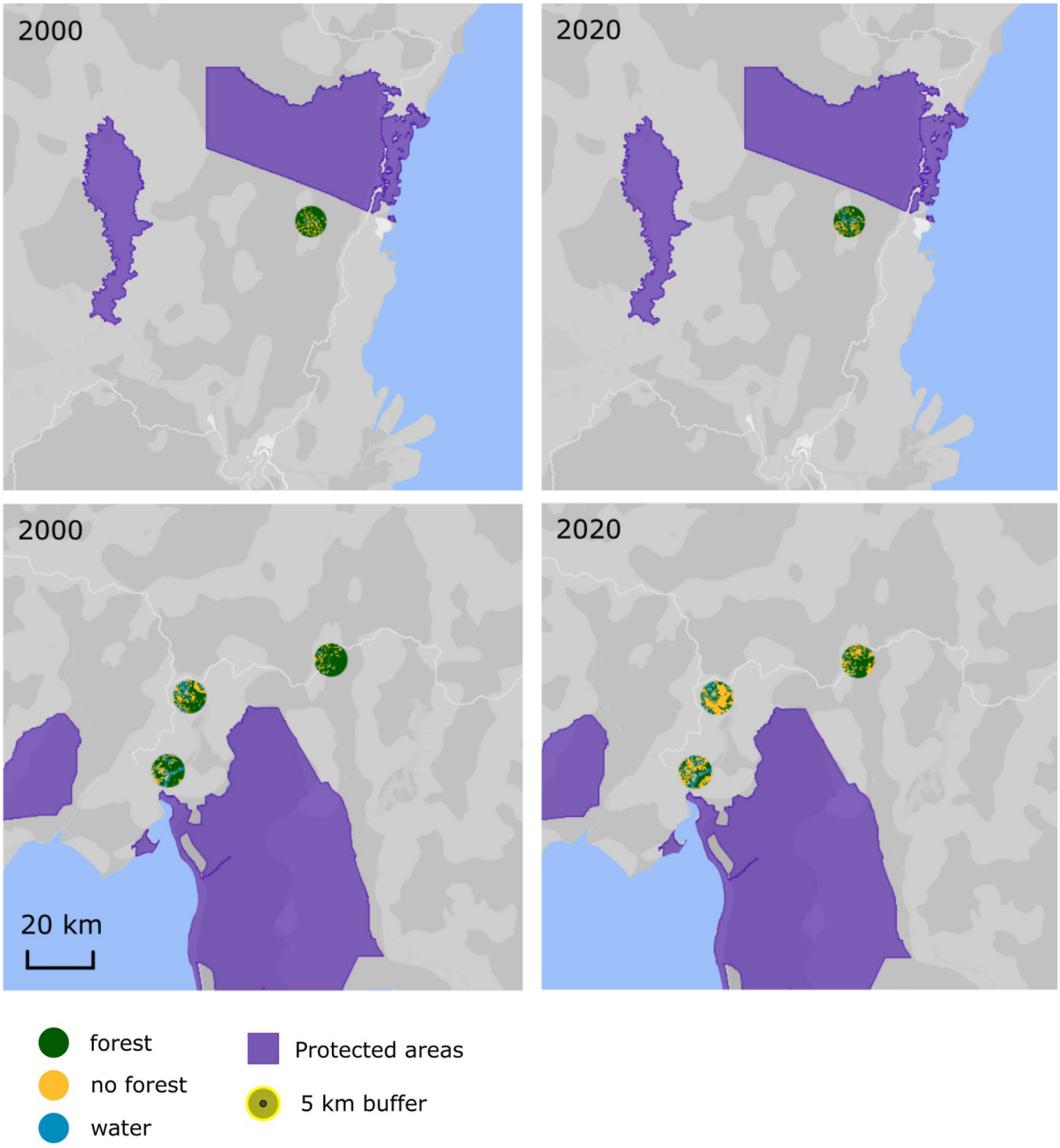
To better understand the context and outcomes of orangutan wild-to-wild translocation, researchers from the IUCN SSC Primate Specialist Group (PSG), Section on Great Apes (SGA) collated data on wild orangutans captured for translocation in Indonesia between 2005 and 2022 from practitioner publications (including scientific articles, annual reports, grant reports, news blogs, charity commission reports, conference presentations), newspaper articles, and other direct communications with practitioners. The metric of captures for translocation was used because not every capture resulted in translocation, and in many cases, data on whether and where individuals were released were unavailable or unclear. This dataset underestimates the total number of orangutans captured from the wild for translocation since 2005, as it includes only those rescues for which data were available and which could be confirmed as unique instances (i.e. so no rescue was counted more than once). Many wild-to-wild translocations are not publicly reported (Sherman et al. 2020). This dataset covers rescues and translocations in Kalimantan and Sumatra, Indonesia. Few data were available for Sabah and Sarawak, Malaysia. Hence, translocations in these two Malaysian States are not part of the dataset. Spatially specific data (GNSS coordinates, such as GPS or GLONASS coordinates) were available for 104 of the captures for translocation in Indonesia.

