

## Name of Protected Area: Mt Wilhelm National Park

### Part 1: Basic information about the protected area

**Table 1. Protected area information**

Name, organisation and contact details for person(s) conducting the assessment <i>Person 1: Name, Organisation, Address, Email, Phone</i>	Warren Jano, SPREP, wjano2009@gmail.com, or contact Amanda Wheatley amandaw@sprep.org.
<i>Person 2: Name, Organisation, Address, Email, Phone</i>	Fiona Leverington, SPREP/Protected Area Solutions, 38 Foothill Place The Gap, Q4061, Fiona@protectedareas.com.au, 617476006295.
Today's Date	25/11/2016
Name (or names) of protected area	Mt Wilhelm
Size of protected area (ha)	817
PNG Code or number	33
World Database of Protected Areas site code (these codes can be found on <a href="http://www.unep-wcmc.org/wdpa/">www.unep-wcmc.org/wdpa/</a> )	71365
What level or kind of protected area is it? (National Park, Wildlife Management Area, Sanctuary, Reserve, Locally Managed Marine Area etc)	National Park
IUCN Category	II
International protected area? e.g. World Heritage or Ramsar?	
Country	Papua New Guinea
Province/s	Simbu
District/s	Gembogl
Local level governments	Mitnan
Ward/s	1
Nearest big town	Kundiawa
Location of protected area (brief description)	Mt Wilhelm National Park includes the highest mountain in Papua New Guinea (Mt Wilhelm or Mt Enduwa Kombuglu at 4509m), which is part of the Bismarck Range in the Central Highlands. The mountain is at the junction of three provinces: Simbu, Madang and Jiwaka. The site has high biological conservation value including the most extensive occurrence of alpine and sub-alpine vegetation in PNG. It is also one of the major trekking attractions in PNG. It is approximately 5 hours' drive from Kundiawa on a gravel road (Kundiawa is about 3 hours' drive from Goroka).
Map references	1;100,000 Topo. Bundi Sheet 7986 – 145'1E 5'47'S
When was the protected area gazetted or formally established?	17/05/1990. In 1981 it was purchased from the landowners. It has been declared government land reserved for National Park by the National Land Registration Act (Chapter 357).
Reference for gazettal or Memorandum of Understanding (MoU)	Gazette 28

Who owns the protected area? please enter Government Private Community/ customary landowners, private, Other (name) and include <b>Clan name(s)</b>	State-owned. Customary landowners are the Wandike Clan.
Number of households living in the protected area	0
Population size within the protected area	0 (outside there are about 1000 people)
Who manages the protected area? (e.g. please enter government, customary landowners [add clan names] management committee [how many and what gender])	Government - formally it is managed by rangers, but now there are none.
Total number of staff (this means anyone working on the protected area in <b>paid jobs</b> – whether NGOs, community, rangers or customary landowners	0
<i>Temporary paid workers</i>	0
<i>Permanent paid workers</i>	0
Annual budget (US\$) – excluding staff salary costs	0
Operational (recurrent) funds	0
Project or special funds	Recent commitment of K500,000 from PNG's Conservation and Environmental Protection Agency (CEPA), but no funds have been received to date.
Reason for protected area establishment	The site has high biological conservation value including the most extensive occurrence of alpine and sub-alpine vegetation in PNG. It includes the highest mountain in PNG.
What are the main values for which the area is designated (Fill this out after data sheet 2)	Landscape (e.g. Stone [mountain], two lakes - Lake Piunde, which means male and Lake Aunde, which means female; flora and fauna of the mountain and grassland; and iconic place (the lakes were the Wandike Clan's secret site - the dead spirits lived there).
List the primary protected area management objectives (add lines if needed after the most important objectives): <i>Management objective 1</i>	To protect the landscape (mountain, stones, the top of the mountain water fall and lakes).
<i>Management objective 2</i>	To protect the fauna (wild dogs) and flora (grassland and orchids).
<i>Management objective 3</i>	To expand the current trekking into a sustainable tourism industry to support the local landholders.
Number of people involved in answering the assessment questions	3
Name/organisation/contact details of people participating in the assessment	<i>William Banda</i> , 79835591; <i>Dua Tanggaba</i> ; <i>Arnold Mundua</i> , Simbu Province Forest Officer and customary landowner, PO Box 192, 72838245; and phone conversation with <i>Pam Christie</i> , PNG Trekking, info@pngtrekkingadventures.com.
Customary landowners/other community; CEPA, Other national government agency; Provincial govt; local level govt; Protected area staff (anyone working on the protected area in paid jobs; NGO; Donors; External experts; Others	Customary landowners, Provincial Government, tourism industry.

