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CHAPTER 20

The role of Permanent Reserved Forest in *in situ* conservation

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Abstract: The tropical rainforests of Peninsular Malaysia are not only important for the socio-economic development of the country but are also home to a megadiverse collection of flora and fauna. Permanent Reserved Forests are lands gazetted under the *National Forestry Act 2022 (Amendment)* to ensure sufficient forest area for ecosystem and ecological services. Currently, there are 4.85 million hectares of Permanent Reserved Forests in Peninsular Malaysia, whereas 1.91 million hectares are classified as protected forests and the remaining are production forest. This chapter aims to highlight the *in situ* conservation initiatives carried out by the Forestry Department Peninsular Malaysia in these Permanent Reserved Forests.

INTRODUCTION

The Malaysian tropical rainforests are one of the oldest in the world and rich in biological diversity. As one of mega-biodiverse countries in the world (Convention on Biological Diversity, n.d.), Malaysia recognises forests as strategic national heritage treasures, and is committed to securing sufficient forest areas for their ecosystem services, biodiversity conservation, environmental protection, and sustainable utilisation of resources towards the socioeconomic development and well-being of present and future generations (Ministry of Energy and Natural Resources 2021). In 2024, the forestry sector recorded a contribution of RM6.62 billion to the country's gross domestic product with exports valued at RM22.91 billion (Forestry Department Peninsular Malaysia 2024).

Peninsular Malaysia is blessed with forest areas covering 5.73 million hectares, or 43.47% of 13.18 million hectares of total land area (Table 1). The forest areas in Peninsular Malaysia are categorised as Protected Area (PA), State Land Forests and Permanent Reserved Forests (PRFs). The Protected Area are areas meant for the protection of wildlife, while State Lands Forests are "land-banks" to be developed for socio-economy benefits. The Permanent Reserved Forests constitute about 4.85 million ha or 84.64% of the total forests and are managed under the Sustainable Forest Management Principle. The principle emphasises that permanent forest land should be managed to achieve one or more clearly specified objectives of management with regards to the production of a continuous flow of desired forest products and services without undue undesirable effects on the physical and social environment (ITTO 2015). Currently, 4.14 million ha or 85.36% of PRFs are certified under the Malaysia Timber Certification Scheme (MTCS). This certification acknowledges that these PRFs are sustainably managed and the wood produced are legal. The PRFs are further divided based on forest types for better management (Table 2) (Figure 1).

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Table 1. Forest areas in Peninsular Malaysia.

Forest area	Total area (ha)	Percentage (%)
Permanent Reserved Forest	4,853,170	84.76
Proposed Permanent Reserved Forest	83,608	1.46
Protection Forest	250,352	4.37
Stateland Forest	538,816	9.41
Total	**5,725,946**	**100.00**

Source: Forestry Department Peninsular Malaysia (2024).

Table 2. Major Forest Types in Permanent Reserved Forest, Peninsular Malaysia.

Forest area	Total area (ha)	Percentage (%)
Inland Forests	4,550,004	93.75
Peat Swamp Forest	212,104	4.37
Mangrove Forest	91,062	1.88
Total	**4,853,170**	**100.00**

Source: Forestry Department Peninsular Malaysia (2024).