The role of deforestation and orangutan habitat use in translocation

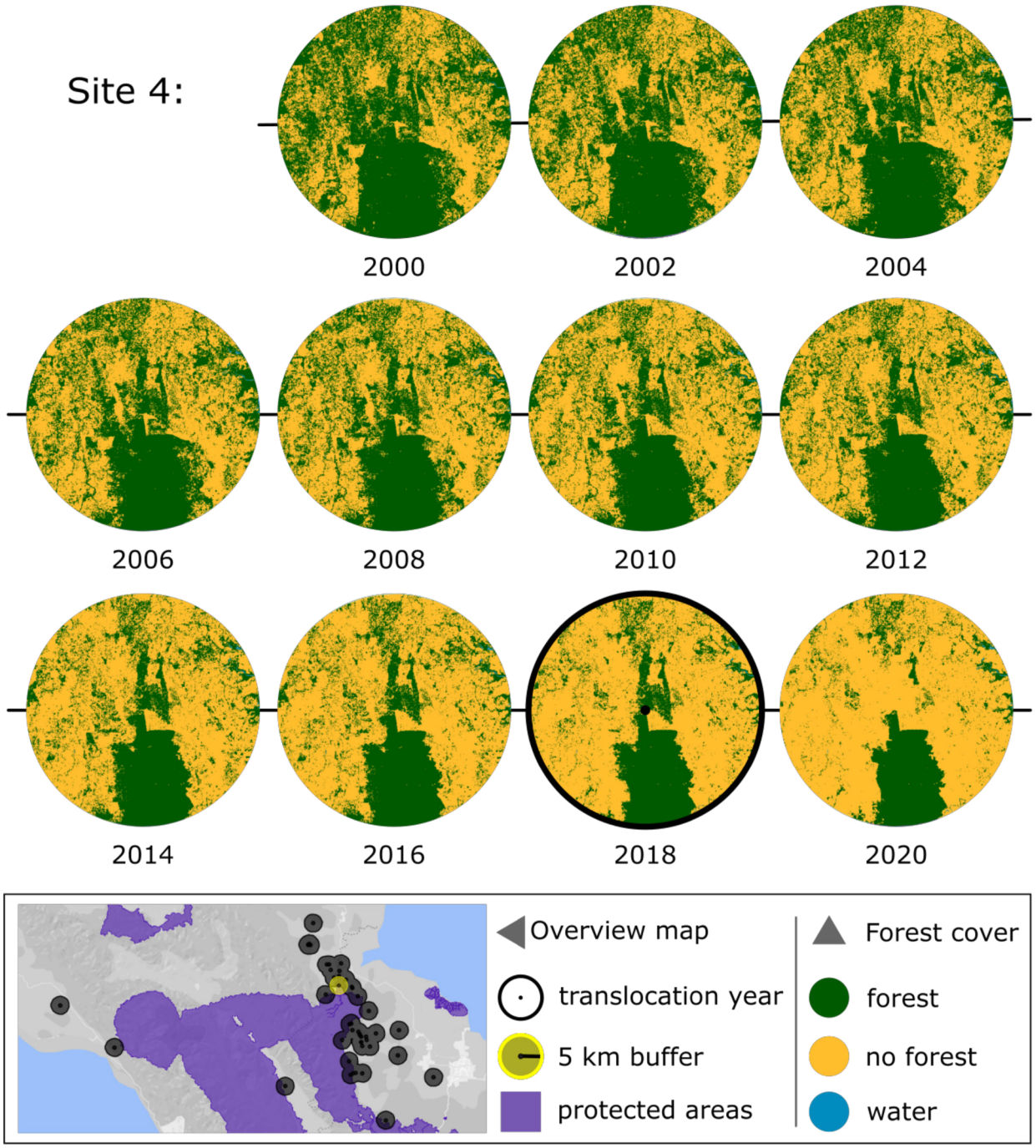
To examine forest change at a scale meaningful for orangutan movement, we considered nine sites with GNSS coordinates—five in Sumatra (Appendix II Figure 1.), and four in Borneo (Appendix II Figure 2.)—where a total of 12 orangutans were captured. A 5 km buffer around each capture site was used to visualise the area where these animals could move prior to capture, and how that habitat changed following the animals' removal (Appendix II Figures 1 and 2). The nine capture sites were selected based on GNSS data availability and cover all three orangutan species and the translocation scenarios described below. Tropical moist forest, degraded forest, and forest regrowth from Vancutsem et al. (2021) were combined into the "forest" class to easily visualise forested and non-forested areas. Overlapping areas hint at the extent to which multiple captures for translocation affect local orangutan metapopulations. Visualisations of sites 4–9 are presented below. Visualisation of sites 1–3 are presented in the main body of these guidelines.



