A PRACTICAL GUIDE FOR CONSERVATION AREA MONITORING

ENGLISH

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Acronyms and Glossary

AGM	Assistant General Manager
CITES	Convention on International Trade in Endangered Species
CREMA	Community Resource Management Area
CSR	Corporate Social Responsibility
DBH	Diameter at Breast Height (about 130cm above the ground)
EIA	Environmental Impact Assessment
EHS	Environmental Health and Safety
EM	Estate Manager
FIA	Forest Integrity Assessment
GBIF	Global Biodiversity Information Facility
GEM	Group Estate Manager
GIS	Geographic Information System
GM	General Manager
GPS	Global Positioning System
GRTT	*Ganti Rugi Tanam and Tumbuh* (Planting and Growing Compensation for Indonesia)
HCS	High Carbon Stock
HCV	High Conservation Value
HCVN	High Conservation Value Network
IUCN	International Union for Conservation of Nature
MoU	Memorandum of Understanding
NDPE	No Deforestation, No Peat and No Exploitation
PIC	Person in Charge
PH	Plantation Head
RSPO	Roundtable on Sustainable Palm Oil
RTE	Rare, Threatened and Endangered
SIA	Social Impact Assessment
SP	Sampling Plot
TH	Total Height
WIP	Wilmar International Plantation

Preface

Recently, numerous oil palm plantations, including those in the Willmar's supply chain, have implemented HCV and HCS approaches in their plantation area. This is one of the efforts taken to implement sustainable plantation, where one of the objectives is to identify, maintain and manage conservation areas within the company's operational area, as well as enhance their value. However, the majority of the plantation companies struggle to monitor the identified HCV and HCS areas. One of the difficulties is the lack of practical and implementable manuals. It is currently difficult for company staff to translate all available manuals published by conservation institutions because they are not based on experiences in the field. Wilmar, therefore, took the initiative to develop a field guide based on its conservation staff experience in monitoring and managing HCV and HCS areas.

We hope that this guide will be more easily comprehended and implemented by the plantation company staff, to increase plantation-wide conservation awareness.

Last but not least, we would like to thank all who supported us to create this guide, particularly the HCV teams in each region and countries, unit leaders (Estate Manager, Group Estate Manager, AGM, GM, and PH), as well as our leader in Survey and Sustainability Department. We would like to acknowledge Simon Siburat, Calley Beamish, Mellisa Tolley and Ginny Ng Siew Ling who have been involved since the beginning in the management and monitoring of the HCV area in Wilmar plantations. Special thanks also go to the Natural Resources Conservation Agency (BKSDA), Zoology Society of London (ZSL), Wildlife Conservation Society (WCS), Yayasan Kalaweit, Borneo Orangutan Survival Foundation (BOSF), Andalas University (Unand), World Wide Fund for Nature (WWF), Sabah Wildlife Department (SWD), Sabah Forestry Department (SFD), Sarawak Forestry Cooperation (SFC), HUTAN, South East Asia Rainforest Research Partnership (SEARPP), Universiti Sarawak Malaysia (UNIMAS), any other parties who have helped implement HCV management and monitoring in Wilmar estates from the start.

Author and Editor Team

Introduction

Monitoring is a periodic assessment (evaluation) aimed at evaluating trends or progress to see whether an activity's objective has already been achieved. It includes continuous and sustainable evaluation and measurement by collecting and analysing information regularly and should be carried out in a consistent and standardised manner to produce a comparable result.[1]

Most conservation areas in palm plantations are managed using the High Conservation Value (HCV) approach and the High Carbon Stock Approach (HCSA). This guide does not provide an in-depth discussion of these approaches; but rather, focuses on practical information for monitoring in conservation areas, especially those with HCVs and HCS forests. In this document, HCV areas and HCS forests are referred to as conservation areas in general.

In terms of conservation area management,[2] monitoring is an adaptive management strategy to ensure that every change made in the designated conservation area is well documented. The monitoring outcome can be used as a basis for further actions to restore the conservation area's function if the change is unfavourable. In addition, monitoring evaluation can be used to update and revise management and monitoring plans in the future. Therefore, this activity should provide useful information for conservation area management.

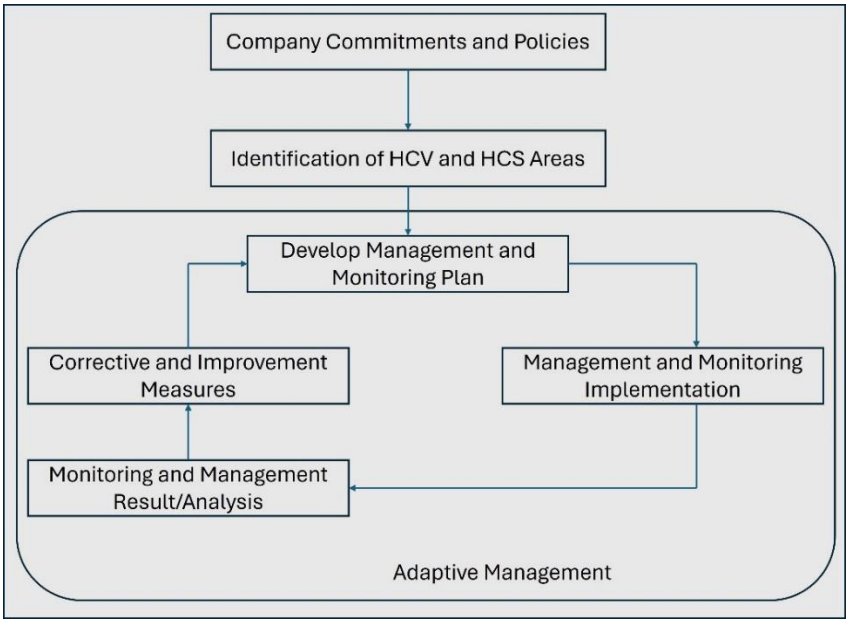


Figure 1. Adaptive Management' concept for HCV and HCS management (Source; Proforest)

[1] https://www.hcvnetwork.org/library/hcv-threat-monitoring-protocol-2013
[2] https://www.hcvnetwork.org/library/common-guidance-for-the-identification-of-hcv-english-indonesian-french-portuguese

The following are three types of conservation area monitoring[3] documented in conservation management and monitoring guides.

1. Strategic Monitoring

   The objective of strategic monitoring is to identify whether there are changes in the area's values. This monitoring focuses on standardised and scientific methods to produce data for analysis. Normally, data used for HCV-HCS monitoring is collected annually and is part of the evaluation for previously developed management and monitoring plans. Monitoring is carried out based on the area's values, i.e., ecological, environmental service, and socio-cultural conservations.

   The presence and richness of biodiversity in conservation areas is the main element observed when monitoring ecological features, as biodiversity is the most vulnerable to threats or disturbances in the area[4]. In terms of environmental service and socio-cultural conservation monitoring, it is important to engage the community since they are one of the key stakeholders who use these conservation values.

2. Operational Monitoring

   Operational monitoring is the company's method to ensure that conservation areas are managed according to management plans and schedules. For example, if the management plan includes boundary markers and signboard installation, this monitoring ensures that they are installed and in good condition. This activity is usually carried out once a month for the entire conservation area.

3. Threat and Disturbance Monitoring

   Monitoring for threats and disturbances in a conservation area is the most crucial because threats are the primary cause of disturbances in the conservation area's quality and quantity. Threats may have an impact on conservation areas. Regular monitoring provides information on the types of threats and disturbances identified in the conservation areas. The availability of this information indicates the effective management of a conservation area.

   This monitoring activity should be conducted as frequently as possible in areas prone to human activities and is recommended weekly for the entire conservation area. In areas that are relatively secure and free from anthropogenic activities, monitoring can be conducted monthly.

Due to that fact that certain conservation areas require specific monitoring, it is recommended that the specific monitoring should be based on the conservation area identified. This includes monitoring of plant species enrichment and conservation area restoration programmes, as well as enhancement of ecological functions of unique ecosystems such as peat and heath forest.

Conservation area monitoring may take the form of field and satellite imagery monitoring activities. This guide provides practical steps for field monitoring based on field experiences of Wilmar's conservation staff.

[3] https://www.hcvnetwork.org/library/common-guidance-for-the-identification-of-hcv-english-indonesian-french-portuguese
[4] https://www.hcvnetwork.org/library/hcv-threat-monitoring-protocol-2013

1

1.0 Monitoring Techniques

1.1 Monitoring Ethics

Monitoring activity is vital for planning for conservation area management[5]. For this reason, one of the requirements that the company must meet is provide training for the monitoring team. Every team member should pay close attention to observation and monitoring ethics when conducting the activity. The following are the general ethics that guide conservation area monitoring:

a) The team lead should inform the owner or management of the conservation area of the timing of the monitoring.

b) The team should have the capacity and knowledge of emergency response, such as the use of first aid supplies.

c) Wear dark-coloured and camouflaged clothing or others suited to the habitat condition, such as black, green, etc. Avoid using perfume or any scented products that may trigger wildlife to be distant or evade the areas.

d) Move cautiously to avoid disturbing and frightening wildlife.

e) Avoid making noise, speaking too loudly, or playing music (from media devices, such as handphone, mp3 player, etc.) that may cause wildlife to flee the observation area before the observation is carried out.

f) Rubbish shall be disposed of responsibly.

g) Do not smoke during monitoring activities.

h) Document all observations of wildlife or vegetation using the data sheet template in Annex 3 and 4.

1.2 Monitoring Equipment

Monitoring equipment is required to produce more accurate monitoring output. Equipment and tools used and carried during conservation area monitoring should be able to guarantee the safety of observers when entering forests or walking forest paths, including the following; -

a) Plants, e.g., rattans or thorny plants, roots, or creeping stems.

b) Animals, e.g., leeches, snakes, and bees.

c) Natural barriers, e.g., difficult footing out of muddy puddles or streams in the forest.

d) Weather, e.g., rains and heat.

To anticipate these challenges, the monitoring team must wear appropriate clothing and be equipped with the following.

a) Long-sleeved shirts, trousers, and footwear covering ankles (rubber boots are recommended).

b) Patrol gears neatly organised in a single container/bag and easily accessible; navigational instruments (GPS and compass) and documentation equipment and tools (camera, notes) should be stored in a separate bag and kept dry.

c) Each team member should be equipped with communication devices, personal supplies such as meals, drinks, personal medicine, and a machete (commonly known as parang).

[5] https://portals.iucn.org/library/efiles/documents/pag-010.pdf

The following are the main equipment used during monitoring:

a) Map indicating the conservation area and access road for vehicles.

b) GPS device that includes the conservation area map to facilitate navigation.

c) Binocular for seeing distant objects, particularly for identifying wildlife species.

d) Digital camera, preferably those with high resolution (>5 megapixels).

e) Field guides containing information on Rare, Threatened, and Endangered (RTE) flora and fauna species.

f) A compass is an additional navigation tool in case the GPS is not working.

g) Wristwatch as a timekeeping tool during the activity.

h) Data input sheet, stationery, and backups (data sheets can be replaced with notebooks for efficiency, but keep in mind that they should be completed as evidence and control for estate management).

i) First aid kit.

j) Machete (ideally covered with holster and hung on the waist to ensure safety).

k) Waterproof gear (waterproof case to protect the datasheet, and dry bag to protect electronic device).

Figure 2. Example of equipment used in the monitoring. (Source: Wilmar)

1.3 Strategic Monitoring

In strategic monitoring, data is collected on all conservation values identified in the company's concession. This guide focuses more on techniques for collecting biodiversity (flora and fauna) data. As for the environmental service and socio-cultural data, it is collected from environmental monitoring reports as required in Environmental Impact Assessment (EIA), High Carbon Stock (HCS) Assessments, High Conservation Value (HCV) Assessments, and Social Impact Assessment (SIA) reports.

Many methods from various field guides can be applied to collect flora data. One of them is the belt transect, which is quite practical for monitoring conservation areas. In riparian areas with navigable water bodies, boat-based monitoring can be employed where suitable and necessary, particularly in sensitive conservation areas. This method enables effective coverage of aquatic and riparian habitats with minimal disturbance. Camera traps can also be incorporated into wildlife survey to enhance data collection, especially in sensitive conservation areas. The use of camera traps allows for non-invasive monitoring, capturing the presence and behaviour of wildlife without direct human interference. By integrating camera trap monitoring, the team can gather valuable insights while minimising human impact on the ecosystem. Wildlife data is collected through observation using Reconnaissance Walk or MacKinnon's 10-species list. See below the description of each data collection method.

1.3.1 Flora Data Collection

a) Vegetation data is collected through 10 x 10 m sampling plots as illustrated in Figure 3.

b) These plots are set in the field, starting from Point 0 on the transect line.

c) Trees with more than 20 cm diameter are measured in the transect line (5 m to the left and 5 m to the right side of the transect line) so that the sampling plot width is 10 m.

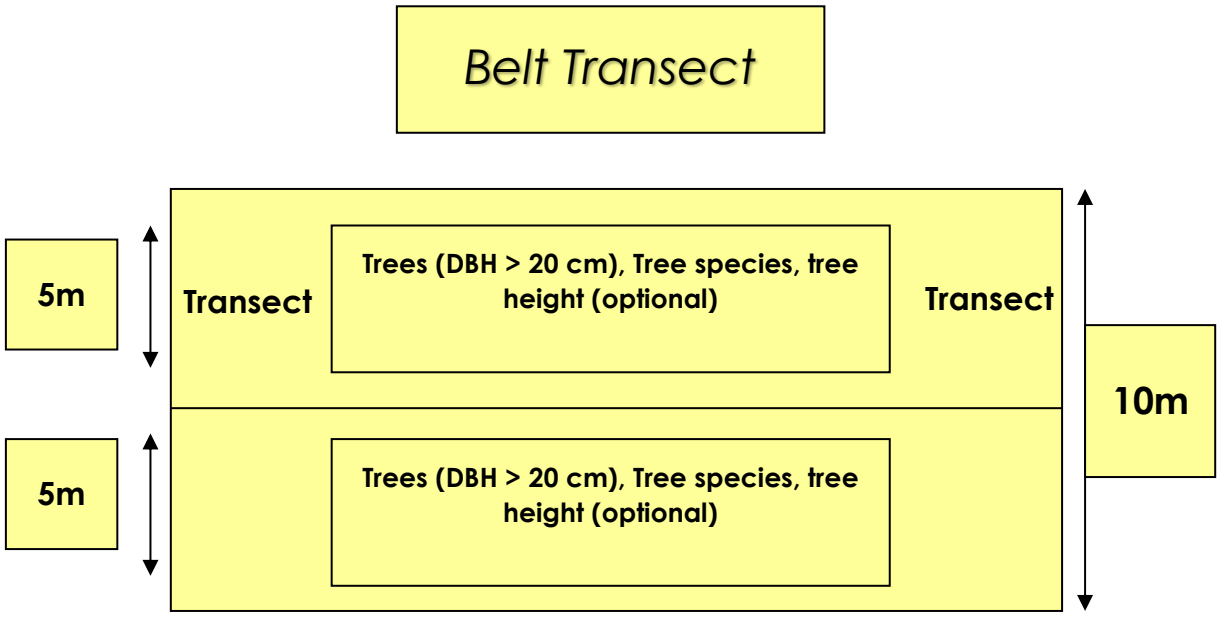


Figure 3. Example of vegetation measurement plot. (Source: Proforest)

i. **Trees**: Species, number of individuals, DBH, and total height. Tree height is an optional parameter, so it can be ignored if the field team does not have the necessary tools for measuring it. The presence of RTE or protected species saplings should also be identified, particularly to support restoration or species enrichment programmes in a conservation area.

ii. **Poles**: Species, DBH (±130 cm) and total height.

iii. **Lianas and epiphytes**: Species and number of individuals.