Please note if assessment was carried out in association with a particular project, on behalf of an organisation or donor	SPREP through the PNG Protected Area Assessment Project, which is a component of the GEF Community-based Forest and Coastal Conservation and Resource Management Project in PNG.
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## Part 2: What makes this protected area special and important?

*No text inserted related to participants' views.*

**Additional information:** The area has an upper montane humid climate with two seasons - wet and dry. Temperature ranges from -3.8 to 14.4°C and rainfall at 3,840m is about 3,000 mm. There is ephemeral snow on the summit at most times of the year (DEC Register 1992). Management has been in decline since the 1990s. In about 1993 the Provincial Ranger was retrenched and the Park subsequently suffered a reduction in government presence. Management continued in a reduced manner until about 1997 when all government intervention in the Park ceased. The collapse of effective government participation can be dated to about 1994. Before the area became a National Park the land was a hunting ground with some provision for regulating access to hunt. Hunting and cutting of trees is now reported as happening randomly (Rappam 2006). In the early 1990s the Park had: one caretaker (on minimal rural wages); five park workers from nearby villages; and a Provincial Ranger based at Goroka, who usually visited the Park twice a month (Rappam 2006). The 1992 Protected Area Register recorded that when the Park was operational there was: general maintenance of tracks and facilities; maintenance of the research hut at Lake Piunde and collection of fees; and considerable time spent with landowners in negotiations about issues. Visitor statistics have not been collected for many years but in January 1992 a total of 585 visitors were recorded of which 301 were PNG nationals; the main nationalities in the remainder were USA (72), Australian (62) and Japanese (51). There is a hut at Lake Piunde along the walking track inside the Park, which was built by the Australian National University. There are four locally-run guesthouses available to visitors in the area. One or two are within the Park boundary one between the Park and Kegsugl and one at Kegsugl. Walkers are provided with guides from the local landowning community, through the guest houses. Information from the Protected Area workshop conducted in 20014 (Peterson 2014) indicated that visitors paid a small track fee (K10) to help with track maintenance. There is no guide fee, although some pay K50 for a guide. The money collected is distributed among the landowners, and they make sure some is spent on protecting the area. The community had a fish farm below the protected area with trout and a guest house on the lake. The participants were seeking assistance from the government – “I can’t do it all ... We want some help to make it a better place for tourists”.

**Table 2. Key values of the protected area**

No.	Key values	Brief description	Note if endangered species or ecosystem (IUCN)
1	Landscape	Mt Wilhelm is the highest mountain in PNG. <b>Additional information:</b> The Park extends from 3,400m to 4,500m above sea level. The Park covers a glacier-formed U-shaped hanging valley; the valley floor has a moderate slope for its length (approximately 6.5 km and .8 km at its widest), rising abruptly through a cirque backwall at the top from 3,800m to the peak of 4,500m. There are two glacial lakes, Lake Piunde and the higher Lake Aunde, cores from which have provided important information on late Pleistocene environments in an alpine tropical location. A high water table makes the surface of the valley floor wet and swampy. There are extensive terminal moraines below 3,400m. The area has been an important research site. It is the only protected area in PNG with intact clear glacial depositional landforms (RAPPAM 2006).	
2	Flora and fauna	<b>Additional information:</b> The area between Mt Wilhelm and Kaijende is one of world’s five richest concentrations of vascular plants (Barthlott et al. 2005). There is a variety of short grasses on the mountain-slopes, and some pandanus trees. A rare species of frog is found here and 284 bird species have been recorded. There is high altitude fauna including: birds of paradise, long bearded <i>Melidictes princeps</i> , (longbeared honeyeater – vulnerable species), 123 species of phytoplankton recorded and 12 crustacean species (Rappam 2006).	
3	Iconic place	Highest mountain in PNG and it is important to the identity of the people for cultural and scenic values. It is a destination for trekking with a chance to experience high-altitude environments.	