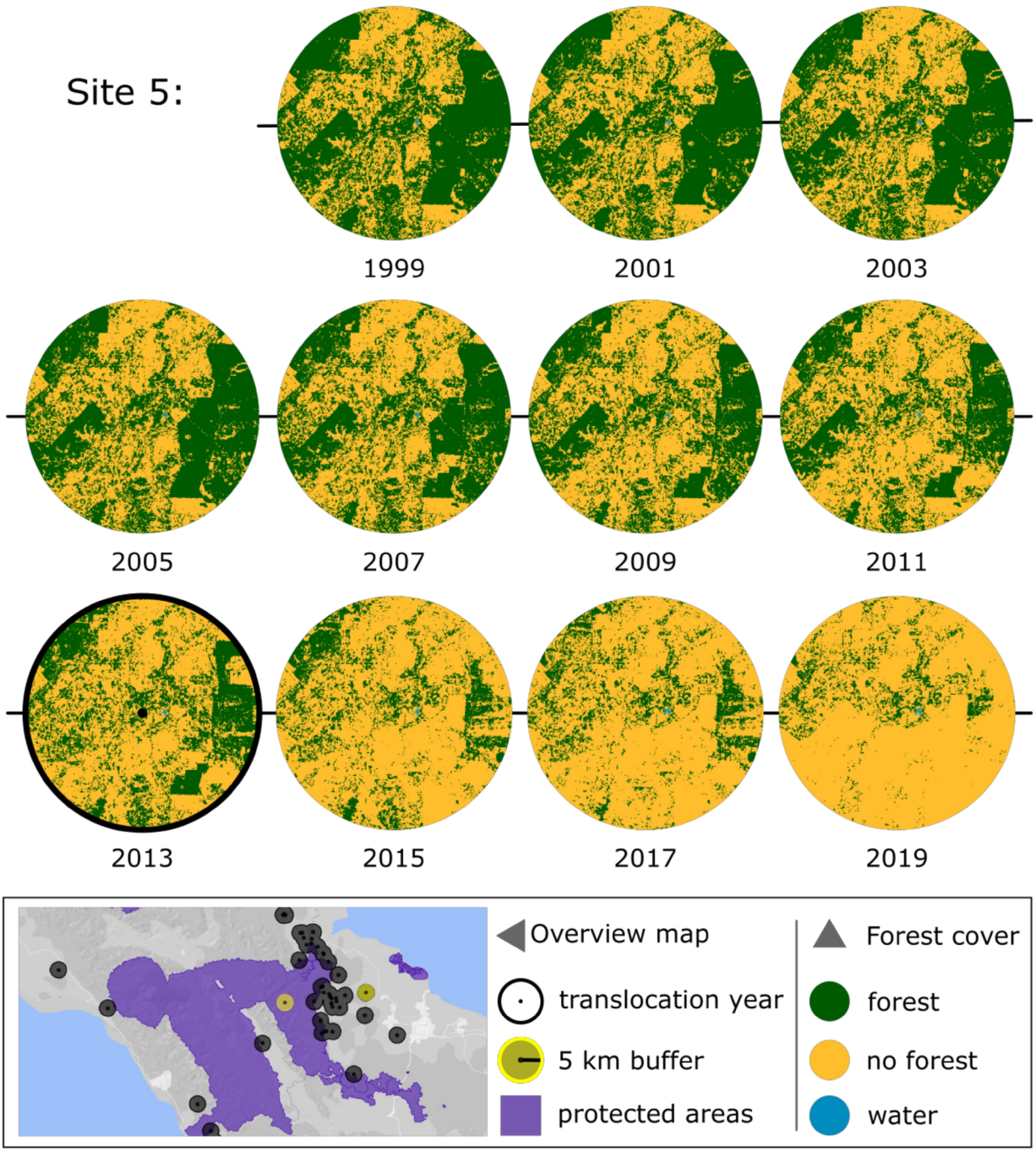
Appendix II Figure 1. Overview of land cover changes between 2000 and 2020 within a 5 km buffer at sites where orangutans were captured for translocation in Sumatra. Intact tropical moist forest, degraded tropical moist forest, and regrowth are combined into a single forest class (green). Protected areas are from UNEP-WCMC and IUCN (2023). Forest map from EC JRC. Basemap is from Google Earth Engine (Sherman et al., 2025).