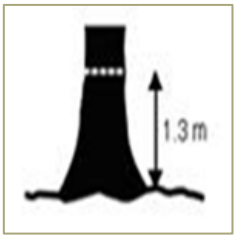
iv. The collected data is inputted into the tally sheet (Annex 3).

v. In case of limited resources of equipment, DBH can be set by measuring the tree circumference. DBH can be calculated using the circle formula as follows.

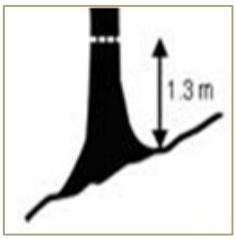
$$\text{Diameter} = 2 \times \sqrt{\frac{Circumference}{2\,x\,\prod}}$$

Figure 4. How to measure tree diameter. (Source: Mongabay)

Circumference measurement methods to set DBH for each tree condition are as follows:

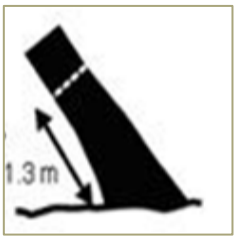


Normal tree condition: In a normal condition, DBH is measured at a height of 1.3 m.

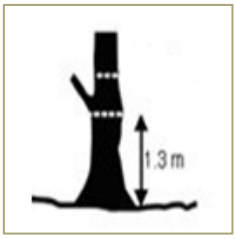


The main trunk grows upright and is not parallel to the slope surface: The diameter is measured perpendicular to the growth direction of the main trunk.

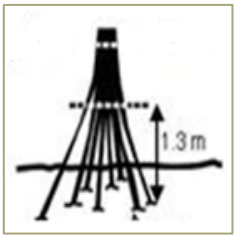
DBH measurement of trees on a slope (the trees grow slanting in parallel to the slope contour): Trees in this position are measured at the 1.3 m height, perpendicular to the axis of the main trunk (also slanting by following the growth direction of the main trunk).



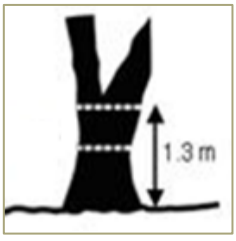
The main trunk grows slanting on the flat ground: This tree is measured at a height of 1.3 m from the ground, following the direction of the slanting main trunk.



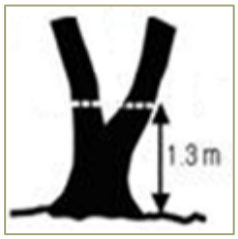
Measure the stand at the lump or the first branch: To measure DBH, the height of 1.3 m should be added with 0.5 m up to the level above the first branching or lump.



When the root system is stilt found at the tree's measurement level: If a growing root system is still found at the required level (1.3 m), measurement can be carried out 0.5 m from the last part of the root system.

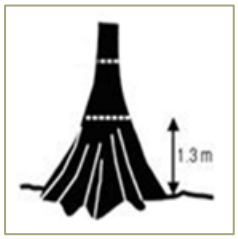


Measurement level is located below the first/main branching: If the measurement level is directly below the first branching, measurement is carried out 0.5 m below the part.



Measurement level is located at the first branching (of equal size): If the tree has a split trunk at 1.3m, measure diameter at breast height for both trunks.

The main trunk is dead but the tree continues to produce new branches: If the diameter measurement level is located at damaged/broken/dead main trunk, but the tree still has alive, growing branches, measure at 0.5 m from the measurement level (1.3 m) or 1.8m from ground level.



Tree has a buttress root that reaches up to the measurement level (1.3 m): In this case, measure at 0.5 m above the buttress root/ measurement level or 1.8m from ground level

1.3.2 Fauna Data Collection

1. **Reconnaissance (Recce) Walk or Opportunistic Sampling,** where wildlife is encountered, either directly (direct sighting) or indirectly (indirect sighting, e.g., footprints, faeces, sound), document it in a field book. The following techniques are used to collect data:
   a. There should be at least three people to carry out field monitoring, and their tasks are as follows:
      i. The first person navigates and clears the trail.
      ii. The second person carries out identification and documentation.
      iii. The third person documents and takes GPS coordinates.

At minimum, there should two people in a team if there is a shortage of members.

   b. A survey can be planned and such that the survey path follows the forest boundaries or transects.
   c. Set locations/distribution and direction of observer's movement or track.
   d. Set the observation transects starting point and mark it to make it easy to revisit. The starting point can be roads or existing boundary marks.
   e. Before conducting monitoring, GPS should be turned on and tracking mode enabled. GPS points for the start and endpoint of monitoring tracks/trails should be captured accordingly.
   f. Observation targets in the rapid survey include:
      i. Mammals;
      ii. Herpetofauna (reptiles and amphibians); and
      iii. Aves (birds).

g. Survey team should walk slowly along the transect line.

h. Observation should be carried out twice a day considering the weather conditions, i.e., in the morning (around 6:00-10:00 a.m.), and evening (around 04:00-06:00 p.m.).

i. Depending on the nature of the assessment area, the data should be collected at least twice a year to account for seasonality.

j. Observation should be repeated at least once for each path.

k. Data collected include species and number of individuals by species encountered, the time they are found (hour, minute), encounter type (nesting/sleeping location or sound/voice), and coordinate.

l. Wildlife species may be encountered directly or indirectly.

m. All wildlife data are documented in the wildlife observation sheet (Annex 1).

2. MacKinnon's 10-species list is a modification of the method developed by MacKinnon. The following techniques are used to collect data:

   a. The team is made up of at least 3 persons, and their respective tasks are described below:

      i. The first person navigates and clears the trail.

      ii. The second person carries out identification and documentation.

      iii. The third person documents and takes GPS coordinates.

   b. The team should walk along a predetermined path and document any encounters with wildlife (especially birds).

   c. Each species data is put in tables each containing 10 wildlife species.

   d. When one table already contains 10 wildlife species, documentation should go on to the next table.

   e. Wildlife species observed and documented in the first table, but also observed when filling the second one, should be documented again in the second table. This continues until the designated area or transect line has been covered.

See Annex 2 for an example of field data from MacKinnon's 10-species list method.

1.3.3 Forest Integrity Assessment (FIA) Tool [6]

- The Forest Integrity Assessment (FIA) tool is a simple and user-friendly tool for assessing and monitoring biodiversity conditions in forests and forests remnants.
- This method is suitable for users who do not have knowledge or experience in forestry or conservation, to monitor conditions.
- Collection of data on plants, the state of forest vegetation or the state of the surrounding ecosystem can be conducted by simply observing and answering questions with either “Yes” or “No” answers in the form provided (Appendix 6).

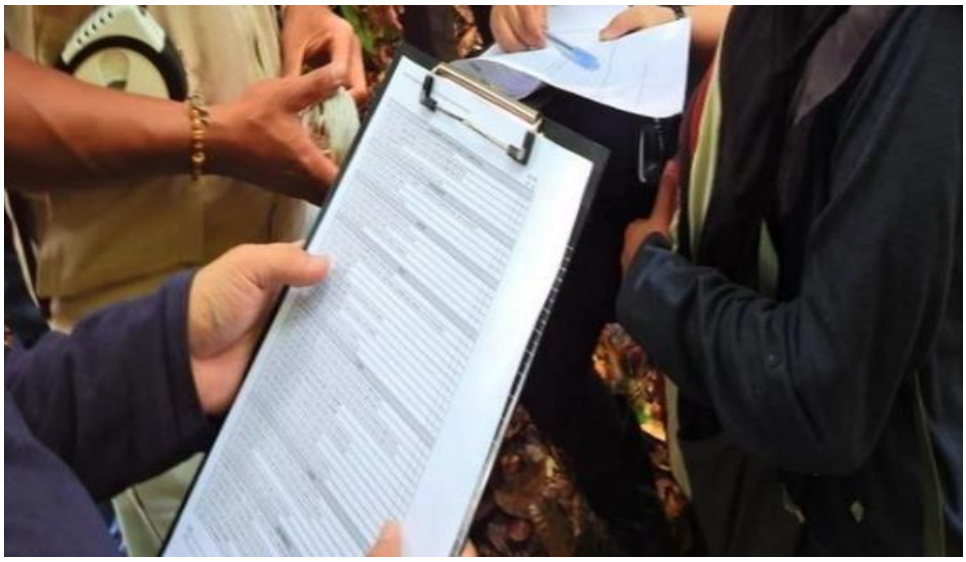


Figure 5. Monitoring team conducting the Forest Integrity Assessment (FIA). (Source: Wilmar)

[6] https://www.hcvnetwork.org/library/forest-integrity-assessment-tool-fiat-manual

1.4 Operational Monitoring

1.4.1 Monitoring of Ecological Conservation (HCV 1-3)

An ecological conservation area is categorised as an area with canopy coverage and harbours HCV 1-3 values. In general, this monitoring process includes the following:

1. There should be at least three people to carry out field monitoring with the following respective tasks:
   a. The first person navigates and clears the trail.
   b. The second person carries out identification and documentation.
   c. The third person documents and takes GPS coordinates.
2. Prior to starting the monitoring activity, ensure that the plan and monitoring preparations are adequate and complete. Information such as monitoring locations, and names of team members should be communicated to the Estate Manager (as a safety precaution).
3. Once at the starting point of the monitoring area, the GPS should be turned on and tracking mode should be enabled. GPS points for the start and endpoint of monitoring tracks/trails should be captured accordingly.
4. Make a monitoring route plan. The monitoring route can follow the forest boundaries or across the forest (transect) including trails or trails prepared for the purpose of the study.
5. When monitoring the forest boundaries, the team should follow the boundaries between the forest and plantation. The team may go off-track within a maximum distance of 50 m (inward or outward) from the forest boundaries.
6. If there are traces or signs of entry into the forest (i.e. small paths are found), the team should follow them up to 100 m maximum into the forest. If no disturbances/threats are found, the team can return to the forest boundaries.
7. If monitoring is carried out in a transect, data is collected by walking along the designated transect.
8. If boundary markers or signboards are found damaged, the team should repair them. If this cannot be done directly in the field, make recommendations to repair the markers or signboards in the monitoring form.
9. Any threats or disturbances detected along the transects should be documented and included in the monitoring form.
10. If it is not possible to collect data on the transect due to unfavourable conditions (e.g., flooding, fire, threats of danger, etc.), the team can move to another transect after notifying the team leader.
11. Any findings, both threats and biodiversity, are captured on GPS and documented in the monitoring form in Annex 4.
12. When encountering miners, loggers or encroachers, try to collect as much data as possible, including their names, number of machines and equipment, income per day (cubic, grams of gold/zircon), etc.

13. If the monitoring team faces any form of threats or intimidation, they are not allowed to fight back. Instead, they must leave the area immediately. However, if they are not allowed to enter the area due to any reason, they may leave the monitoring area and find new location. For every change in locations, the team is required to inform the team leader.
14. Security measures can be taken against threats that can be managed or eliminated (e.g., snares and nets) before handing them over to the team leader.
15. Each observation record must contain complete and detailed information including photos of the findings during monitoring.
16. Survey equipment should be well-maintained.
17. The monitoring team should prioritise Occupational Health and Safety (OHS) during field monitoring.
18. The monitoring team should report to the Estate Manager upon completion of the monitoring activity.

1.4.2 Ecosystem Service Monitoring

Areas that are particularly relevant for ecosystem services include swamp forest and riparian zones.

Riparian zones are areas adjacent to a water body that acts as a buffer zone. In several locations, such areas have a closed canopy or forests. However, there are also riparian areas that are cleared or planted with plantation commodities. In general, the process for riparian area monitoring is as follows.

1. There should be at least three people to carry out field monitoring, and their tasks are as follows:
    a. The first person navigates and clears the trail.
    b. The second person carries out identification and documentation.
    c. The third person documents and records the GPS coordinates.
2. Before conducting monitoring, the GPS should be turned on and tracking mode enabled. GPS point for start and endpoint of monitoring tracks/trails should be captured accordingly.
3. Monitoring should be conducted along the river/around the lake/spring/riverbanks considered as riparian areas. Conduct monitoring in riparian forest boundaries for areas with dense forests along the rivers (similar to ecological conservation monitoring).
4. Each finding, either threat or biodiversity, is captured on GPS and documented in monitoring form (Annex 4).
5. If boundary markers or signboards are found damaged, the team should repair them. If this cannot be done directly in the field, make recommendations to repair the markers or signboards.

Figure 6. Example of signboards that should be cleaned. (Source: Wilmar)

6. Actions can be taken against threats that can be managed or eliminated (e.g., snares, nets, and invasive species). Specifically for snares, they can be removed and handed over to the team leader.
7. If the condition of the riparian area is not favourable or cannot be accessed, the team is allowed to relocate to other riparian areas upon notifying the team leader.
8. Each observation record should include detailed information.
9. Survey equipment should be well-maintained.
10. The monitoring team should prioritise OHS during the field monitoring.

1.5 Threats and Disturbances Monitoring

Threats and disturbances to a company's conservation areas may be different across companies. Some companies may report no threats and disturbances in their conservation areas, while others may report many types of threats and disturbances that have caused destruction and degradation to the identified conservation values. The different types of threats and disturbances commonly found in a plantation company's conservation areas are as follows.