**Table 3. Checklist of values/benefits**

Not important 0; Important 1; Very important 2; Don't know DK

How important is the protected area for each of the listed values/benefits?	Score (0,1,2, DK)	Comment
1. Biodiversity – the presence of many different kinds of plants, animals and ecosystems	2	Diverse and important flora, including vascular plants and grasslands and fauna adapted to high alpine areas.
2. Presence of rare, threatened, or endangered species (plants and animals)	2	One species of rare frog was found by the Binatang Research Group (Madang).
3. Ecosystems (e.g. wetlands, grasslands, coral reefs etc) that are rare because they have been cleared or destroyed in other areas	2	High alpine montane ecosystems.
4. Protecting clean, fresh water	2	The NP is the source of the Purari River and this must be clean for the people to use. The park provides catchment protection. <b>Additional information:</b> The Park covers the Pindaunde Valley, along the south eastern side of the mountain. The Pindaunde catchment provides the drinking water for the landowning community and school downstream (Rappam 2006).
5. Sustaining important species in big enough numbers that they are able to survive here	1	There is no one living in the NP, so nature has to take care of itself. The size of the park is sufficient to maintain the existing species.
6. Providing a source of employment for local communities now	2	Some income is received from tourists and hikers (e.g. for accommodation, food and guiding). There is no other means for the customary landowners to make money. There are no business opportunities apart from this. We can't plant vegetables and other crops here.
7. Providing resources for local subsistence (food, building materials, medicines etc.)	0	A few pandanus plants are taken for weaving mats, but there are no other uses. This is not significant.
8. Providing community development opportunities through sustainable resource use	0	
9. Religious or spiritual significance (e.g. tambu places)	2	There is a traditional belief that the dead spirits go to the two lakes and these are very important.
10. Plant species of high social, cultural, or economic importance	2	Dwarf ground/stone fern (Binga Kainga) that grows above 4000 feet. It is used for dressing in traditional singing/ ceremonies and it is a symbol of identity for the Mt Wilhelm area.
11. Animal species of high social, cultural, or economic importance	0	No hunting takes place in the NP and there are no villages within the NP.
12. Attractive scenery	2	<b>Additional information:</b> The park has high scenic beauty, with the highest peak in PNG, alpine lakes and vegetation, birds of paradise, glacial landforms and high altitude fauna.
13. Tourism now	2	High value for tourism as Mt Wilhelm provides unique opportunities for trekkers to walk in snow and ice and to experience wonderful views in the high alpine area.
14. Potential value for tourism in the future	2	There is great potential to expand tourism but it depends on the input of the National Government to improve access, training and facilities.
15. Educational and/or scientific value	2	In the 1960 ANU built a research station and there were educational programs, a lot of international research and also research from UPNG as well as visits from schools. The park's altitude has resulted in a unique set of flora and fauna for PNG and as such is an important national scientific resource.
16. Maintaining culture and tradition on customary land and passing this on to future generations	1	Times are changing and there is no constant decree on maintaining traditions and customs and these are declining.

### Part 3: What are the threats to the protected area?

**Table 4: Threats to the protected area**

- H** High significance threats are seriously degrading values. This means they are badly damaging some value –it might be a kind of animal or plant, or your traditional gardens
- M** Medium threats are having some negative impact – they are damaging values but not so badly
- L** Low threats are present but not seriously damaging values
- 0** N/A where the threat is not present in the protected area or where something is happening but is not threatening the values at all

Threat type	Score (H,M,L,0)	Notes
1.1 Housing and settlement	0	No-one lives within the national park.
1.1a Population increase in the protected area community	0	
1.2 Commercial and industrial areas	0	
1.3 Tourism and recreation infrastructure	0	There are only two guesthouses (outside the NP) and there are no negative impacts from these. Maybe in the future tourism may affect the park.
2.1 Customary land owner and community gardens and small crops	0	There are no gardens within the park – it is high, cold and not amenable to settlement or gardening.
2.1a Drug cultivation	0	
2.1b Commercial plantations	0	
2.2 Wood and pulp plantations	0	
2.3 Livestock farming and grazing	0	
2.4 Marine and freshwater aquaculture	0	There has been an increase in the fish population in the lake and this may affect the lake and its native fish species in the near future.
3.1 Oil and gas drilling	0	
3.2 Mining and quarrying	0	
3.3 Energy generation	0	
4.1 Roads and railroads (include road-killed animals)	0	
4.2 Utility and service lines (e.g. electricity cables, telephone lines)	0	
4.3 Shipping lanes	0	
4.4 Flight paths	0	
5.1 Hunting, killing and collecting terrestrial animals (including killing of animals as a result of human/wildlife conflict)	L	There is a small amount of hunting which is done secretly. If the landowners see people hunting there will be fights within the community.
5.2 Gathering terrestrial plants or plant products (non-timber)	0	For traditional purpose (pandanus) and some collection of the Binga (dwarf fern) used for singsings.
5.3a Logging and wood harvesting for local/customary use	0	
5.3b Logging and wood harvesting – commercial logging	0	
5.4a Fishing, killing and harvesting aquatic resources for local/customary use	0	
5.4b Fishing, killing and harvesting aquatic resources for commercial use	0	
6.1 Recreational activities and tourism	L	No reported impacts although sometimes people die on the track – landowners feel that people who go up there should be fit enough to walk. The major trekking company using the area reports no problems with erosion or littering by tourists.
6.2 War, civil unrest and military exercises	0	
6.3 Research, education and other work-related activities in protected areas	0	
6.4 Activities of protected area managers (e.g. construction or vehicle use)	0	