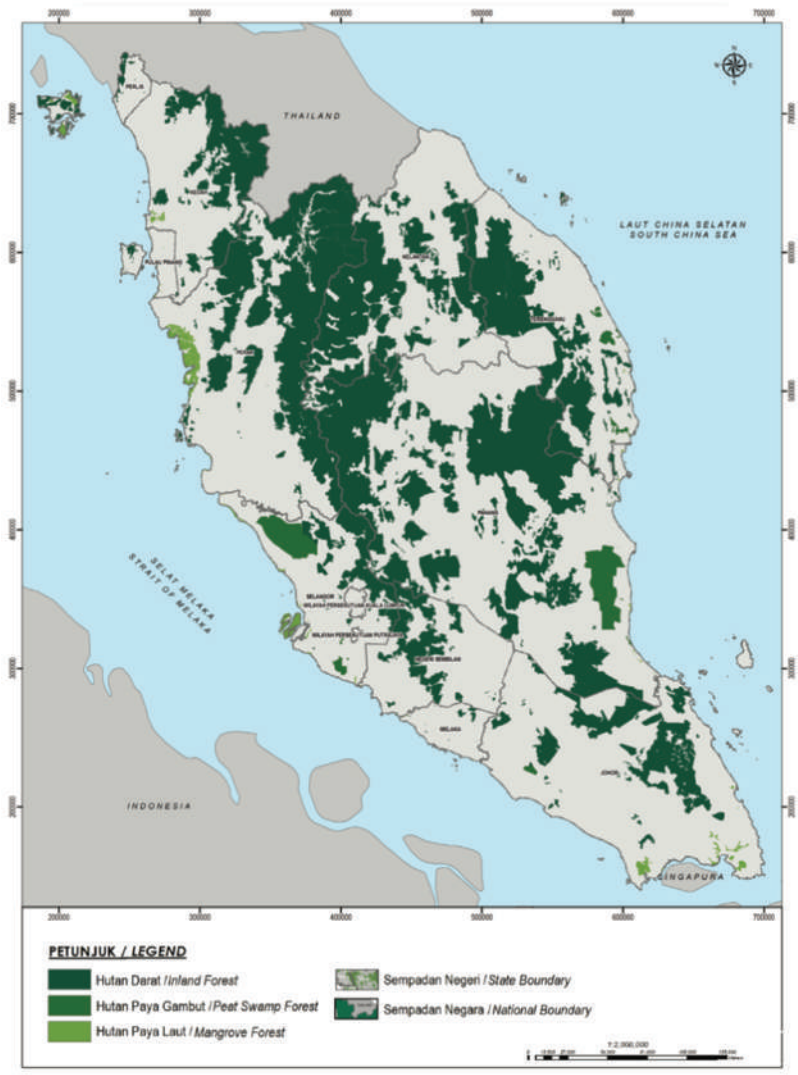

Figure 1. Major forest types in Permanent Reserved Forests.

The Permanent Reserved Forests

Permanent Reserved Forests (PRFs) are land constitute by State Authority and notified in Gazette as stated under Section 7, National Forestry Act 2022 (Amendment) or Act 313. The establishment of PRF allows for proper planning and better management of the valuable renewal resources to enhance commercial returns while ensuring environmental conservation. PRFs shall be classified into 12 functional classes to promote sustainable forest management and multiple uses of the forest. Section 10, Act 313 allows classification of PRF under one or more classes which shall be descriptive of the purpose or purposes for which the land is being or intended to be used. The classification is as followed:

a. Timber production forest under sustained yield;
b. Soil protection forest;
c. Soil reclamation forest;
d. Flood control forest;
e. Water catchment forest;
f. Forest sanctuary for wildlife;
g. Virgin jungle reserved forest;
h. Amenity forest;
i. Education forest;
j. Research forest;
k. Forest for federal purposes and
l. Forest state park

The production forest in Peninsular Malaysia only constitutes timber production forest under the sustained yield class. The concept of sustained yield is that the annual volume harvested must correspond with the volume increment of the forest timber taken from the forest (Mohd *et al.* 1988). These forests are managed under the Selective Management System, which aims to optimise the management objectives of economical and efficient harvesting and sustainability of the forest at minimum forest development costs. Thang (1987) explained that the system was established to meet the following requirements:

"*...that it has the flexibility to manage highly variable forest conditions and changes in the socio-economic environment; that it is rationally based on inherent characteristics of the forest and prevailing socio-economic conditions; and that it will allow for the optimisation of forest management goals which are, namely, (a) an economic cut, (b) the sustainability of the forest, and (c) the minimum costs for forest development.*"

The remaining classes are meant for protection. The management of protection forests are limited to the demarcation of boundaries and enforcement of activities, as entry is not allowed without permission from the authority. As for the amenity forests and forest state parks, management activities adhere to the respective management plans developed. Act 313 does not specify that logging activity cannot be carried out in these protected forest areas. However, it is the management's decision not to allow logging activities due to the importance of these areas for social, environmental, and wildlife protection.