1.5.1 Land Clearing/Land Claim

Land clearing is one of the most sensitive social issues. Therefore, the monitoring team should practice caution and use polite expressions and gestures to retrieve as much information as possible. Data collected from this process can be used as one of the company's efforts in identifying potential claims by communities over conservation lands. In addition, through monitoring, the company can develop strategic steps to reduce challenges with claims and the clearing of conservation areas.

Figure 7. Example of land claims over conservation area. (Source: Wilmar)

The steps for monitoring threats or land claims are as follows:

1. Identify the landowners, including their full names and addresses.
2. Enquire the reasons for the land clearing or claim.
3. Measure the cleared areas by GPS tracking.
4. Record the block number or any information regarding the cleared or claimed area.
5. Take photos of cleared areas and their boundaries.
6. Document all information in the monitoring form and submit it to the company management for further action.

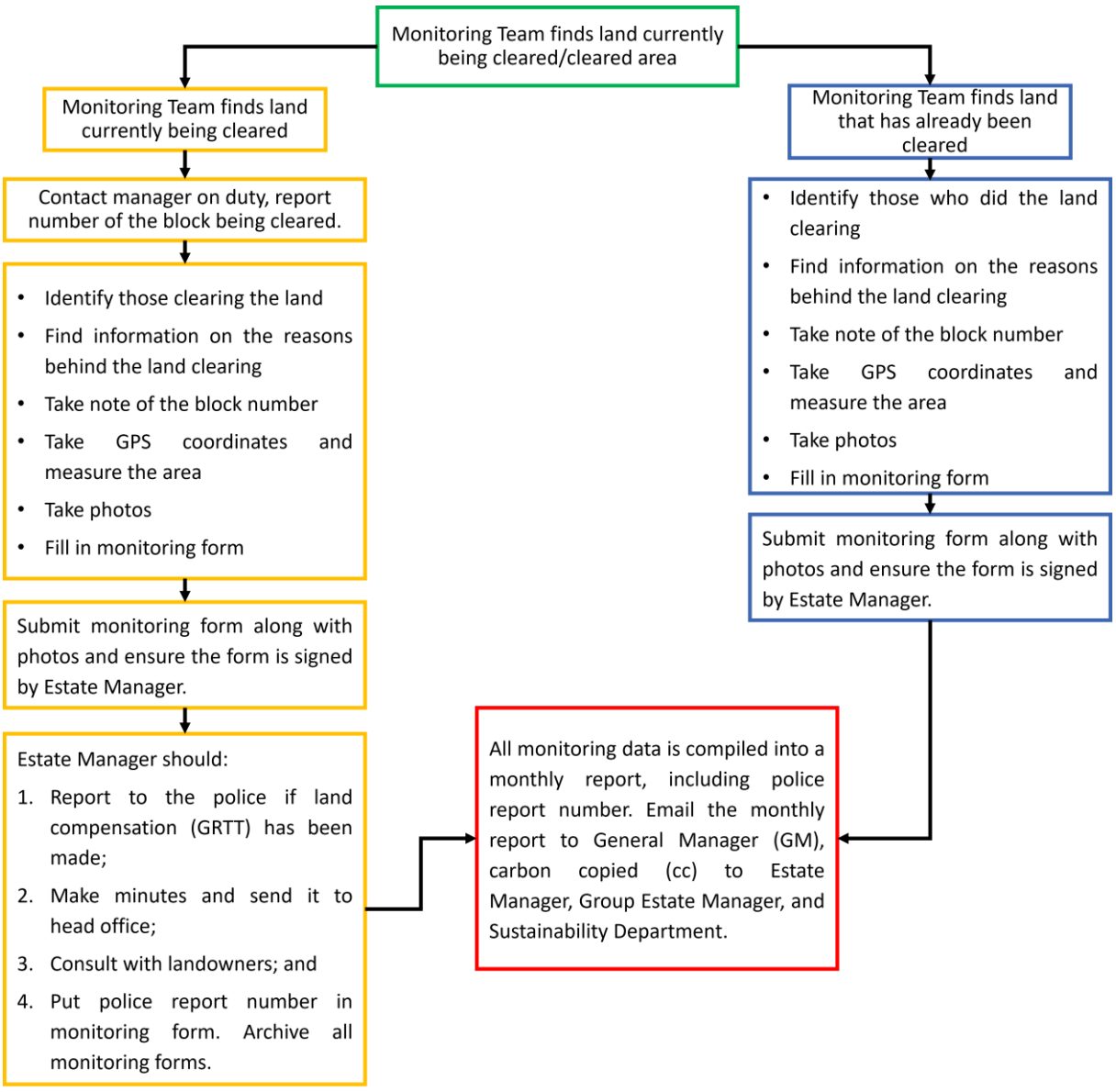


Figure 8. Flowchart of Land Clearing Monitoring and Reporting.

1.5.2 Burning in Conservation Areas

Land or forest fires usually occur during the draught or dry seasons. The cause of fires can be either intentional (slash-and-burn) or negligent (cigarette butts, mosquito coils, embers, etc.). Preventive measures are needed to avoid fires in conservation areas and plantations. This can include the installation of signboards prohibiting land burning, Signboards of Fire Danger Rating System (FDRS), constructing fire watchtowers, and preparing a map of fire-prone locations based on the previous year's hotspots. Fire-belts can be established around conservations areas example forest to serve as a break when there is outbreak of forest fire. For peat areas, it is also necessary to maintain the water levels to anticipate drought in peatlands.

Figure 9. Examples of a signboard prohibiting land burning. (Source: Wilmar)

Although preventive measures have been taken, field officers will need to take the following immediate steps in the case of a fire breakout or occurrence:

1. Immediately report cases of fire in the conservation areas to Estate Manager.
2. Ensure there are personnel guarding the area to prevent the fires from spreading.
3. Identify the source of the fire.
4. Record the GPS coordinates of the fire locations.
5. Take photos of the burning areas.
6. Implement efforts to extinguish the fires.
7. Once the fire is extinguished and it is safe to conduct measurements, measure the burnt areas using GPS.
8. Analyse and investigate the cause of the fires.
9. Record all information into the monitoring form and submit it to the company's management for further action.

Figure 10. Forest fire. (Source: Wilmar (left) and University of Leeds (right))

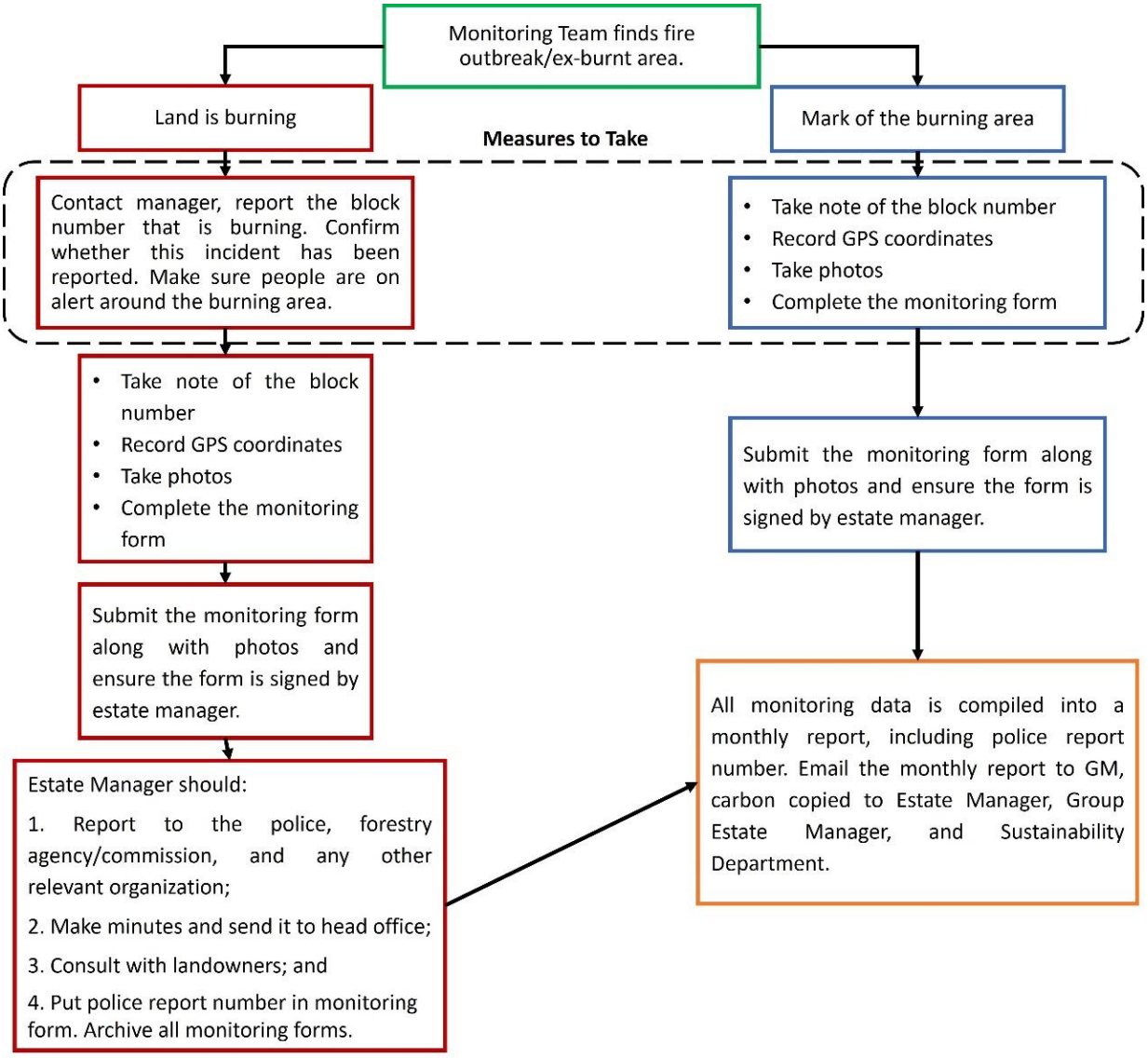


Figure 11. Flowchart of Land Fire Monitoring and Reporting.

1.5.3 Timber Extraction (Logging)

Timber extraction is a form of threat or disturbance to conservation areas. Timber extraction can be in the form of logs or processed timbers. Steps to collect data regarding timber extraction are as follows:

1. Measure timber in cubic. For logs, volume is measured using this formula:

$$Volume\ (m^3) = \pi r^2\ x\ Log\ length$$

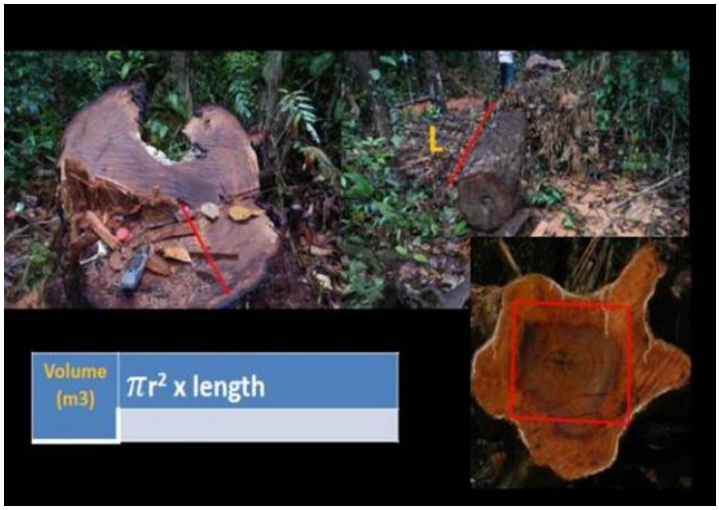


Figure 12. Log cubic measurement. (Source: Proforest)

As for processed timber, volume is measured using the following formula:

$$Volume\ (m^3) = (length\ x\ width\ x\ height)\ x\ number\ of\ logs$$

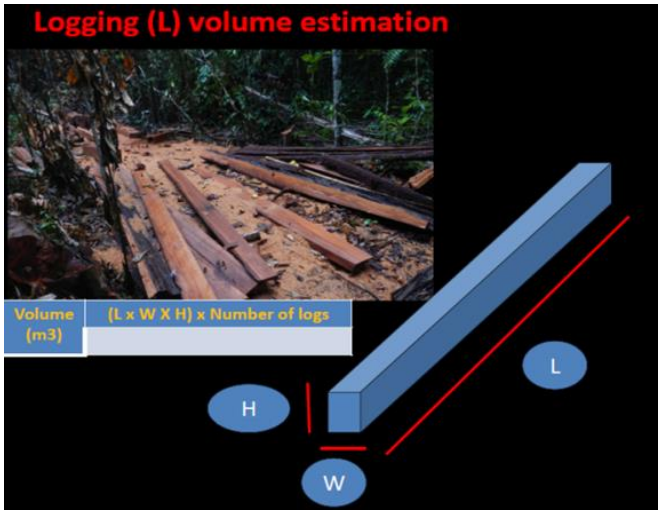


Figure 13. Calculation of processed timber cubic measurement. (Source: Proforest)

2. Record the GPS coordinates at each logged tree or timber processing site.
3. Take photos of each logged tree or timber processing site.
4. Find information on the loggers from employees or communities near the logging site.
5. Record all information in the monitoring form and submit it to the company's management for further action.