Threat type	Score (H,M,L,0)	Notes
6.5 Deliberate vandalism, destructive activities or threats to protected area staff and visitors	0	
7.1 Fire and fire suppression (including arson)	M	In 1997 there was a big drought and the fire burnt down the vegetation and it took a long time to recover.
7.2 Dams, hydrological modification and water management/use	0	
7.3a Increased fragmentation within protected area	0	
7.3b Isolation from other natural habitat (e.g. deforestation)	0	
7.3c Other 'edge effects' on park values	0	
7.3d Loss of keystone species (e.g. top predators, pollinators etc.)	0	
8.1 Pest plants	0	No weeds reported – too cold for piper tree.
8.1a Pest animals	0	No pest animals are known to be present.
8.1b Diseases such as fungus or viruses that make native plants or animals sick	0	
8.2 Introduced genetic material (e.g. genetically modified organisms)	0	
9.1 Household sewage and urban waste water	0	
9.1a Sewage and waste water from protected area facilities	0	
9.2 Industrial, mining and military effluents	0	
9.3 Agricultural and forestry effluents (e.g. excess fertilizers or pesticides)	0	
9.4 Garbage and solid waste	0	Some litter around the trekkers' huts (brought in by local people).
9.5 Air-borne pollutants	0	
9.6 Excess energy (e.g. heat pollution, lights etc.)	0	
10.1 Volcanoes	0	
10.2 Earthquakes/Tsunamis	0	
10.3 Avalanches/Landslides	0	
10.4 Erosion and siltation/ deposition (e.g. shoreline or riverbed changes)	0	
11.1 Habitat shifting and alteration	M	Ice affects the vegetation and there is less ice than there used to be. It is expected that there will be changes in the vegetation.
11.2 Droughts	H	There was a severe drought in 2015.
11.3 Temperature extremes	L	
11.4 Storms and flooding	0	
11.5 Coral bleaching	0	
11.6 Intrusion by saltwater into gardens etc.	0	
11.7 Sea level rise	0	
Other (please explain)		
12.1 Loss of cultural links, traditional knowledge and/or management practices	0	A decline in availability of Binga (dwarf fern) will affect the people who collect and use it for traditional events such as singsings.
12.2 Natural deterioration of important cultural site values	0	
12.3 Destruction of cultural heritage buildings, gardens, sites etc.	0	
Other (please explain)		

**Table 5. Worst threats and ways forward**

Threat No.	Threat (Most significant first)	Threat number or name (copy no. from Table 4)	Nature of the threat, impact and how to reduce the impact.
1	Drought	11.2	Severe drought in the highlands (2015) caused hardship for customary landowners. Not known how this affected the national park.
2	Fire	7.1	In previous droughts, fire has burnt areas adjacent to the natural tree-line and has affected the vegetation.
3	Climate change (habitat shifting)	11.1	There is less ice than there used to be in the high montane area and this will impact on the vegetation.

## Part 4: What is the management like in the protected area?

**Table 6. Management effectiveness scores, comments, next steps**

Issue	Score (0,1,2,3, NA)	Comment	Next steps
1a. Legal status	3	The area is legally gazetted as a national park, but it is not fully recognised as such by the landholders.	Engage in consultation with the customary landowners to negotiate the future level of protection to be provided to the area under PNG's new protected area legislation.
1b. Legal status			
2a. Protected area regulations	3	Regulations are good enough.	
2b. Protected area regulations			
3. Law enforcement	3	People respect the area as a national park. People do not go up and abuse it. We have no legal support but the customary landowners will enforce the law if they see some wrongdoers.	If tourism increases, patrols may be needed to ensure people behave appropriately and are safe. A ranger workforce is required and they will need training and capacity building.
4. Protected area objectives	2	The area is managed for conservation and climbers/ tourism and nothing else.	Develop a Management Plan and identify clear, agreed objectives.
5. Protected area design	2	The area is quite small and is situated at the top of a mountain and currently there are limited outside influences.	Connectivity with other areas could be investigated. According to the 2014 Protected Area policy workshop, several landowners are willing, and have been willing for many years, to make their land available for expansion of the park boundary.