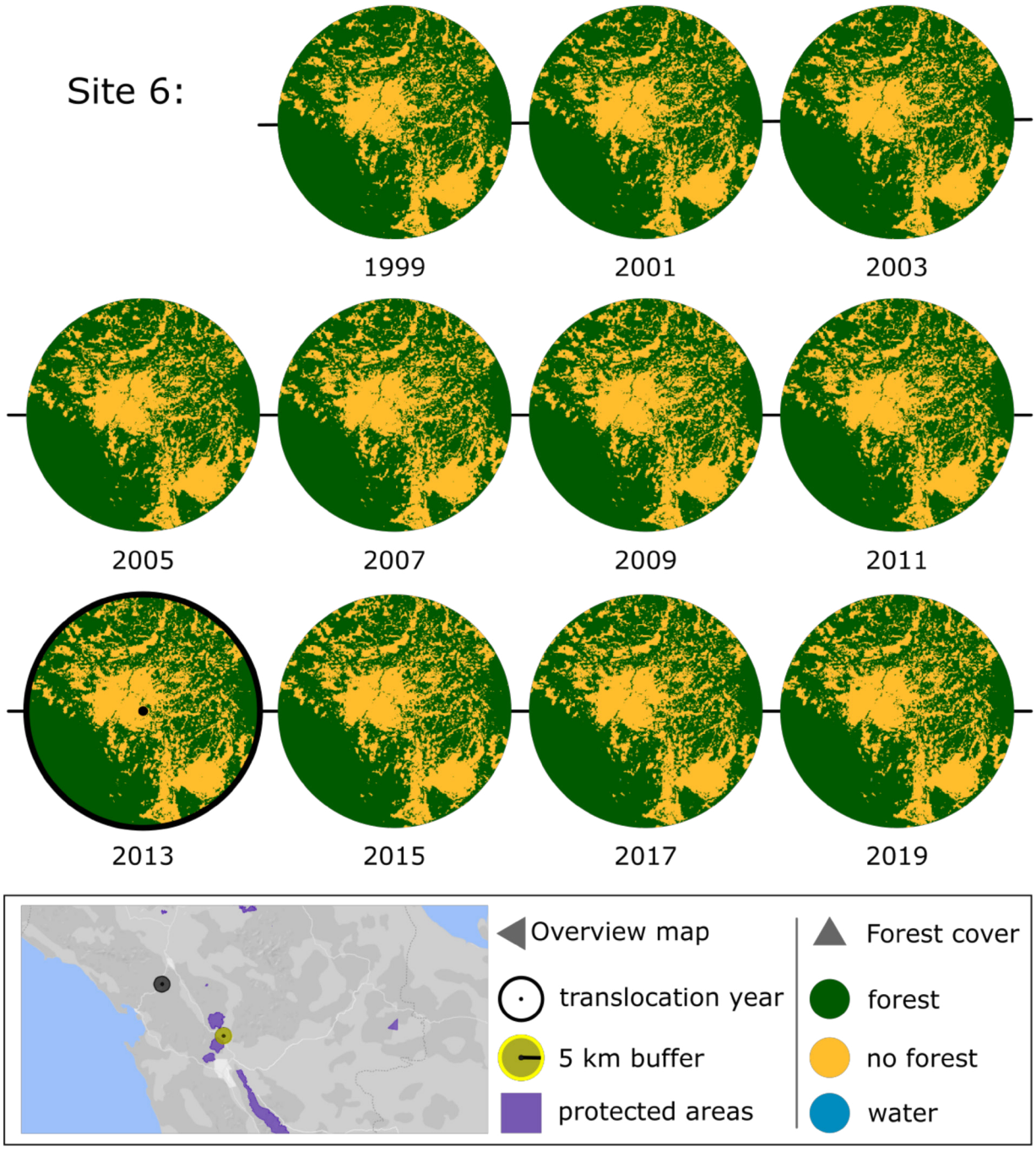
Appendix II Figure 2. Overview of land cover changes between 2000 and 2020 within a 5 km buffer at sites in Kalimantan where orangutans were captured for translocation. Top panels show forest changes within the 5 km buffer at one site in East Kalimantan. Bottom panels show forest changes within the 5 km buffer at three sites in Central Kalimantan. Protected areas are from UNEP-WCMC and IUCN (2023). Forest map from EC JRC. Basemap is from Google Earth Engine (Sherman et al., 2025).