Figure 14. Example of timber harvesting activity. (Source: Proforest)

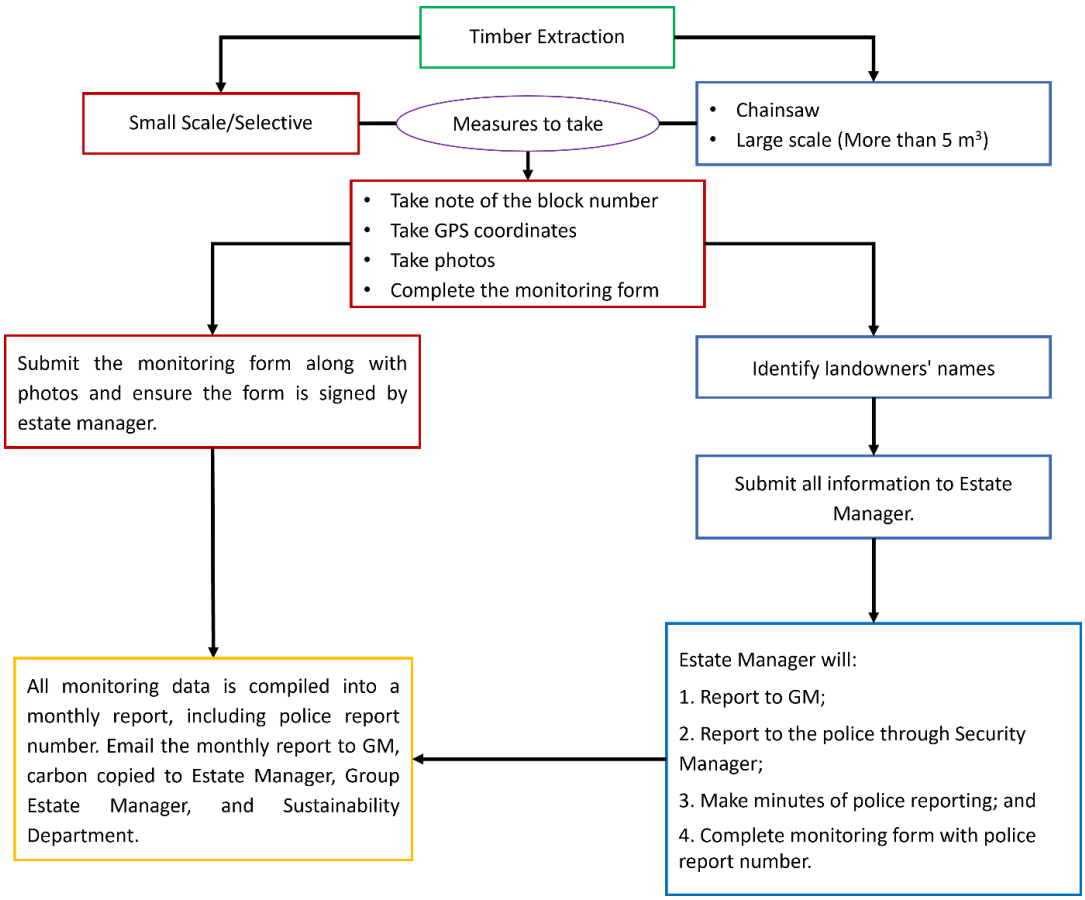


Figure 15. Flowchart of Logging Monitoring and Reporting.

1.5.4 Mining

In most cases, mining activities in the company's conservation area is mainly caused by land claims and leasing to miners. As such, the monitoring process should be conducted prudently and ethically. Data can be collected through the following steps:

1. Identify the type of mining commodity (e.g. gold, zircon, rock, sand, etc.)
2. Measure the size of mining operation.
3. Calculate the number of machinery units used.
4. Record the full names of the machine owners, number of workers, and the daily mining output.
5. Record the GPS coordinates of the mining sites.
6. Take photos of each machinery and equipment used, mining products, and make a description of the mine location for documentation purposes.
7. Find information regarding the mining collectors and the amount of mining product collected.
8. Record all the information in the monitoring form and submit it to the company management for further action.

Figure 16. Overview of mining zone size. (Source: Civic Response)

Figure 17. Workers and mining machineries at the mine site. (Source: Pulse Ghana)

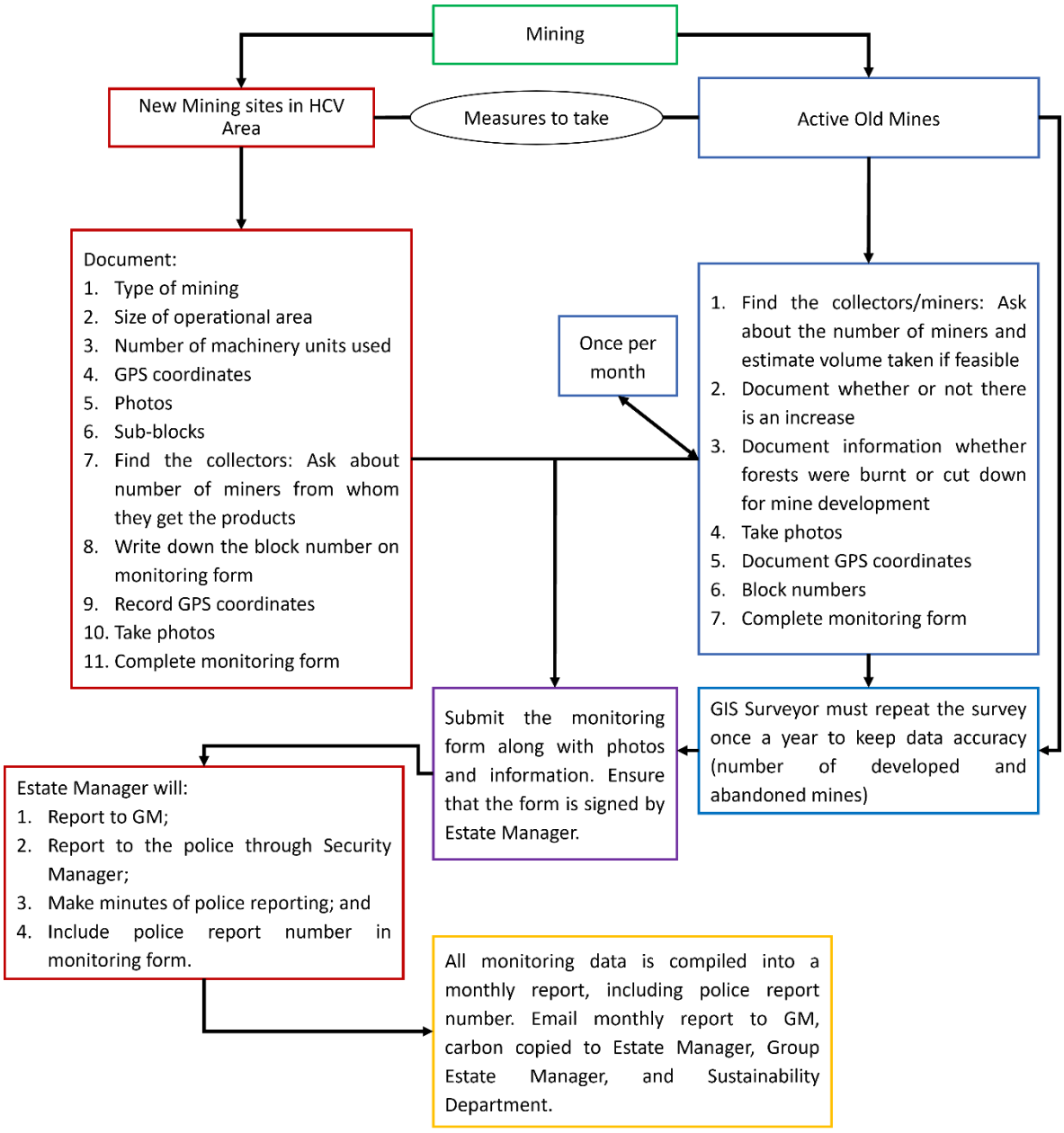


Figure 18. Flowchart of Mining Monitoring and Reporting.

1.5.5 Poaching or Hunting

In monitoring poaching threats, it is necessary to identify the motives behind them. As for hunting activities that fall under HCV 5 criteria, data collection techniques will be covered in another section (see socio-cultural monitoring section). In this section, activities that are considered as threats are poaching, i.e., those committed outside the context of HCV 5.

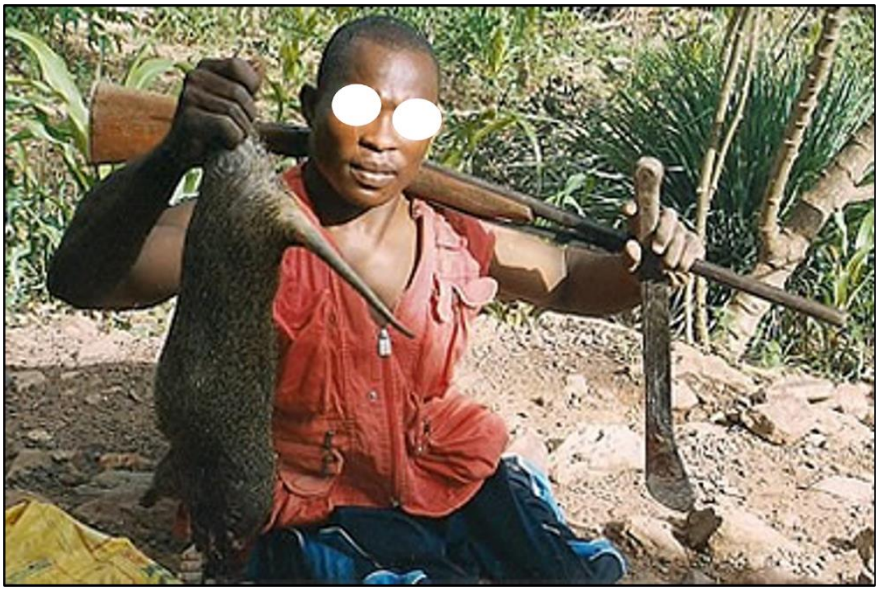


Figure 19. Hunter with locally made gun. (Source: Ghana Environment)

Data is collected in the following steps:

1. Identify the type of tools and equipment used for poaching (foot trap, neck trap, net, birdlime, firearm, etc.) and/or wildlife species trapped.
2. If poachers are using firearms, ask them to provide evidence/licence or permit from the police.
3. Ensure the relevant parties possess the appropriate hunting license or permit from the responsible authorities, such as forestry or wildlife management agencies.
4. Where traps are found but with no hunters in sight, dismantle and destroy them.
5. In the case where an animal is trapped or shot, document the species and its protection status.
6. Record the GPS coordinates of where each poaching tool or equipment is found or where hunters are encountered.
7. If knowledgeable and it is safe, take photos of traps before and after dismantling them, proceeding with caution, especially around dangerous traps like pit traps or potential explosives. Prioritise safety, naturalise pit traps where possible, and document evidence of poaching, including poachers, hunted wildlife, or signs like footprints and equipment. Stay vigilant at all times.

8. Record all the information in the monitoring form.
9. Report to the appropriate authorities, such as forestry or wildlife management agencies, if any of the wildlife caught or poached is a protected species.

Keep a record of the report and follow up actions taken should follow the recommendations and guidance from the appropriate/recommended organisation.

Figure 20. Example of dismantling of terrestrial animal trap. (Source: Wilmar)

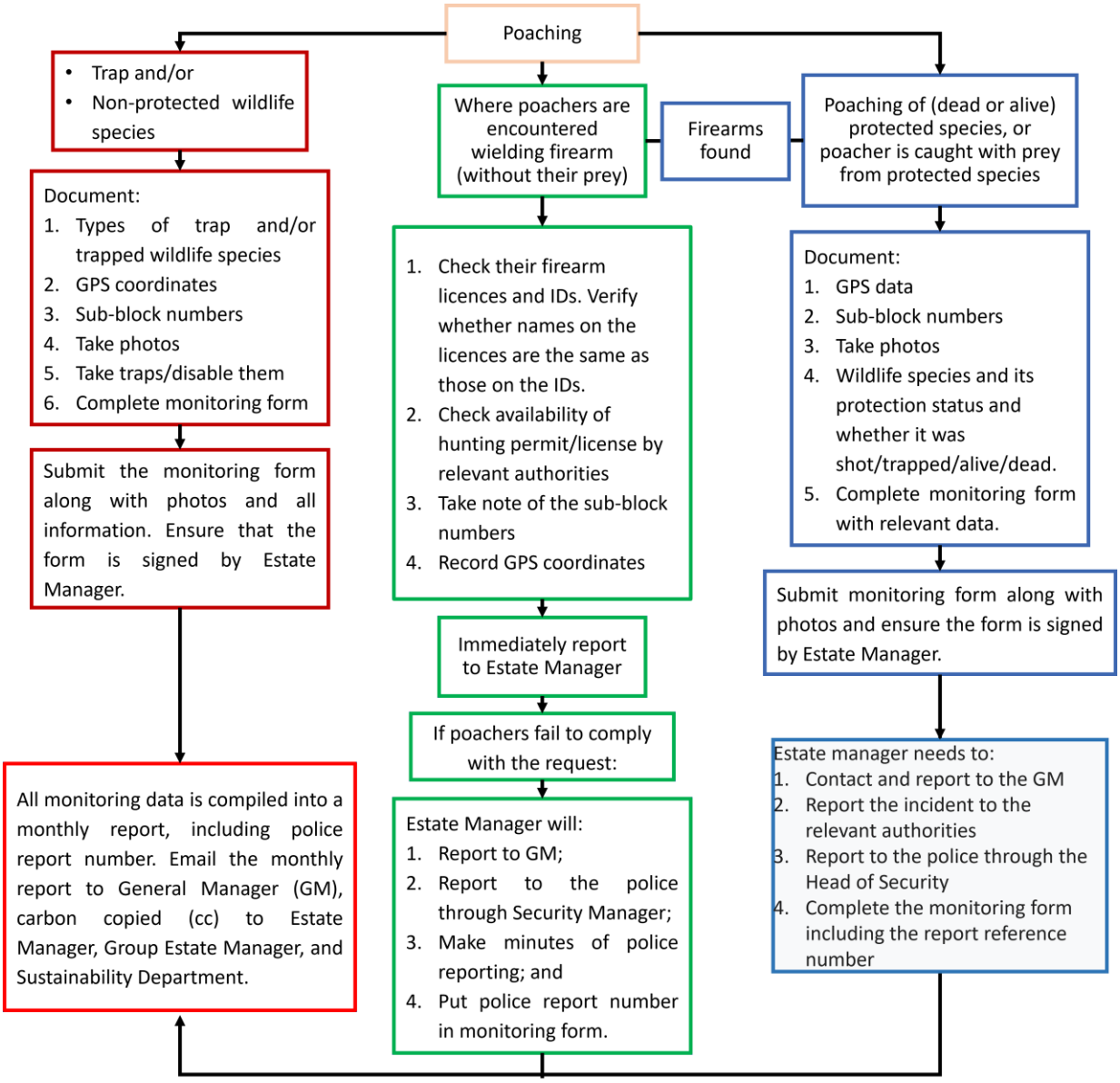


Figure 21. Flowchart of Poaching Monitoring and Reporting.