THE FORESTRY POLICY OF PENINSULAR MALAYSIA

Forests are no longer considered as a resource of timber production merely for the socio -economic development of the country. In fact, the protection functions of forest resources such as biodiversity, environmental stability, preserving community culture are becoming increasingly important. The government has recognised that forest management needs to take into consideration the new emerging issues faced by forestry sectors such as water supply and food security, climate change, and improving livelihood standards. To address

this, Malaysia has taken into account the new developments in the formulation of forestry policies and legislations. The Peninsular Malaysia Forestry Policy covered the aspects of sustainable forest management, conservation and protection of biodiversity and forest ecosystem services, mitigation and adaptation of climate change impact, empowerment of research and development as well as information sharing (MENR 2021).

The Peninsular Malaysia Forestry Policy outlined nine main pillars, in which the second pillar aims to enhance focus on conservation of forest biodiversity to prevent degradation of ecosystem, species extinction and depletion of genetic resources (Forestry Department of Peninsular Malaysia 2021). The pillar have two main strategies:

I. Conservation of forest biodiversity through intensifying conservation efforts, including information gathering, *in situ* and *ex situ* initiatives to protect rare, threatened and endecmic (RTE) species.
II. Improve knowledge and scientific documentation on forest biodiversity by acquiring detailed information regarding diversity of flora and fauna especially of undiscovered species and document as a reference in decision-making to ensure that the national biodiversity can be managed sustainably.

IN SITU CONSERVATION INITIATIVE

Forest biodiversity scientific expedition

The Forestry Department of Peninsular Malaysia focuses its efforts on conserving and preserving forest biodiversity to prevent ecosystem degradation, species extinction, and the loss of genetic resources, while taking into account the interests of both social and the environment. Since 1999, JPSM has actively conducted scientific expeditions on forest biodiversity, which serve as a key foundation in understanding the richness of the nation's forest biodiversity. The main objective of these scientific expeditions is to gather detailed information on the biodiversity present in PRFs, which can assist researchers and scientists in deepening their scientific understanding of forest ecosystems.

Continuous efforts through these scientific expeditions have further enriched the nation's biodiversity knowledge base with data and various new discoveries that play a critical role in shaping more strategic and sustainable conservation directions for flora and fauna, while also supporting improvements in the overall management of natural resources. Numerous significant findings, including new, endemic, and unique species of flora and fauna, have been successfully recorded and documented (Appendix 1). As a reflection of the outcomes from 50 scientific expeditions conducted, a total of 39 seminars have been held and 31 proceedings of the *Forest Biodiversity Series* have been successfully published, serving as important references and guides in national biodiversity studies. To date, the expeditions have managed to record 6,766 species of flora (higher and lower plants) and 2,552 fauna (invertebrates and vertebrates). Besides documenting forest biodiversity, the expedition also indirectly act as an out-door laboratory by providing a first-hand experience to future researcher or scientist. The expedition has seen young students participating in the expedition and in the later years coming back as the lead researches.

Virgin Jungle Reserve Forests

Virgin Jungle Reserve (VJR) are forest areas designated as a primary reference site for ecological, botanical, and forest management studies, while also preserving biodiversity and natural forest ecosystems. To date, there are 126 VJR areas covering 32,876.22 hectares in Peninsular Malaysia, encompassing various ecosystems as listed in Appendix 2. VJR areas also serve as an important element in complying with Principles 6 and 8 of the Malaysian Criteria and Indicators (MC&I) for Sustainable Forest Management (SFM), which emphasise the conservation of high conservation value forests.