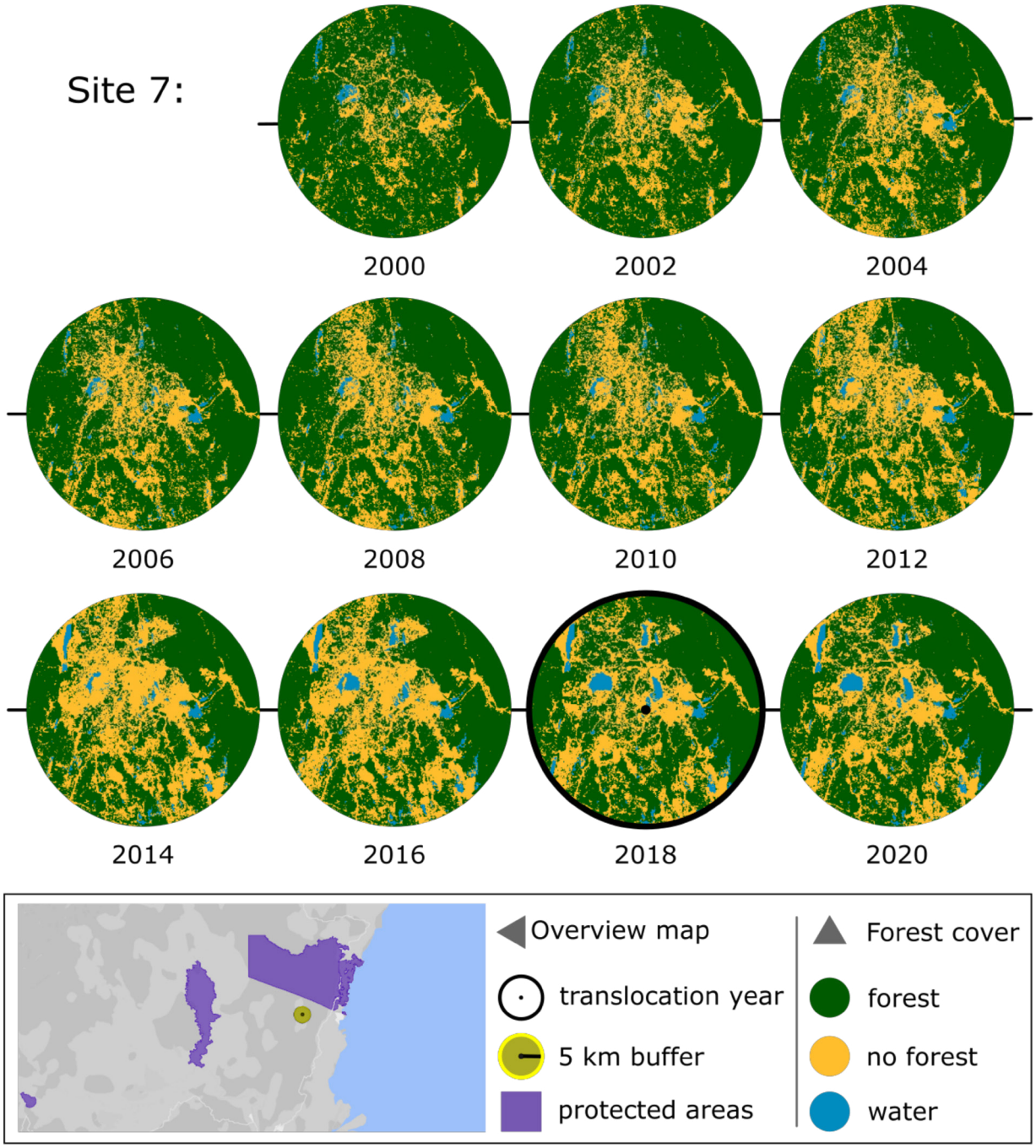
Appendix II Figure 3. Forest change in areas surrounding orangutan capture for translocation sites – scenario 4. An adult male Sumatran orangutan reported as seasonally foraging in durian (*Durio* sp.) and langsat (*Lansium parasiticum*) gardens at the edge of protected forest. He had been shot multiple times with air rifles to scare him away from crops. Year of capture is indicated with thick-black-bordered circle. Intact tropical moist forest, degraded tropical moist forest, and regrowth are combined into a single forest class (green). The map inset at the bottom is the location of the specific capture site and buffer (yellow) along with other locations where orangutans were captured for translocation (black). Source Basemap: Google Earth Engine. Source forest map: EC JRC (Sherman et al., 2025).



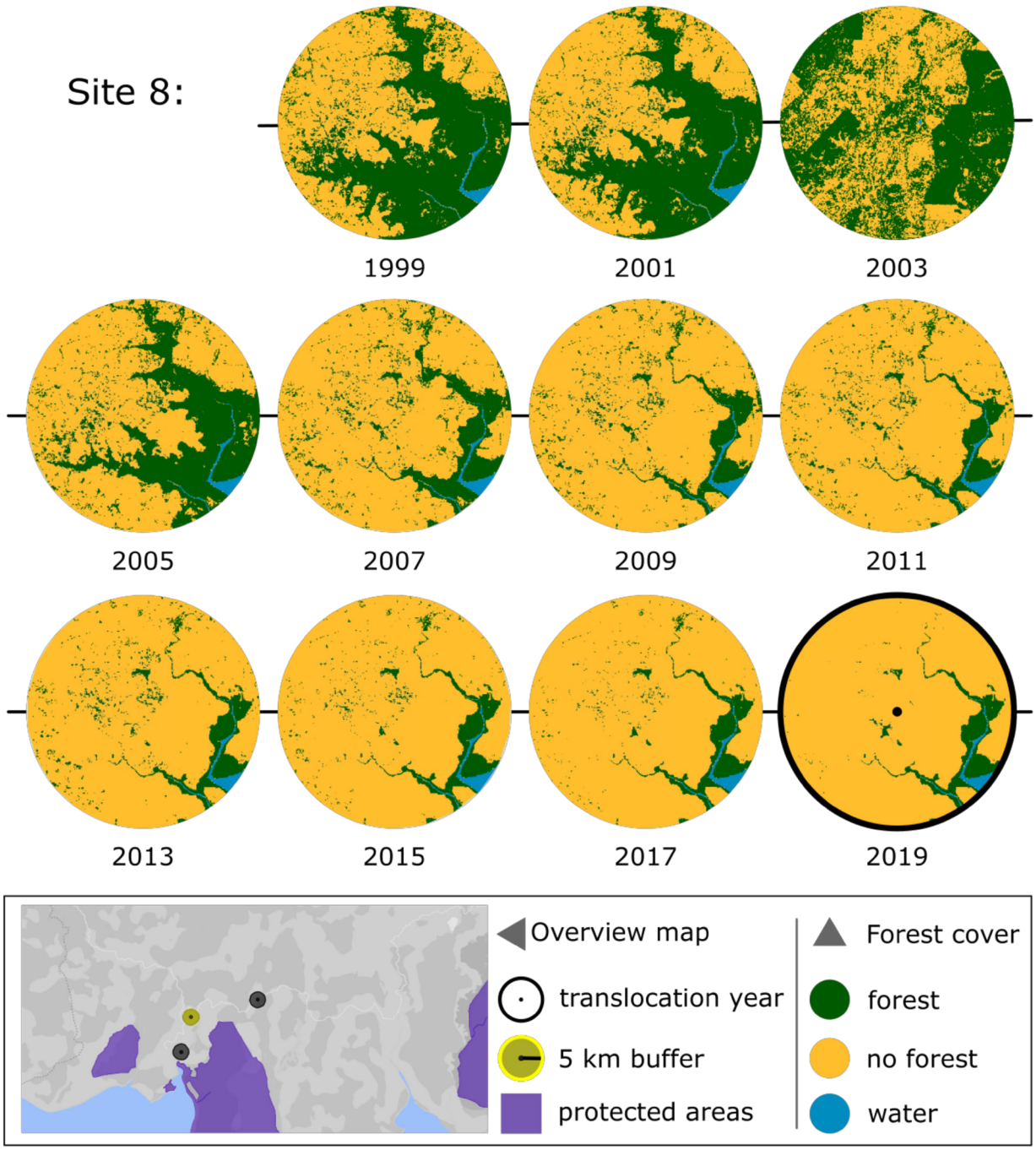
Appendix II Figure 4. Forest change in area surrounding orangutan capture for translocation site – scenario 5. Healthy Sumatran orangutan population reported as isolated in area considered at risk for deforestation; two adult females were translocated from this site. Year of capture is indicated with thick-black-bordered circle. Intact tropical moist forest, degraded tropical moist forest, and regrowth are combined into a single forest class (green). The map inset at the bottom is the location of the specific capture site and buffer (yellow) along with other locations where orangutans were captured for translocation (black). Source Basemap: Google Earth Engine. Source forest map: EC JRC (Sherman et al., 2025).