1.5.6 Opportunistic Sighting of RTE Wildlife

Wildlife encounters, whether routine or unexpected, provide valuable insights into wildlife behaviour, habitats, and populations. Opportunistic sightings or unplanned observations of wildlife are especially significant, as they are often rare or unexpected moments that structured surveys might miss.

These sightings are not only important for conservation but can also involve critical safety considerations to our staff or workers, particularly when they include potentially dangerous wildlife that may enter estate areas such as elephants, tigers, or other dangerous wildlife.

Properly documenting and managing these sightings ensures that they contribute meaningfully to conservation goals while prioritising the safety of both observers and wildlife. This section provides guidelines for recording, reporting and responding to opportunistic sightings, including protocols for safely handling encounters with dangerous species. A detailed flow chart outlining the specific management action of such events is described in Figure 25.

Figure 22. Elephants roaming in oil palm plantation (Source: SPOTT)

Figure 23 & 24. Wounded Tapir stuck in irrigation canal (Source: Newsflare) and Tiger spotted in plantation (Source: InfoSawit)

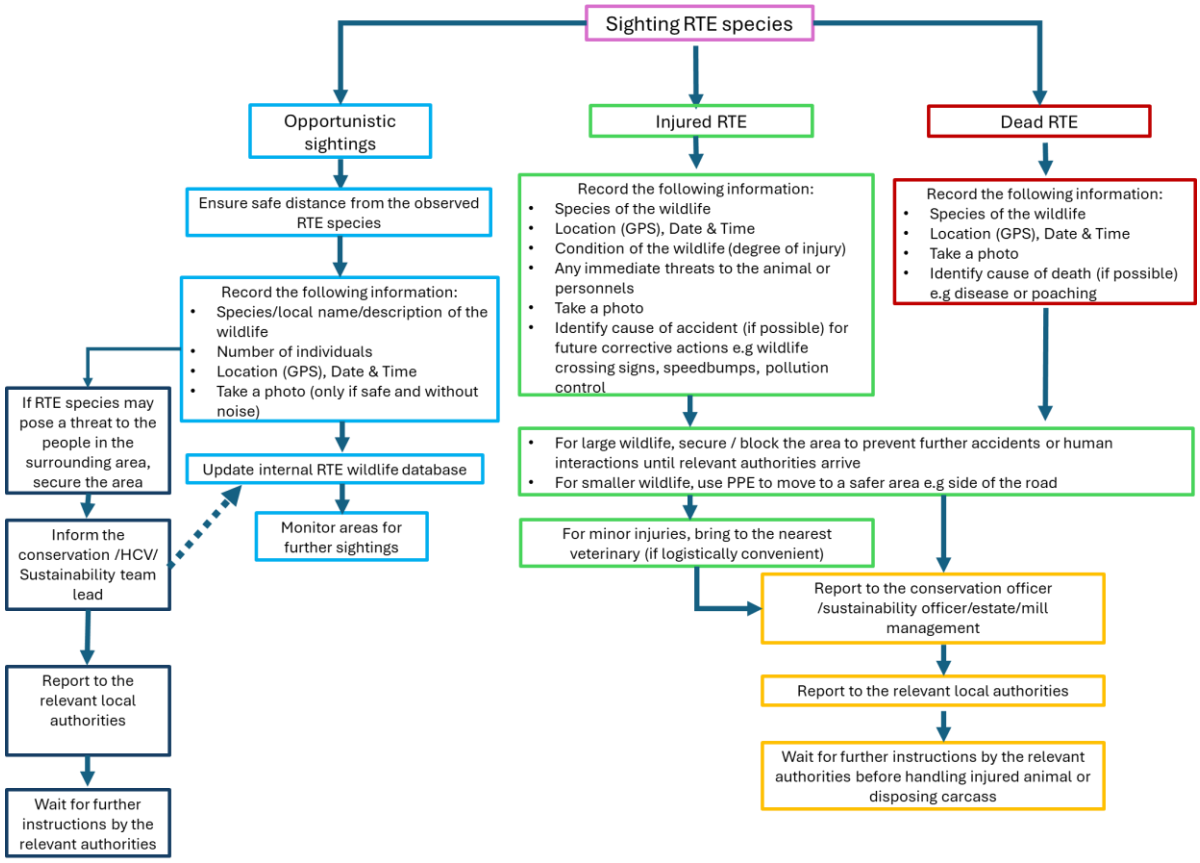


Figure 25. Flow chart of Opportunistic Sightings of RTE Wildlife.

1.5.7 Monitoring Water Quality and Causes of Water Pollution

Water pollution may lead to water quality degradation and disruption to aquatic ecosystems. Water pollution can be caused by various factors such as plantation activities (e.g., spraying and fertiliser application), domestic waste (e.g., domestic laundry wastewater and garbage), and industry (e.g., factory waste, chimney cleaning wastewater and land application).

The following are steps to collect data for water pollution monitoring:

1. Identify the type of water pollution.
2. Record the GPS coordinates of the locations where pollution is found.
3. Take photos at the pollution locations.
4. Find and trace the source of pollution.
5. Once the source of pollution has been identified, record the GPS coordinates and photos for documentation purposes. Water samples can be collected for lab analysis if necessary.
6. Record all the information into the monitoring form and submit it to the company's management for further action.

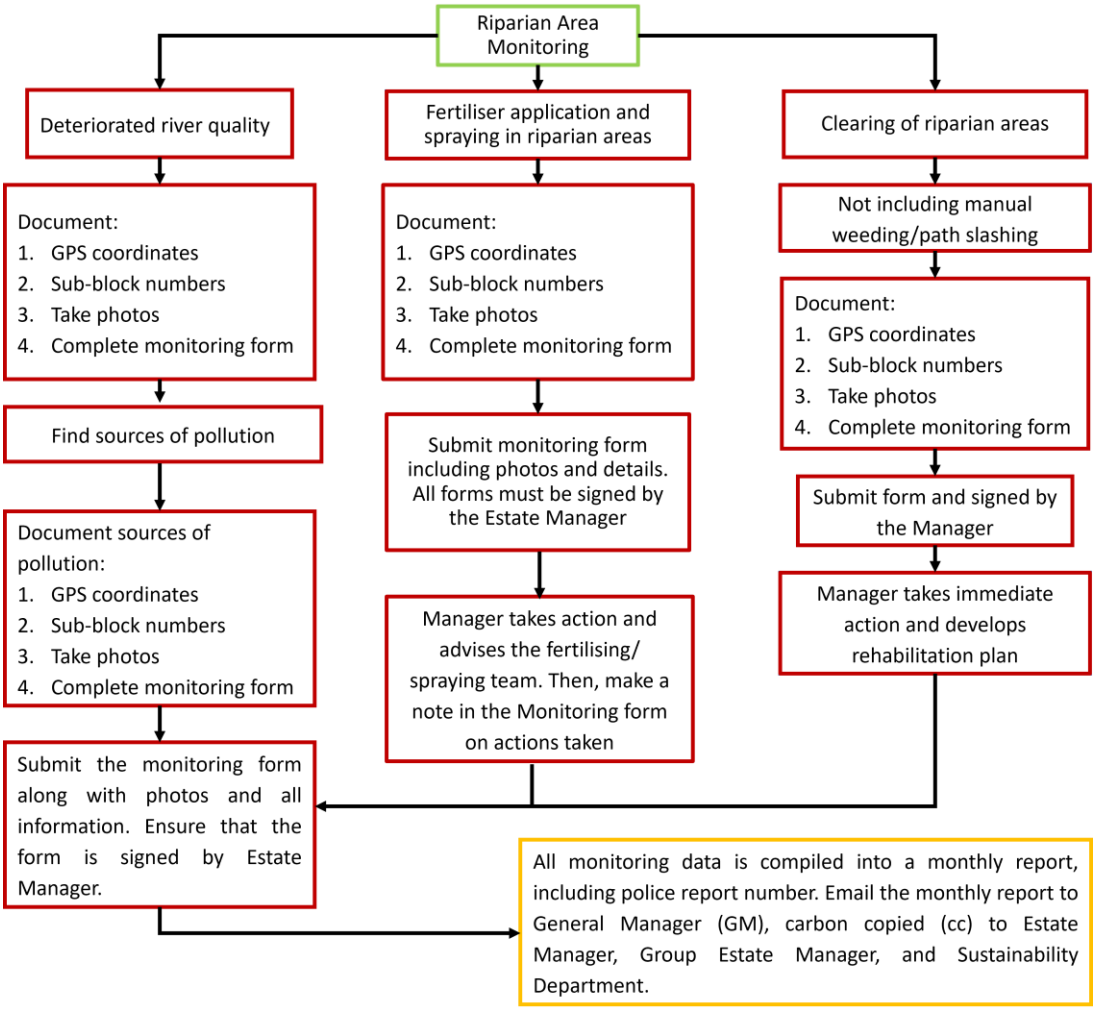


Figure 26. Flowchart of Riparian Disturbance Monitoring and Reporting.

Water Appearance and Condition	Possible sources of pollution to check on
• Strong odour • Early signs of algae growth (sign of early stage eutrophication) • Thriving watergrass	• Factory waste or sewage • Excess fertiliser application seeping into the rivers or waterbodies.
• Eutrophication • Possible 'algal bloom' (booming algae population that can make water surface turn green because it is covered by algae) • Possible overgrowth of watergrass, particularly the invasive ones.	• Fertiliser application near/ into the river / drainage which then flows into the river • Fertilising operations are carried out excessively in the block
• Waste accumulated along or in the river	• Waste or discarded materials from nearby employee housing • Waste or discarded materials generated by field workers in the area • Activities in riparian areas, such as fishing
• Cloudy/Muddy/Unclear water • Traces of fecal matter and strong odours • Signs of early eutrophication process	• Domestic laundry wastewater from employee housing or community settlement • Workers using the river as a toilet
• Cloudy or 'Milky white' water • Dead fish / aquatic life	• Effects from fish poisoning activities
• Water with 'latte' colour	• Timber extraction activity in the upstream part of the river or effects from a landslide
• Water is blackish or darkish brown colour	• Mining activity in upstream rivers or tributaries, most likely for gold
• Water is blackish or darkish brownish colour and has traces / no traces of oil • Eutrophication	• Workers washing/cleaning activities, where waste is channelled to drainages and enter the rivers
• Water is cloudy and muddy • Highly sedimented	• Land clearing in the upstream river area without taking into account riparian area maintenance • Land clearing on steep slopes, or logging activities • Clearing of new lands in upstream riparian forests, or along the rivers • Heavy continuous rainfall causing landslides and sedimentation in the riverbed

Figure 227. Possible source of water pollution.

Eutrophication

Alga Bloom

Pollution

Fronds in riparian area

Spraying in riparian area

Waste in riparian area

Figure 238. Examples of water pollution. (Source: Supeme Light, Yonka, Mongabay, and Wilmar)

1.5.7 Invasive Plant Species

Invasive plants or climbers are one of the threats to conservation areas as they can kill the trees they cover. Close monitoring is needed to ensure invasive plant species are under control.

Figure 249. Velvet bean (Mucuna sp.) invasion of conservation areas. (Source: Proforest)

See Figure 29 for examples of invasive plant species commonly found in plantations.

Figure 30. Example of invasive plant species in Africa. (Source: Mahindra nursery, University of Florida, North Carolina Plant Toolbox, Invasives South Africa)

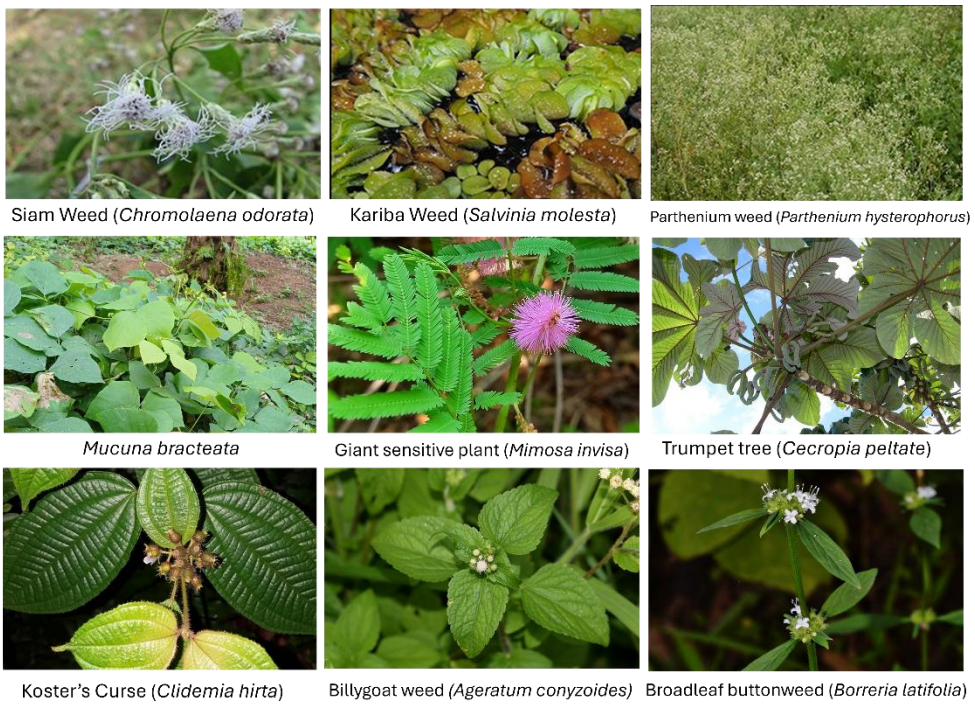


Figure 31. Example of invasive plant species in Malaysia and Indonesia. (Source: Malaysia Biodiversity Information System, iNaturalist, Bogor Agricultural University)

The following are steps to collect data on this threat.

1. Identify the type of invasive plant species.
2. Measure the length and width of the area covered by the invasive species.
3. Classify the coverage rate of the invasive species against the tree's canopy height by the following levels:
   a. Low threat: if the species is yet to reach the tree trunk.
   b. Moderate threat: if the species has started to climb up the tree trunk halfway.
   c. Critical threat: if the species already climbs up the trunk further than the halfway level, up to the full coverage over its canopy.
4. Record the GPS coordinates of the locations threatened by the invasive species.
5. Take the species pictures for documentation purposes.
6. Record the information in detail into the monitoring form and submit it to the company's management for further action.