Box 1.
Richetia kuantanensis (Ashton) Ashton & J. Henk. was declared extinct in 2010 (Chua *et al.* 2010). The only collection on the species was in 1936 in Bukit Goh before the area was converted into plantation. In 1971, the species was described as *Shorea kuantanensis* (Ashton 1978). There were efforts by Forestry Department of Peninsular Malaysia and Pahang Forestry Department to locate the population at the type locality and its vicinity after but there was no success. FDPM continuous efforts in recording rare and threatened species led to the discovery of *R. kuantanensis* in 2014 located at Lata Tembakah Recreational Forest (Mohd. Nasir *et al.* 2017).

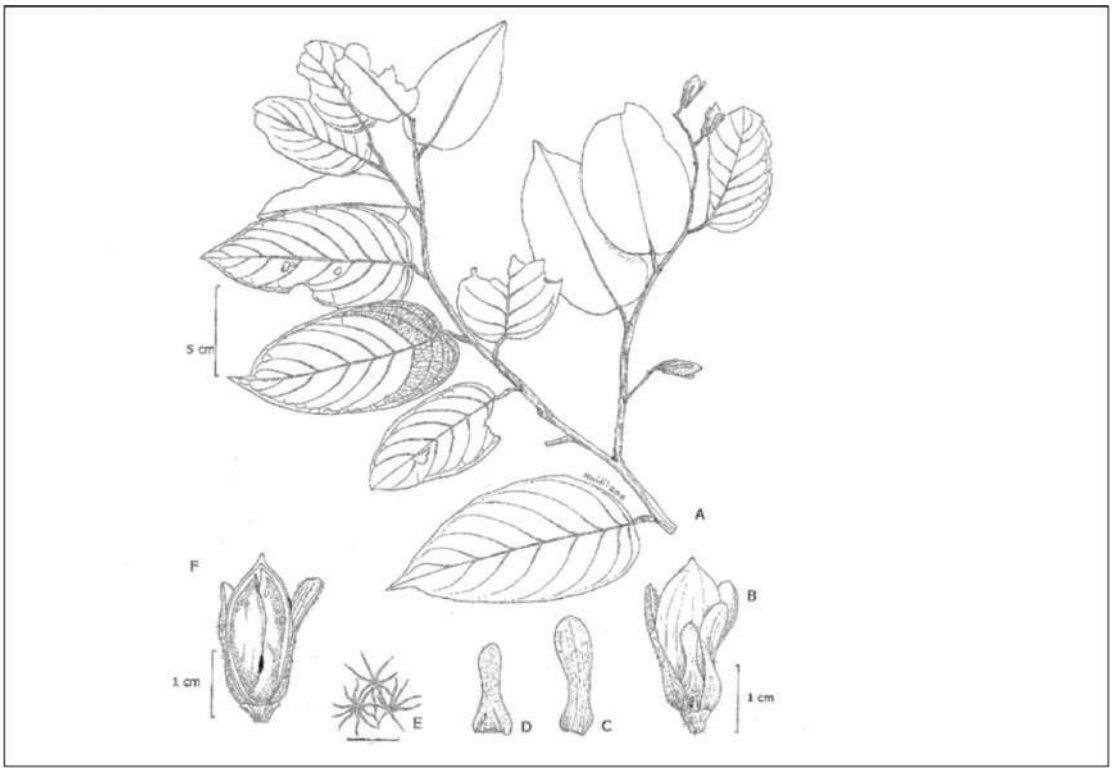

Figure 2. A. Twig of *R. kuantanensis* (Ashton) Ashton & J. Henk.; **B.** Fruit, note the calyx enclosed three-quarter of the nut, hence the nut exceeded the calyx; **C and D.** Spatulate fruit calyx, note the indumentum; **E.** Hair on fruits calyx; and **F.** longitudinal section of the open fruit to show the cotyledons. Source: Mohd. Nasir 2369 (KEP).