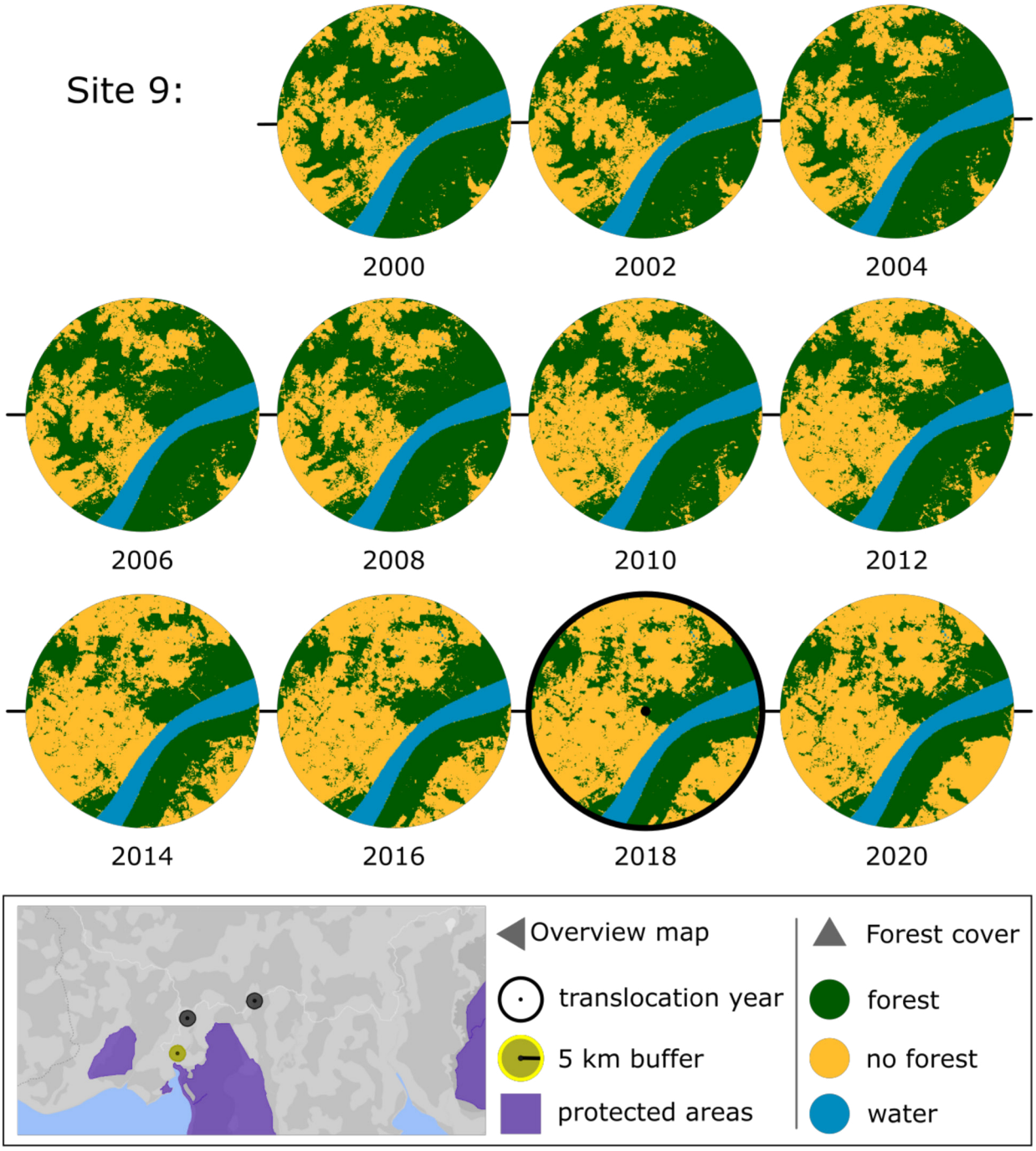
Appendix II Figure 5. Forest change in area surrounding orangutan capture for translocation site – scenario 6. A report of an injured adult male Tapanuli orangutan in a salak plantation. Year of capture is indicated with thick-black-bordered circle. Intact tropical moist forest, degraded tropical moist forest, and regrowth are combined into a single forest class (green). The map inset at the bottom is the location of the specific capture site and buffer (yellow) along with other locations where orangutans were captured for translocation (black). Source Basemap: Google Earth Engine. Source forest map: EC JRC (Sherman et al., 2025).



Appendix II Figure 6. Forest change in area surrounding an orangutan capture for translocation site – scenario 7. A report by community members of a juvenile male Bornean orangutan, previously thought to have been foraging in a local pineapple garden in Kutai National Park. The orangutan was gravely injured after having been shot repeatedly with an air rifle. Year of capture is indicated with thick-black-bordered circle. Intact tropical moist forest, degraded tropical moist forest, and regrowth are combined into a single forest class (green). The map inset at the bottom is