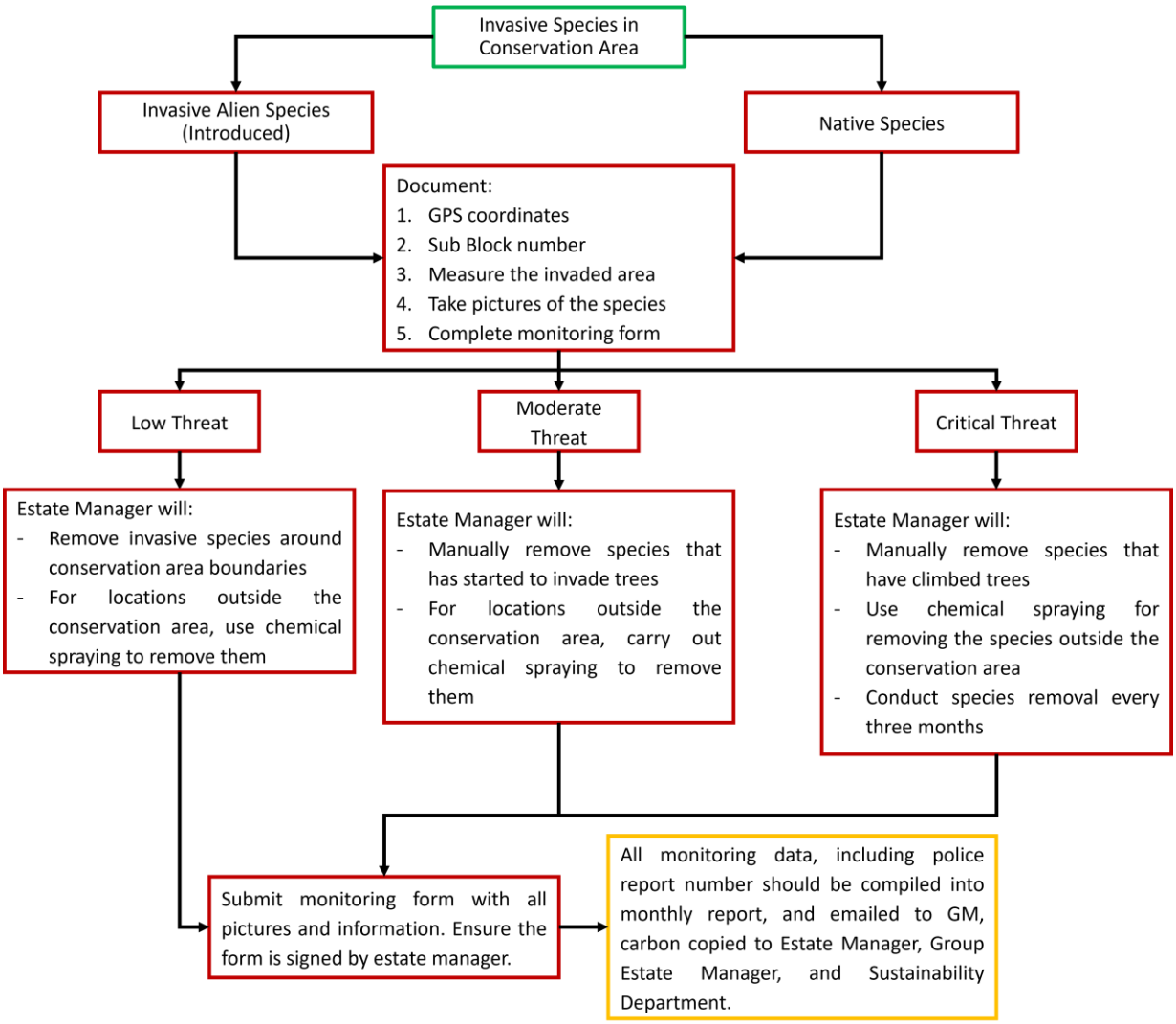


Figure 32. Flowchart of Invasive Species Threat Monitoring and Reporting.

1.5.8 Plant and Wildlife Species

Data collection is focused on the flora and fauna that are categorised as Rare, Threatened and Endangered (RTE) species. The list of RTE species can be obtained from several references such as local government policies, national laws/enactments, GBIF, CITES, IUCN and through sustainability standards.

Steps for collecting data are as follows:

1. Identify the type of flora and fauna that are present in the area.
2. Identification of the species can be carried out via:
   a. Observing the main characteristics of the plants (leaf shape, midrib and vein shape, leaf texture, flower and fruit, sapling, colour, etc.) and wildlife (fur/feather colour, mouth/beak, sound, tail, eyes, head).

Matching/Referencing field guides or conducting desktop study based on prior research or existing theories. Study records identification of the wildlife species, habitats, behaviours, and track signs. Information or data can be obtained from academic institutions and research centres that have various literatures on wildlife. For species identification, the following species identification guides or field observation handbooks are recommended. The identification of protected wildlife species may vary depending on the country. For wildlife status in international trade, refer to IUCN Redlist website (https://www.iucnredlist.org/) as well as *'CITES Conversion Implementation'*, under consideration which contains lists of flora and fauna that fall under Appendices I, II, and III (https://cites.org/). Other websites such as iNaturalist (https://www.inaturalist.org/), eBird (https://ebird.org/home), and various taxonomic databases can also be valuable tools for species identification and information gathering.

Table 1. List of recommended literature in the recommended regions.

Recommended literature	Recommended region
National Geographic Complete Birds of the World	Global
A Field Guide to Mammals of Africa including Madagascar	Africa
First Field Guide to Wildlife of Southern Africa, A Folding Pocket Guide to Familiar Species in Kenya, Tanzania, and Uganda	Africa (East Africa)
Birds of Western Africa by Helm Field Guides	Africa (West Africa)
Woody Plants of Western African Forests. A guide to the forest trees, shrubs, and lianas from Senegal to Ghana	Africa (West Africa)
Field Guide to Trees in Southern Africa	Africa (South Africa)
Field Guide to Wildflowers of South Africa	Africa (South Africa)
Field Guide to Mammals of Southern Africa	Africa (South Africa)

Mammals of South-East Asia	Southeast Asia
A Naturalist's Guide to The Trees of Southeast Asia	Southeast Asia
A Field Guide to the Reptiles of Southeast Asia	Southeast Asia
A Guide to Snakes of Peninsular Malaysia and Singapore	Southeast Asia (Peninsular Malaysia)
A Field Guide to the Mammals of Borneo	Southeast Asia (Borneo)
Phillipps' Field Guide to the Birds of Borneo: Sabah, Sarawak, Brunei, and Kalimantan	Southeast Asia (Borneo)
A Field Guide to the Snakes of Borneo	Southeast Asia (Borneo)
Checklist of Mammals in Indonesia (Third Edition)	Indonesia
Identifying the Protected Species of Reptiles and Amphibians in Indonesia	Indonesia
Birds of the Indonesian Archipelago by James Eaton	Greater Sundas and Wallacea

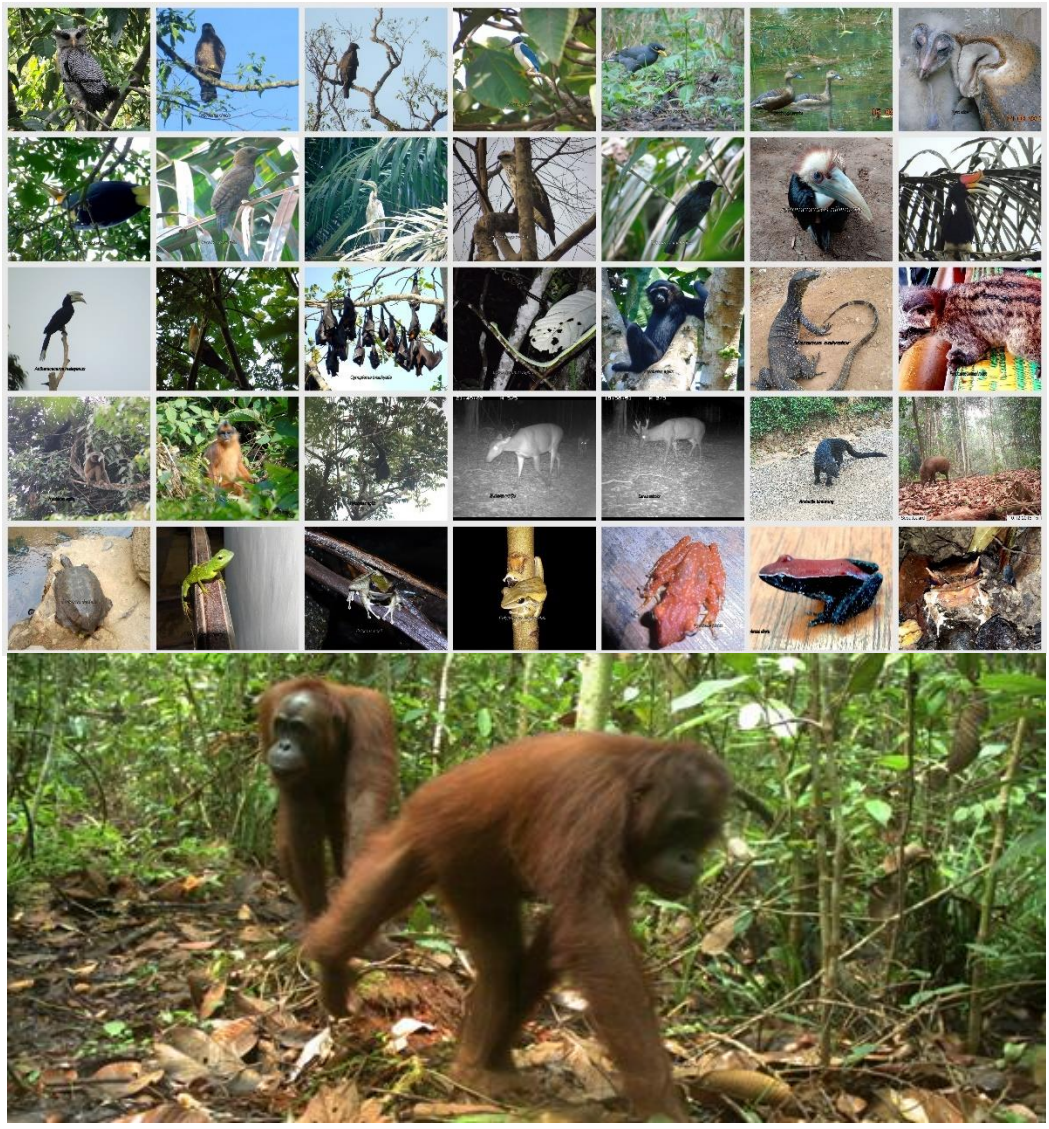


Figure 33. Examples of wildlife species found in the area. (Source: Wilmar, Nature Travel Agency)

3. For plants, collect data such as the species name, GPS coordinates, and pictures of each of the plant/tree. Picture may include the whole tree, leaf, flower, fruit, saplings and others.
4. For directly encountered wildlife, data such as species name, number, age estimates (adult, juvenile, baby), sex, activity, GPS coordinates and pictures should be documented for each species.
5. For indirect encounter wildlife (tracks), data collected can be in the form of wildlife signs/track (footprint, droppings, nest, feather, horn), number and size of tracks, GPS coordinates, and pictures of every track. Pictures are preferably taken by placing another item next to it for easy comparison (such as pencil, officer's palm, coin, etc.).
6. Record all the information in the monitoring form or develop an application of the monitoring form to be used on a phone/tablet.

Figure 34. Record the GPS coordinates of where the wildlife was encountered. (Source: Wilmar)

1.5.9 Sociocultural Conservation Monitoring

Values relevant to sociocultural conservation include HCV 5 (community basic needs) and HCV 6 (community cultural sites, customs, or symbols). In general, for the determination of HCV 5 and 6, visits and discussions with the community need to be conducted to identify the types of threats in the area.

Figure 255. Active cultural sites. (Source: Proforest)

Specifically for HCV 5, monitoring is conducted on natural resource extraction activities, such as fishing, traditional hunting, resin sapping, bamboo extraction, sand winning etc. The following are steps that can be taken:

1. Identify species extracted from conservation area (fish, bush meat, bamboo, firewood, medicinal plant, resin, rattan, etc.).
2. Identify the names and origins of the people encountered.
3. Identify the methods used to extract the natural resources (fishing, net-fishing, trapping, etc.).
4. Identify the number of resources caught/extracted in a certain period.
5. Identify the use of the extracted resources (subsistence, to sell, distributed to other members of the community, etc.).
6. Identify the frequently visited areas where the natural resources are extracted and the frequency of entering the conservation areas for the said purpose.

7. Record all the information into the monitoring form.

Steps for monitoring cultural sites are as follows:

1. If the cultural sites are often visited, cooperation with the sites' caretaker or community will be required.
2. Visits: visits by external stakeholders to community cultural sites (HCV 6) should be documented in a guest book managed by the caretaker, the information of which should include visitor's name, address, reason for visit and contact.
3. If a cultural site is used only at certain periods, conservation PIC shall monitor its use during ceremonial events to document the activities and collect data of those who visit or use the sites to better understand the traditional culture of the community.

1.6 Restoration and Enrichment Planting

As part of the response plan to threats and disturbances in conservation areas, it is essential to carry out restoration activities and enrichment planting in disturbed areas to restore their condition and function, hence their preserved significance. To do so, Wilmar uses two approaches: natural succession or regeneration and seeding/nurseries to support planting enrichment.