High Conservation Value Forests

High Conservation Value (HCV) forests refer to forests of outstanding or critical importance in terms of biological, ecological, social, and cultural values. Initially introduced in 1999 by the Forest Stewardship Council (FSC) for Forest Management Certification, the HCV concept has since been adopted globally and expanded into the agriculture and plantation sectors (HCV Malaysia Toolkit Steering Committee 2018). HCV areas are established to ensure long-term protection, particularly where such areas may be at risk from management practices such as harvesting or development activities.

A total of 44 HCV forests have been established, covering an area of 1,976.59 hectares across Peninsular Malaysia (Appendix 3). The Director-General of Forestry Peninsular Malaysia Circular No. 9 of 2024: *Guidelines for the Management of High Conservation Value (HCV) Areas in Permanent Reserved Forests (PRF) in Peninsular Malaysia* has been enforced as a guiding document for the management of HCV areas.

Ecological plots
Ecological plots are permanent reference areas established for long-term studies on the structure, function, and changes within forest ecosystems. The establishment of ecological plots helps provide continuous scientific data to support sustainable forest management. A total of 16 ecological plots have been established since 2008 (Appendix 4).

Ethnobotany plots
Ethnobotanical plots are designated areas within PRF for the study and conservation of plant species with traditional, cultural, and medicinal value to local communities. The establishment of ethnobotanical plots also aims to document traditional knowledge related to the identification and use of plants for medicine, wildlife food sources, handicrafts, and other customary purposes. To date, only four ethnobotanical plots have been established within PRFs which are located in Kelantan (1 plot), Pahang (1 plot), and Kedah (2 plots) as shown in Appendix 5.

CONCLUSION

Permanent Reserved Forests, among other forests, play a vital role in conserving Malaysia's biodiversity while supporting essential ecosystem services. In Peninsular Malaysia, the Forestry Department of Peninsular Malaysia has strengthened *in situ* conservation through scientific expeditions and scientific research and also established of Virgin Jungle Reserve and High Conservation Value forests to safeguard Malaysia's natural heritage. The Forestry Department is committed to preserve and conserve forest biodiversity, taking into consideration of people's interests and the national responsibility as stipulated and ratified in the international multilateral agreements.

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APPENDICES

Appendix 1. Selected list of Forest Biodiversity Scientific Expedition significant findings from 1999 – 2024.

No.	Species	Locality / Year	Significance
	FLORA		
	FAMILY: Achariaceae		
1.	*Ryparosa scortechinii*	Gunung Tebu (2012)	Endemic
	FAMILY: Annonaceae		
2.	*Annona glabra*	Matang Mangrove (2002)	New record
	FAMILY: Arecaceae		
3.	*Iguanura belumensis*	Belum Royal State Park (1999)	Endemic
4.	*Johannesteysmannia lanceolata*	Gunung Angsi (2007)	Endemic
5.	*Licuala stongensis*	Gunung Stong (2003)	Endemic
6.	*Licuala acutifida*	Bukit Panchor (2008)	Endemic
	FAMILY: Begoniaceae		
7.	*Begonia herveyana*	Melaka (2008)	Endemic
	FAMILY: Dipterocarpaceae		
8.	*Richetia kuantanensis*	Lata Tembakah (2017)	New record
9.	*Neobalanocarpus heimii*	Mandi Angin (2004)	Biggest tree
10.	*Shorea lumutensis*	Pangkor (2009)	Endemic
	FAMILY: Gnetaceae		
11.	*Gnetum globosum*	Kenong (2004)	New record
	FAMILY: Lythraceae		
12.	*Sonneratia griffithii*	Merbok (2013)	Rare species
	FAMILY: Orchidaceae		
13.	*Cleisostoma* sp.	Gunung Tebu (2012)	New species
14.	*Paphiopedilum barbatum*	Belumut (2009)	Endemic
	FAMILY: Polypodiaceae		
15.	*Tectaria shahidaniana*	Wang Kelian, Perlis (2000)	New species
	FAMILY: Rafflesiaceae		
16.	*Rafflesia kerrii*	Gunung Stong (2003)	Biggest flower
	FAMILY: Rhizophoraceae		
17.	*Bruguiera hainesii*	Merbok (2013)	Rare species
	FAMILY: Thismiaceae		
18.	*Thismia perlisensis*	Bukit Jernih (2024)	New species
	FAMILY: Tiliaceae		
19.	*Brownlowia tersa*	Hutan Paya Laut Merbok (2013)	Rare species
20.	**FAMILY: Zingiberaceae**		
21.	*Alpinia suriana*	Cameron Highlands (2007)	New record
22.	*Etlingera terengganuensis*	Mandi Angin (2004)	Endemic
	Hornstedtia conica	Belum (2003)	Endemic
	FAUNA		
	FAMILY: Cercopithecidae		
23.	*Macaca arctoides*	Perlis State Park (1999)	New record
	FAMILY: Cyprinidae		
24.	*Paedocypris* sp.	Bukit Bauk (2006)	Formerly the smallest vertebrate in the world
	FAMILY: Gekkonidae		
25.	*Cyrtodactylus quadrivirgatus*	Gunung Tebu (2012)	New record
	FAMILY: Molossidae		
26.	*Optomops* sp.	Cameron Highlands (2007)	New record