the location of the specific capture site and buffer (yellow) along with other locations where orangutans were captured for translocation (black). Source Basemap: Google Earth Engine. Source forest map: EC JRC (Sherman et al., 2025).



Appendix II Figure 7. Forest change in area surrounding orangutan capture for translocation site– scenario 8. Healthy adult male Bornean orangutan reported to be staying in and "disturbing" a local durian garden. Year of capture is indicated with thick-black-bordered circle. Intact tropical moist forest, degraded tropical moist forest, and regrowth are combined into a single forest class (green). The map inset at the bottom is the location of the specific capture site and buffer (yellow) along with other locations where orangutans were captured for translocation (black). Source Basemap: Google Earth Engine. Source forest map: EC JRC (Sherman et al., 2025).



Appendix II Figure 8. Forest change in area surrounding orangutan capture for translocation site– scenario 9. Healthy adult male Bornean orangutan seen in APL land near a power plant and uninsulated electrical wires. Year of capture is indicated with thick-black-bordered circle. Intact tropical moist forest, degraded tropical moist forest, and regrowth are combined into a single forest class (green). The map inset at the bottom is the location of the specific capture site and buffer (yellow) along with other locations where orangutans were captured for translocation (black). Source Basemap: Google Earth Engine. Source forest map: EC JRC (Sherman et al., 2025).

In each of the nine scenarios, the orangutans were in an area where they could have travelled between forest patches and intact forest, or among degraded forest landscapes in which it was currently living. Some of these forests were cleared or degraded two to four years after the orangutans were removed, suggesting that orangutan translocation may have adverse impacts on forest retention (e.g. by making it politically or morally easier to clear forest areas once the protected animals are removed). In six of the nine scenarios (67%), the orangutans were not at immediate risk, and their translocation had high risks of negative impacts for the individual orangutans' welfare and for species conservation. In these six cases, the precautionary approach would be to leave these animals in place and protect them by working with local communities and companies rather than moving them. In three other scenarios (33%) the orangutans were at immediate risk of death due to injuries caused by humans (not directly related to forest loss), and no alternative actions were feasible to protect their lives or health. In these three scenarios, the risk of leaving them in place was greater than that of capturing them to provide emergency medical treatment.

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