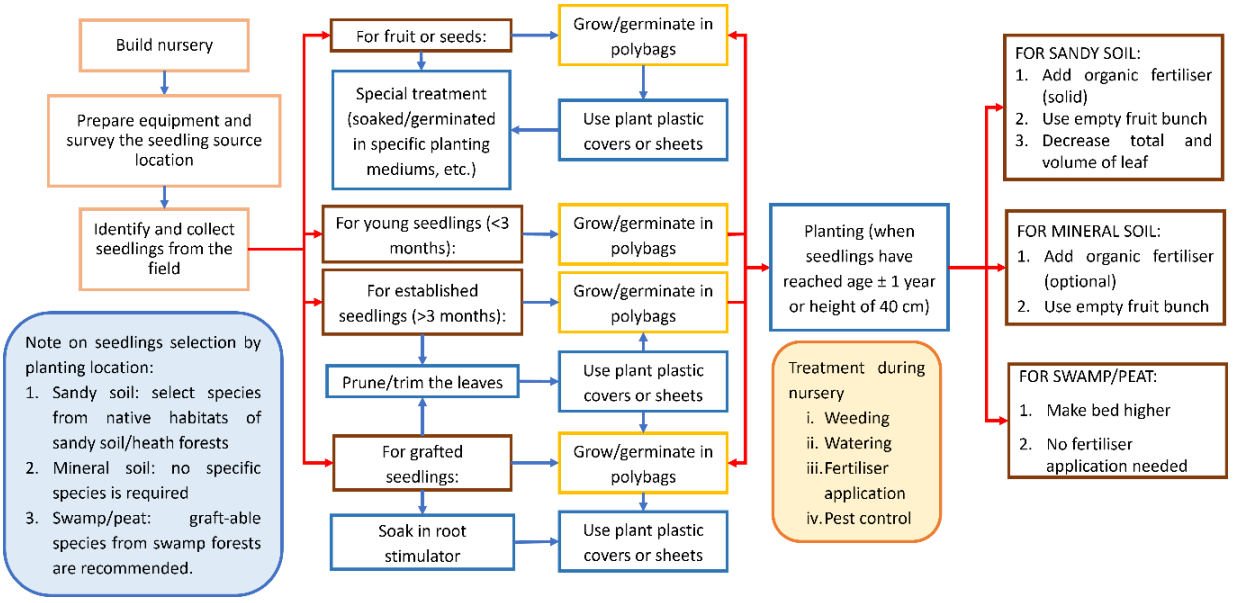


Figure 36. Flowchart of Plant Rehabilitation and Enrichment.

1.6.1 Natural Succession or Regeneration Pattern

It is essential to protect and preserve natural vegetation in forests and riparian areas that remain with sufficient natural stands. Methods to protect and preserve the area are as follows:

a. Patrol and safeguard the areas to avoid disturbances impeding vegetation growth, e.g., cattle grazing, forest fires, and conversion of forest into plantations.
b. Build firebreaks (if necessary).
c. Create hedges (if necessary) to prevent wildlife disturbances and other human activities.
d. Mark the sapling areas with signage.
e. Create the surrounding area of the sapling,
f. Remove weeds/invasive alien plants that threaten the growth of saplings.
g. When overly crowded, sapling should be moved to less densely populated locations.
h. Apply fertiliser if and when necessary.

Figure 26. Natural succession maintenance. (Source: Proforest)

1.6.2 Nursery Pattern

1. **Selection of nursery site/location**

   Use a temporary nursery in restoration project. Its location should meet the following criteria:

   i. Year-round access to sufficient water supply or sources
   ii. Has relatively flat terrain (with a maximum land slope of 5%) and is accessible by car or motorcycle.
   iii. Have dedicated workforce, specialised labour for this purpose.
   iv. Proper drainage systems.
   v. Avoid locations that are exposed to strong winds.
   vi. Large enough area to accommodate the required quantity of seedlings.

Figure 278. Forest plant nursery. (Source: Centre of Scientific and Industrial Research, Ghana)

2. **Nursery construction and seed selection**

   Once the ideal location has been identified, the following steps should be taken for nursery construction and seed selection. This should be carried out in the following stages:

   i. Construct the nursery borders and seedling bed (beds preparation).
   ii. Construction of work hut/shelter.
   iii. Create a shaded area using black netting (50% and 70%).
   iv. Create a watering system.

v. Set the quantity of seedlings to plant in the restoration site, taking into account species growth ability and local native species that can be collected from nearby forests.

vi. Clean fruits and seeds by their characteristics.

vii. Prepare a soil mixture (medium) consisting of soil, sand and cocopeat to sow the seed.

viii. Sow seeds in the prepared medium. For seeds that are complicated and difficult to germinate, the appropriate seeding technique should be done according to the characteristics and needs of each seed.

ix. Prepare polybags of appropriate size for each seedling once they have germinated. The size of the polybags depends on the type of tree that is planted.

x. Prepare growing medium in polybags, made from soil, organic fertiliser, and husk.

xi. Plant the germinated seeds or seedlings in the prepared growing mediums.

xii. Take care of the seedlings by watering and weeding on a regular basis. Management of the saplings in the nursery is crucial to ensure the quality of the planted tree.

Figure 289. Nursery information board. (Source: Centre of Scientific and Industrial Research, Ghana)

Figure 40. Seed of Swietenia mahogoni (Mahogany). (Source: Centre of Scientific and Industrial Research, Ghana)

3. Planting area preparation

After deciding on the ideal location, nursery should be built and seedlings be selected with the following steps:

i. Create a boundary, pathway, or planting circles.

ii. Line and peg the planting area.

iii. Make planting holes in planting spots according to the determined distance.

iv. Make firebreaks (if necessary).

v. Create fencing (if necessary) to avoid disturbances from wildlife and other human activities.

vi. Construct water catchment areas or ponds to store water for use in the restoration area (if necessary), particularly in locations where drought often takes place and water is often difficult to access.

Figure 41. Area preparation in the restoration site. (Source: Wilmar)

4. Planting

The tree planting activities are carried out in the several stages:

i. Carefully transport seedlings to restoration site using proper tools and equipment to avoid damage to the sapling.

ii. Plant in the beginning of the rainy season to ease the watering process. It is best to avoid planting during the dry season as saplings wilt and die easily if there is lack of water and care.

iii. Mulch made of soil and grass roots or dry leaves can be applied to the ground to avoid weed growth and maintain soil moisture.

Figure 42. Planting the seedling. (Source: Wilmar)

5. Maintenance and monitoring

Figure 43. Plant maintenance in the restoration site. (Source: Wilmar)

i. Weeding: This is done around the plants twice a year; after planting (during dry seasons) and during rainy seasons, until the plants reach the age of three. This should be carried out more intensively in locations prone to invasive species (e.g., *Chromolaena odorata*) to prevent being closed or covered by them. The purpose of weeding is to prevent competition for nutrients, sunlight, water, space and include removing the habitat of pest species.

ii. Crop circles: A 1-meter-radius circle is made around the plant to allow sufficient aeration and loosen the soil. The circle is maintained until the plant reaches the age of five or until needed.

iii. Keep paths around the plants clean and weeded. Maintain 1-metre-wide path clean and clear to prevent wild plants from interfering with the main tree growth, allowing light to be absorbed and overcome growth competition issue. Do this until the plant reaches the age of five.

iv. Record keeping: Collect data on plant mortality and height once a year through sample method (5% of each restoration block area).

v. **Replace:** If percentage of seedlings that grow and live is <95% based on the results of data collected, the replacement of tree species that have died should be carried out in the following year's planting season.

Figure 294. Site condition after two years of restoration. (Source: Invasive.org)

2

2.0 Reporting

Monitoring officers are staff appointed by management to monitor conservation areas in the plantation area. Therefore, they are required to report any monitoring output to the management (i.e., Estate Manager). This report serves as the basis for a follow-up plan or response to findings.

2.1 Strategic Monitoring Report

As part of strategic monitoring actions, a rapid survey is conducted annually to collect data such as a species list that is present within the company concessions as well as their distribution of each species by location. The results of the rapid survey provide an overview of the conditions of the conservation area, which can be used for reviewing management and monitoring plans.

In general, a rapid survey indicates three potential scenarios, i.e., deteriorating, enhanced, or stable conservation values). Human activities including poaching, water pollution, and logging become the main driver behind changes in conservation value. Intensifying human activities around the surrounding conservation areas can also lead to an increase in potential threats and disturbances.

2.2 Operational Monitoring Report

Results of the Operational Monitoring provides information on the implementation of the management and monitoring plans in the field and identifies any obstacles or challenges during the implementation process. The operational monitoring plan can be prepared in the form of a table that compares the management and monitoring plans to the actual implementation of the plan. This report will be reviewed and produced annually as a basis for the development of the next year's management and monitoring plans.

Table 2. Scenario on the output of rapid survey report.

Scenario	Value parameter	Category	Description	Recommendation
Deteriorating conservation value	Biodiversity	Priority species number decreases or can no longer be found	Priority species are rarely encountered, or no species have been discovered in the last three years. This species is mainly used to estimate a value of a conservation area.	1. Increase regular monitoring to identify any threats (particularly poaching) in the conservation area. 2. Conduct enrichment planting of food plants serving as food supply for the priority species.

	Environmental services	Pollution or damage to water quality	Human-caused deterioration of water quality in the riparian zone and surroundings of water bodies	1. Make efforts to eliminate the source of pollution. 2. Increase regular monitoring to ensure no further pollution. 3. Disseminate information and raise awareness about the value of riparian areas to the community and workers/employers.
Enhanced Conservation Value	Biodiversity	Priority species population grows	Increase in number of the priority species	Increase regular monitoring to identify any threats (particularly poaching) in the conservation area. Conduct enrichment planting of food plants serving as food supply for the priority species. Improve collaboration with conservation committees, Community Resource Management Areas (CREMA), Forest Service Division of the Forestry Commission to prevent conflict between humans and priority species. Disseminate information and raise community and workers'/employees' awareness.
	Environmental services	Water sources	Water sources are not depleted during the prolonged dry season, and no	Implement management and monitoring measures based on the initial assessment.

			major flooding during the rainy season.	Disseminate information and raise awareness on the value of water sources to the community and workers/employees.
Unchanged Conservation Value	Biodiversity and environmental services	No changes in conservation value	1. Compared to the initial assessment, the observed species population is constant or has not significantly changed. 2. No change in the quality and quantity of water sources since the initial assessment.	Implement management and monitoring measures based on the initial assessment.

Table 3. Example of Operational Reporting.

wilmar	**HCV OPERATIONAL MONITORING REPORT 2013**
Location and Situation	All HCV Areas of PT MENTAYA SAWIT MAS
HCV Assessed	All HCV value
Description	There is still a lack of understanding of HCV among employees, staff, and the community
Management and Monitoring Plan	1. Disseminate information regarding HCV to staff and employees every 6 months. 2. Install posters and information boards regarding HCV and protected wildlife species. 3. Disseminate information regarding HCV to local communities (Villages A, B, C, and D). 4. Install HCV signboards and posters of the identified HCV values.
Implementation	1. Information is disseminated to staff and employees of PT XXX on 27-28 December 2013. Minutes, documentation, and attendance are attached. 2. Posters are placed in 2 strategic locations so they are easy to find and read. a. First, they were placed in front of the office fence near Security Post 1 on 12 January 2013. b. They were also placed in front of the employee's housing area on 12 June 2013. *The report and installation map are attached.* 3. Disseminate information to 4 Villages: a. Village A on Thursday, 7 June 2013 b. Village B on Tuesday, 30 July 2013 c. Village C on Monday, 22 July 2013 d. Village D on Monday, 22 July 2013 *Minutes, documentation, and attendance are attached.* 4. HCV signboards, riparian signboards, and posters were installed in 9 locations in January, February, April, June, August, and December 2013. The report and installation map are attached.

Location	MSM1D1-015
HCV Assessed	HCV 1
Description	This is a lowland forest with at least three primate species (orangutan, gibbon, and maroon leaf monkey) living inside
Management Plan	1. Monitor regularly 2. Install HCV signboards and boundary markers. 3. Develop orangutan and biodiversity transects. 4. Conduct customised surveys (nest and biodiversity). 5. Restore the area, particularly in Sub Block P24. 6. Monitor the restored area. 7. Conduct a survey to assess necessary measures on orangutan presence (in collaboration with conservation committees, CREMA's, Forest Service Division of the Forestry Commission. 8. Install camera traps. 9. Establish and collect data on vegetation plot.
Progress	1. Monitoring was conducted following the monthly monitoring schedule, and monthly report was sent to Estate Manager, GEM, AGM, and HCV Assistant Manager by the next 7 months. 2. Signboards were installed in Sub Block O24 point x.673692 y.9760522 on 28 August 2013. Boundary markers (1000 metre) in Block 024 were also installed on 22 May 2013. 3. Orangutan and biodiversity transect were installed in 2012 and reported in 2012 Management Plan Realisation. 4. Customised survey for year 2013 was conducted in 7-12 January and 26-28 August 2013 (the report is not included in this document). 5. The area was restored in 2012 and reported in the 2012 Management Plan Realisation. 6. The restored area was monitored every 2 weeks by making circles around the tree seedlings planted with a size of 1mx1m to

	protect from any invasive plants growing in this area. 7. The survey was conducted in September 2012 and reported in the 2012 Management Plan Realisation. 8. Camera traps (camera no. 12 and 07) were installed on 17 November 2013. 9. Vegetation plots were also reported in the Management Plan Realisation for January – December 2012. There will be another vegetation plot data collection or an assessment of plots that already exist since September 2014.

2.3 Threat and Biodiversity Monitoring Report

Threat and biodiversity monitoring is the most regular type of monitoring carried out in the form of patrols. The results should be submitted no later than one day after the activity is completed so that corrective or preventive measures can be taken immediately against the threats found.

See Annex 4 for an example of threat and biodiversity monitoring report format.

3

3.0 Management Evaluation

Conservation area management requires continuous monitoring to obtain information on the latest development of the area. In the management concept, monitoring is part of the evaluation to assess the effectiveness of conservation area management. From this process, it is possible to analyse the effectiveness of management. If the increased threats are identified through monitoring, prevention and measures should be taken against threats that may occur in the following years. However, if the monitoring indicates an improvement of area quality, measures should be to taken to maintain the existing management.

The following are examples of the follow-up or evaluation of monitoring results.

Table 4. Examples of the follow-up or evaluation of monitoring results.

Type of Threat	Report Recipient	Follow-up Action	PIC
Land claim	Estate Manager	Map conservation area claimed by the community	Estate Manager and GIS Department
		Disseminate information on conservation to the community	Estate Manager and CSR/Legal/Security Department
		Develop MoU on conservation area management	Estate Manager and CSR/Legal/Social Department
		Give compensation for conservation area claimed by the community	Estate Manager and CSR/Legal/Social Department
Land fire	Estate Manager	Extinguish fire	Estate Manager and CSR/Legal/Social Department
		File report to the police	Estate Manager and CSR/Legal/Social Department
		Map fire-prone area	Estate Manager and GIS Department
		Disseminate information on land burning prohibition to employees and community	Estate Manager and CSR/Legal/Social Department
Invasive species	Estate Manager	Slash/reduce invasive species regularly	Estate Manager
		Not planting invasive cover crops around the conservation area	Estate Manager
		Plant local trees in areas destroyed by invasive species	Estate Manager and EHS

(cont.)