27.	**FAMILY: Rhacophoridae**		
28.	*Rana montjerai*	Jerai (2005)	New species
	Theloderma licin	Ulu Muda (2003)	New species
29.	**FAMILY: Tetrigidae**		
	Eufalconius sekayu	Hulu Terengganu (2024)	New species

Appendix 2. List of high conservation value forests established in permanent reserved forests in Peninsular Malaysia.

State	Forest Reserve	No. of plots	Year established	Significance
Johor	Gunung Arong	1	2008	*Cotylelobium melanoxylon*
	Panti	2	2015	*Dryobalanops beccari*
	Panti	3	2018	*Hopea auriculata*
	Panti	4	2024	*Neobalanocarpus heimii*
	Ulu Sedili	5	2024	*Richetia peltata*
	Labis	6	2024	*Dipterocarpus tempehes*
	Kluang	7	2024	*Richetia blumutensis*
Kedah	Gunung Jerai	1	2013	*Paphiopedilum callosum*
	Merbok	1	2013	*Phoenix palludosa*
Kelantan	Gunung Stong Tengah	1	2016	*Licuala stongensis*
	Lojing	2	2015	*Rafflesia kerri*
Perlis	Mata Ayer	1	2007	*Cycas clivicola*
Melaka	Bukit Senggeh	1	2020	*Begonia herveyana*
	Batang Melaka	2	2020	*Begonia herveyana*
Negeri	Setul	1	2007	*Vatica yeechongii*
Sembilan	Sungai Menyala	2	2007	*Lowland dipterocarp forest*
	Tampin	3	2018	*Begonia tampinica*
Pahang	Gunung Benom (Lata Jarum)	1	2009	*Rafflesia cantleyi*
	Endau-Rompin (Padang Tujuh)	2	2012	*Tropical heathforest*
	Pontian	3	2013	*Canarium reniforme* *Bruguiera hainesii*
	Lentang	4	2014	*Anthoshorea bentongensis*
	Paya Pasir	5	2015	*Eurycoma longifolia*
Perak	Chikus	1	2015	*Dipterocarpus coriaceus*
	Sungai Pinang	2	2007	*Shores lumutensis*
	Segari Melintang	3	2007	*Shorea lumutensis*
	Kledang Saiong	4	2016	*Vatica abdulrahmaniana*
	Kledang Saiong	5	2016	*Parashorea globosa*
	Pangkor Selatan	6	2018	*Hopea auriculata*
	Kledang Saiong	7	2007	*Johannesteijsmannia perakensis*
	Bubu	8	2018	*Anthoshorea lamellata*
	Temengor	9	2007	*Rhizanthes infanticida*
	Temengor	10	2007	*Salt Lick*
	Gerik	11	2016	*Rafflesia cantleyi*
	Pulau Kalumpang	12	2007	*Pre-historic site*
	Pulau Kecil	13	2015	*Bruguiera hainesii*

Pulau Pinang	Bukit Panchor	1	2014	*Iguanura corniculata*
	Taman Negara Pulau Pinang	2	2018	*Hopea bracteata* var. *penangiana*
Selangor	Kanching	1	2010	*Hopea subalata*
	Kanching	2	2007	*Hopea subalata*
	Semangkok	3	2007	*Rubishorea platyclados*
	Kuala Langat Selatan	4	2018	*Rubroshorea teysmanniana*
Terengganu	Jerangau	1	2004	*Dipterocarpus sarawakensis*
	Jerangau	2	2008	*Johannesteijsmannia altifrons*
	Pasir Raja	3	2008	*Neobalanocarpus heimii*

Appendix 3. List of virgin jungle reserves in Peninsular Malaysia.

State	No.	Forest Reserve	Year established
Johor	1	Ma'okil	1994
	2	Gunung Ledang	1996
	3	Air Hitam	2000
	4	Kluang	1954
	5	Renggam	1959
	6	Labis	1959
	7	Lenggor	1960
	8	Panti	1960
	9	Panti	1996
	10	Ulu Sedili	1964
	11	Ulu Sedili	1976
	12	Bukit Hantu	2001
	13	Gunung Arong	1951
	14	Labis	2005
	15	Kuala Sedili	2014
Kedah	1	Bukit Perangin	1960
	2	Bukit Perangin	1960
	3	Gunung Raya	1976
	4	Sungkop	1950
	5	Gunung Jerai	1960
	6	Gunung Jerai	1960
	7	Gunung Jerai	1960
	8	Gunung Jerai	1960
	9	Rimba Teloi	-
	10	Bukit Perak	1975
	11	Bukit Perak	1975
	12	Ulu Muda	2013
	13	Gunung Inas	1962
	14	Gunung Machinchang	1976
	15	Gunung Machinchang	1978
	16	Gunung Machinchang	1977
Kelantan	1	Chabang Tongkat	1976
	2	Lebir	1961
	3	Relai	1960
	4	Sg Durian	1967
	5	Temangan	1959
	6	Ulu Sat	1967

	7	Ulu Temiang	1967
	8	Nenggiri	1996
	9	Perias	2002
	10	Gunung Rabong	2002
	11	Batu Papan	2002
	12	Lojing	2006
	13	Jeli	1967
	14	Gunung Basor	1996
	15	Stong Utara	1996
	16	Stong Tengah	2002
	17	Stong Selatan	2005
Perlis	1	Mata Ayer	1991
	2	Bukit Bintang	1995
Melaka	1	Tanjung Tuan	1953
	2	Batang Melaka	1964
	3	Bukit Senggeh	1964
Negeri	1	Angsi	1959
Sembilan	2	Berembun	1990
	3	Berembun	1959
	4	Pasoh	1995
	5	Serting	1995
	6	Sungai Menyala	1948
	7	Tebong	1964
	8	Pasir Panjang	1990
Pahang	1	Balok	1985
	2	Balok	1991
	3	Pekan	1993
	4	Beserah	1953
	5	Bukit Galing	1989
	6	Lepar	1986
	7	Lesong	1984
	8	Lesong	1990
	9	Lesong	1990
	10	Menchali	1981
	11	Jengka	1990
	12	Kemasul	1975
	13	Paya Pasir	1976
	14	Tekam	1996
	15	Terenggun	1975
	16	Batu Gangan & Bau Gangan (Tambahan)	2005
	17	Sg Kial & Hsk Sungai Kial (Tambahan)	1986
	18	Hulu Teranum	2005
	19	Hulu Teranum	1997
Perak	1	Segari Melintang	1951
	2	Lumut	1951
	3	Pangkor Utara	1960
	4	Gunung Besout	1960
	5	Bukit Tapah	1960
	6	Sungai Pinang	1960
	7	Bukit Kinta	1962
	8	Bukit Larut	1962
	9	Bintang Hijau	1962
	10	Kledang Saiong	1962
	11	Bubu	1963