Type of Threat	Report Recipient	Follow-up Action	PIC
Illegal logging	Estate Manager	Conduct confiscation/stop the operation	Estate Manager and CSR/Legal/Social/Security Department
		Secure logs and logging equipment	Estate Manager and CSR/Legal/Social/Security Department
		File report to the police	Estate Manager and CSR/Legal/Social/Security Department
		Disseminate information on logging prohibition in conservation areas to employees and the community	Estate Manager and CSR/Legal/Social Department
Mining	Estate Manager	Conduct confiscation/stop the operation	Estate Manager and CSR/Legal/Social/Security Department
		Confiscate mining equipment	Estate Manager and CSR/Legal/Social/Security Department
		File report to the police, carbon copied to Mining and Energy Office/relevant authorities	Estate Manager and CSR/Legal/Social/Security Department
		Disseminate information on mining prohibition in company areas to employees and the community	Estate Manager and CSR/Legal/Social Department
HCV 5&6 Disturbance	Estate Manager	If the disturbance is caused by company activity, restoration is carried out and to be witnessed by community representatives	Estate Manager and CSR/Legal/Social/Security Department
		If the disturbance is caused by community or outsider activity, the company helps with the restoration after communicating with the community	Estate Manager and CSR/Legal/Social/Security Department
		Conduct participatory prevention efforts so that the disturbances do not recur	Estate Manager and CSR/Legal/Social/Security Department

(cont.)

Type of Threat	Report Recipient	Follow-up Action	PIC
Waters	Estate Manager	Disseminate information on riparian/lake/reservoir/swamp boundary areas to employees	Estate Manager and EHS
		Clean up oil palm waste/debris/fronds/fruits	Estate Manager
		Plant ground cover crops in erosion-prone areas	Estate Manager and EHS
		Give sanction/warning to employees who continue to operate in the riparian zone	Estate Manager
		Ensure waste management flow is in accordance with the applicable regulations	Estate Manager and Mills' Management
		Give sanction to employees negligent in managing waste/waste streams	Mill Management
Biodiversity	Estate Manager	Input to flora and fauna database	PIC of Conservation
		Map distribution areas of flora and fauna species included in RTE criteria	Estate Manager and GIS Department
		Increase habitat carrying capacity by enriching food source tree species	Estate Manager and EHS

This evaluation results are part of the next management plan, followed by monitoring of the management plan implementation. This is carried out continuously to maintain the quality of the conservation area.

4

4.0 Reference and Annex

4.1 Reference

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4.2 Annex

Annex 1: Recce Walk Monitoring for Wildlife

Date :

Assessment area/Block :

Group :

Estate/Plantation :

**Uncategorised: Unable to identify gender or age of the species*

No	Local Name	Scientific Name	Type of Encounter (direct, faeces, scratches, footprint, etc)	Baby		Young		Adult		Uncategorised	Description
				M	F	M	F	M	F		

NB: M = Male, F= Female

Annex 2: MacKinnon's 10-species List Sheet* Example

* *This is only an example. In field data collection, the table is a blank sheet.*

Date :

Block :

Group :

Type of Vegetation :

Company / Estate name :

Table	Scientific Name	Local name of specie	Species Number Increase	Table	Scientific Name	Local name of specie	Species Number Increase
1	*Pseudocalyptomena granueri*	African Green Broadbill	1	1	*Psittacus erithacus*	African Gray Parrot	2
1	*Centropus sinensis parroti*	Bubut besar	1	3	*Haliastur indus*	Elang bondol	2
1	*Merops viridis*	Kirik-kirik biru	2	3	*Pycnonotus goiavier*	Merbah cerukcuk	2
1	*Prinia flaviventris*	Perenjak rawa	3	3	*Orthotomus ruficeps*	Cinenen kelabu	2
1	*Nisaetus cirrhatus*	Elang brontok	4	3	*Pycnonotus simplex*	Merbah corok-corok	3
1	*Stachyris erythroptera*	Tepus merbah-sampah	5	3	*Pellorneum capistratum*	Pelanduk topi-hitam	3
1	*Hypothymis azurea*	Kehicap ranting	6	3	*Strix leptogrammica*	Kukuk beluk	3
1	*Pycnonotus goiavier*	Merbah cerukcuk	7	3	*Corvus enca*	Gagak hutan	3
1	*Psittacula longicauda*	Betet ekor-panjang	8	3	*Hypothymis azurea*	Kehicap ranting	3
1	*Orthotomus atrogularis*	Cinenen belukar	9	4	*Prinia flaviventris*	Perenjak rawa	4
1	*Corvus enca*	Gagak hutan	10	4	*Mixornis bornensis*	Ciung air coreng	4
2	*Orthotomus atrogularis*	Cinenen belukar	10	4	*Pycnonotus goiavier*	Merbah cerukcuk	4
2	*Mixornis bornensis*	Ciung air coreng	11	4	*Prinia flaviventris*	Perenjak rawa	4
2	*Pycnonotus goiavier*	Merbah cerukcuk	11	4	*Collocalia linchi*	Walet linchi	5
2	*Orthotomus ruficeps*	Cinenen kelabu	12	4	*Merops viridis*	Kirik-kirik biru	5
2	*Stachyris erythroptera*	Tepus merbah-sampah	12	4	*Malacocincla sepiaria*	Pelanduk semak	6
2	*Aethopyga siparaja*	Burung-madu sepah-raja	13	4	*Cinnyris jugularis*	Burung-madu sriganti	6
2	*Corvus enca*	Gagak hutan	13	4	*Orthotomus ruficeps*	Cinenen kelabu	6

Annex 3: Flora Data Collection Sheet

Date :
Block :
Type of Vegetation :
Estate :

Team Lead:
Method :
No. Plot :
Coordinate :

No	Species	Circumference (cm)	DBH (cm)	Total height (cm)

Annex 4: Threat and Biodiversity Monitoring Sheet

FIELD HCV MONITORING FORM				Submitted to: Name of Manager: Signature: Date of Reporting:
Estate:	Monitoring Location:	Monitoring Staff: 1. ..... 2. ..... 3.	Date of Monitoring: Start Time: Finish Time:	

Finding	Photo ID	GPS Coordinates		Species	Intensity/total number/area size	Measure taken by HCV PIC and Estate Manager
		Longitude	Latitude			
1. Water pollution from domestic sewage						
2. Garbage in the waters						
3. Water pollution from industrial activities						
4. Traps or spent bullet casing						
5. Rifle hunting						
6. Extraction of natural resources (timber)						
7. Invasive species						
8. Water pollution from plantation activities (spray or fertiliser)						
9. Water damage from other causes (fish poison, electrofishing)						

(cont.)

Finding	Photo ID	GPS Coordinates		Species	Intensity/total number/area size	Measure taken by HCV PIC and Estate Manager
		Longitude	Latitude			
10. Fire in HCV areas						
11. Mining						
12. Natural resources extraction by community (HCV 5)						
13. Disturbance towards HCV 6 area						
Flora and fauna	Photo ID	GPS Coordinates		**Fill in** e.g., Nest/footprint/heard/seen/caught/trapped/dead/alive		**Comment** e.g., young/adult, total of male/female encountered, seen behaviour/activity
		Longitude	Latitude			
Note or other findings during monitoring						

Annex 5: Signboard, Boundary Markers, and Poster Monitoring Sheet

Monitoring staff :

Date of monitoring :

No	Estate	Block	Sub-block	GPS coordinates		Type (signboard/poster/boundary marker)	Image	Condition (Good, Poor)
				X	Y			
Distribution map of signboards, boundary marker:								

Reported by,

(Monitoring Staff)

Acknowledged,

(Estate Manager)

Forest Integrity Assessment

MANAGEMENT UNIT:		
SITE:		
ASSESSOR(S):		
DATE:	TIME:	ID:

STRUCTURE AND COMPOSITION	
1. Naturally fallen tree > 40 cm	○
2. Naturally fallen tree > 60 cm	○
3. Several trees > 10 cm	○
4. Several trees > 20 cm	○
5. Tree > 40 cm	○
6. Several trees > 40 cm	○
7. Tree > 60 cm	○
8. Several trees > 60 cm	○
9. Tree > 80 cm	○
10. Several trees > 80 cm	○
11. Climber (liana, vine) > 10 cm	○
12. Tree with ferns or other plants not rooted in the soil (epiphytes)	○
13. Several trees with ferns or plants not rooted in the soil (epiphytes)	○
14. Tree with nestinghole	○
15. High tree crown with thick branches	○
16. Tree with marks from mammal, bird or lizard	○

STRUCTURE AND COMPOSITION	
17. Tree species important for wildlife > 20 cm	○
18. Several trees of species important for wildlife > 20 cm	○
19. Standing dead tree or snag > 20 cm	○
20. Termite mound	○

IMPACTS AND THREATS	
21. Commercially valuable timber tree species	○
22. Commercially valuable timber tree species > 20 cm	○
23. Tree species felled for local use	○
24. Tree species felled for local use > 20 cm	○
25. Average visibility in forest > 10 m	○
26. Average visibility in forest > 20 m	○
27. No sign of invasive plant or animal species	○
28. No sign of hunting, traps or snares	○
29. No sign of burning	○
30. No sign of logging	○
31. No sign of clearing for agriculture	○
32. No sign of grazing (domestic animals)	○
33. No waste, litter or trash	○
34. Distance to road, track or river > 1 km	○
35. Distance to road, track or river > 5 km	○

TOTAL SCORE:	

FOCAL HABITATS	
Rivers and streams	○
Forested wetlands	○
Seasonally flooded forests	○
Naturally open wetlands	○
Permanent ponds, dams and lakes	○
Seasonal ponds, dams and lakes	○
Springs	○
Naturally open or semi-open native grasslands	○
Steep slopes (more than 1 m : 3 m)	○
Salt licks and mineral mud flats important for wildlife	○
Cave or sinkhole	○

NOTES

FOCAL SPECIES						
	○	○	○	○	○	○
	○	○	○	○	○	○
	○	○	○	○	○	○
	○	○	○	○	○	○
	○	○	○	○	○	○
	○	○	○	○	○	○
	○	○	○	○	○	○
	○	○	○	○	○	○
	○	○	○	○	○	○
	○	○	○	○	○	○

NOTES

Annex 7: Forest Integrity Assessment Survey Form (Southeast Asian Lowland Dipterocarp Forest)

Observations	Yes ☑	Additional field observations
LANDSCAPE		
1. Site is itself, or is part of, a continuous forested area **larger than 200 ha**		
2. Site is part of, or **closer than 500 m** to, a continuous forested area **larger than 200 ha**		
3. Site is part of, or **closer than 500 m** to, a continuous forested area **larger than 20 ha**		
4. Site is **larger than 1 ha**		
5. Site is mostly bordered by natural forest and/or water (e.g.a river or lake)		
TOPOGRAPHY		
6. Site generally steeply sloping (greater than 1:2 gradient – 45 degrees) or is of generally **very** rough, steep terrain		
7. Presence of prominent gorges or ravines		
8. Presence of prominent rocky outcrops		
9. Presence of caves or prominent rocky overhangs		
WATER		
10. Presence of seasonal/ephemeral streams, swamps or ponds		
11. Presence of permanent swamps, ponds or wallows (or an oxbow lake)		
12. Presence of permanent streams or rivers		
13. Any rivers or streams present have section(s) of riffles or cascades		
14. Presence of waterfalls		
TREES		
15. Many (>100) saplings or trees **1-10 cm DBH** (**D**iameter at **B**reast **H**eight)		
16. Many (>100) saplings or trees **1-10 cm DBH** growing beneath a **high intact or partially intact canopy** (of 30 or more metres)		
17. Presence of trees **40-50 m** tall		
18. Some (<30) trees **10-40 cm DBH**		
19. Many trees (>30) **10-40 cm DBH**		
20. Some trees (3 – 10) larger than **40 cm DBH** (or above buttresses, where present)		
21. Many (>10) trees larger than **40 cm DBH**		
22. Some (3 – 5) trees larger than **80 cm DBH** (or above buttresses, where present)		
23. Many (>5) trees larger than **80 cm DBH**		
24. Some/many standing dead trees larger than 40 cm diameter		
25. Some/many fallen dead trees or logs larger than 40 cm diameter		
FLORA		
26. Some (3 – 5) woody plants in flower – including woody vines or lianas (can be indicated by fallen flowers)		
27. Many (>5) woody plants in flower – including woody vines or lianas (can be indicated by fallen flowers)		
28. Some (3 – 5) woody plants with fleshy fruits, berries or nuts – including woody vines or lianas (can be indicated by fallen fruit etc.)		
29. Many (>5) woody plants, with fleshy fruits, berries or nuts – including woody vines or lianas (can be indicated by fallen fruit etc.)		
30. Some (3 – 5) large vines or lianas with **stem(s) larger than 10 cm diameter**		
31. Many (>5) large vines or lianas with **stem(s) larger than 10 cm diameter**		
32. Some (3 – 5) trees with ferns, orchids or other epiphytic plants present in their crowns/branches		
33. Many (>5) trees with ferns, orchids or other epiphytic plants present in their crowns/branches		
34. Some (3 – 5) trees with mosses and/or lichens on stems or in branches		
35. Many (>5) trees with mosses and/or lichens on stems or in branches		
36. Some (3 – 5) conglomerations of leaf-trapping thread-like fungal strands in the understory		
37. Many (>5) conglomerations of leaf-trapping thread-like fungal strands in the understory		
FAUNA		
38. Signs of nests, nesting holes or burrows of mammals, birds, reptiles or amphibians		
39. Signs of foraging, feeding or other clear activity by mammals, birds, reptiles or amphibians		
40. Sightings or signs of **two or more** mammal species (can include presence of dung)		
41. Leeches present		
42. Some (3 – 5) earthworm casts or cicada chimneys		
43. Many (>5) earthworm casts or cicada chimneys		

DISTURBANCE		
44. **NO** presence of tangled masses, curtains or 'towers' of **narrow-stemmed climbers or vines** (including climbing bamboo)		
45. **NO** presence of open grassy areas		
46. Average visibility within forest **more than 10 m** but less than 50 m (off trail)		
47. Average visibility within forest **more than 20 m** but less than 50 m (off trail)		
48. **NO** obvious man-made clearings present (roads, skid tracks, log landings etc.)		
49. **NO** signs of recent logging		
50. **NO** signs of hunting or poaching (e.g., no shotgun cartridges/bullet cases, traps, campsites observed)		
SCORE		

For more guidance on answering the survey questions, please refer to Assessing forest integrity: A preliminary test of a new, easy-to-use field methodology