	12	Tanjung Hantu	1951
	13	Pulau Kecil	1996
	14	Pulau Gula	1996
	15	Pulau Sangga Besar	1996
	16	Pulau Sangga Kecil	1996
	17	Trong	1996
	18	Pulau Pasir Hitam	1996
	19	Sungai Tinggi	1996
Pulai Pinang	1	Pantai Acheh	1972
	2	Teluk Bahang	1976
	3	Bukit Kerajaan	2012
Selangor	1	Semangkok	1916
	2	Ulu Langat	1969
	3	Bukit Lagong	1947
	4	Bukit Tarek	1914
	5	Ulu Langat	2005
	6	Ulu Gombak	1959
	7	KualaLangat	1927
	8	Pulau Klang	1994
	9	Sungai Lalang	1970
	10	Bukit Jugra & Bukit Jugra (T)	1904
	11	Sungai Lalang	2005
	12	Bukit Cherakah	2005
Terengganu	1	Bukit Bauk	1954
	2	Jambu Bongkok	2009
	3	Jerangau	1963
	4	Rasau Kerteh	1963
	5	Gunung Tebu	1973
	6	Bukit Sal	1963
	7	Pulau Tenggol	2009
	8	Sungai Nipah	1978
	9	Kuala Kemaman	2009
	10	Bukit Terendak	2009
	11	Pelagat	2009
	12	Pulau Redang	2009

Appendix 4. List of arboretums in Permanent Reserved Forests in Peninsular Malaysia.

State	#Arboretums	Location	Year established
Johor	1	Jemaluang Nursery	2019
Kedah	1	Bukit Perangin Forest Reserve	2006
Kelantan	1	Semerak Forest Reserve	2019
Melaka	1	Melaka Botanical Garden	2008
Negeri Sembilan	1	Lenggeng Forest Reserve	2019
Pahang	1	Rotan Tunggal Forest Reserve	1984
Perak	2	Jebong Forest Reserve	2012
		Pangkor Utara Forest Reserve	2011
Perlis	1	Bukit Bintang Forest Reserve	2000
Pulau Pinang	2	Balik Pulau Forest Reserve	2006
		Teluk Bahang Forest Reserve	1997
Selangor	2	Kanching Forest Reserve	1993
		Rantau Panjang Forest Reserve	2025
Terengganu	2	State Forest Nursery of Terengganu (Chalok)	2003
		Forestry Training Centre of Terengganu	2020

Appendix 5. List of ecological plots in Permanent Reserved Forests in Peninsular Malaysia.

State	#Plots	Forest Reserve	Year established
Pahang	1	Tranum	2008
Melaka	3	Bukit Senggeh	2008
		Tanjung Tuan	2008
		Batang Melaka	2018
Perlis	1	Mata Ayer	2009
Perak	1	Bintang Hijau	2009
Negeri Sembilan	2	Sungai Menyala	2010
		Berembun	2018
Kedah	1	Bukit Perangin	2011
Terengganu	1	Gunung Tebu	2012
Pahang	2	Batu Gangan	2017
		Pekan	2017
Selangor	1	Semangkok	2018
Kelantan	1	Lebir	2018
Pulau Pinang	1	Bukit Kerajaan	2018
Johor	1	Lenggor	2018

Appendix 6. List of ethnobotanical plots in Permanent Reserved Forests in Peninsular Malaysia.

State	#Plots	Forest Reserve	Year established
Kelantan	1	Batu Papan	2011
Pahang	1	Sungai Kial (Tambahan)	2012
Kedah	2	Gunung Jerai	2013
		Gunung Jerai	2019