Issue	Score (0,1,2,3, NA)	Comment	Next steps
6. Protected area boundaries	1	The people know the boundary on one side and the other side is not known. There are some pegs in the area which may be old marker pegs. <b>Additional information:</b> The upper boundary of the Park is disputed by the landowners. The boundary has not been fully surveyed on the ground with the more inaccessible areas marked from air photos; essential documents in this boundary work are missing. Several landowners are willing, and have been willing for many years, to make their land available for expansion of the Park boundary (Rappam 2006).	Negotiation with customary landowners is required to confirm the boundary and then this needs to be mapped and marked on the ground.
7. Management plan	0	A draft Plan of Management was prepared by Samuel Antiko, PNG National Parks Service, in 1991. There is no current Management Plan.	The customary landowners would like a Management Plan and want to be involved in its formulation.
7a. Planning process – input of rights holders	0	The customary landowners have no input into management planning.	
7b. Planning process – plan review	0	There has been no review and updating of any plans.	
7c. Planning process – monitoring informs planning	1	Guides and local people gain information about the NP and use this to help manage the area.	
8. Regular work plan	0	There is no work plan. Village people do not go up there except to guide tourists or to look for the dwarf ferns.	
9. Resource inventory	2	There has been plenty of information/research done in the area but the community has no place to store the information	Need to create an office/information /resource centre to store information and make it accessible to people.
10. Protection systems	2	There is a system of trekking permits for tourists, and this is managed by the local communities. There are no other protection systems.	Need to ensure there is a well administered system of permits with money invested into the management of the area.
11. Research and monitoring	0	Research was conducted here but there is currently no research.	
12. Resource management	0	No resource management activities are undertaken, but the customary landowners indicated that no resource management was needed.	CEPA, the agency responsible for the management of the park should review whether more active resource management is required to maintain the park's values.
13a. Staff numbers	0	There are no paid staff - park staff were retrenched in the 1990s.	A park manager should be appointed in Simbu to manage and coordinate the PA and once the Management Plan is developed an expanded ranger work force will be needed, especially to manage the track and liaise with customary landowners and visitors.
13b. Other people working on the protected area	0	No customary landowners work in the park. However, up until the 1990s, local support staff were employed.	

Issue	Score (0,1,2,3, NA)	Comment	Next steps
14. Training and skills	2	Local people already know the area well and are experienced in guiding.	Need more training in management of the park and how to look after the trekkers and climbers – especially in rescue and first aid training.
15. Current budget	0	There has been no budget, but PGK500,000 is committed to construct a resource centre (provided by the Minister for Tourism, the local member for the region).	Ensure a consistent budget into the future.
16. Security of budget	0		
17. Management of budget	NA		Note that if a budget is obtained, people will need to be trained in budget management
18. Equipment	0		
19. Maintenance of equipment	NA		
20. Education and awareness	1		Guidelines about how to manage protected areas are needed. This may include information on entrance fees and guide fees.
21. Planning for land use or marine activities	3	The local communities take the NP into account and provide support in terms of protecting the area.	
22. State and commercial neighbours	0	There is little contact between CEPA, the official managers of the NP, and other stakeholders, including the customary landowners.	
23. Indigenous people/ Customary landowners	3	Customary landowners are the de facto on-ground managers in the absence of CEPA or Provincial staff.	We would like more communication and support from CEPA.
24a. Impact on communities – open communication	1	There is some communication with CEPA and the Provincial Government e.g. in relation to the recent funding to be provided for the resource centre.	
24b. Impact on communities – welfare programs	0		
24c. Impact on communities – support of landowners	1	The customary landowners support the NP as it is their only means to generate funds to support their livelihood.	
25. Economic benefit	3	Benefits mainly come from the tourists, through guiding fees. Landowners are happy about the climbers as tourism creates relationships, and they get some money.	Consultation between government and customary landowners is required to negotiate effective benefit sharing arrangements that will support the livelihoods of the local people.
26. Monitoring and evaluation	1	There is some local monitoring but not systematic monitoring – visual checks by landowners to check everything looks okay	

Issue	Score (0,1,2,3, NA)	Comment	Next steps
27. Visitor facilities	2	The main facilities are the track itself and the huts. The huts are not cared for and are in very poor condition. There is conflict between two landowner groups who own the huts. The Tourism Promotion Authority has constructed toilets at the base camp. Two lodges are located outside the park. Additional information. In 2017 the re-development of the Kegeuglo airstrip will give accessibility to both local and international tourists to visit Mt Wilhelm. A MOU has been signed and should be completed by the end of 2017.	Huts need to be maintained and upgraded, with consistent rates applied. If numbers increase significantly, the track may need to be improved to prevent erosion, but it is adequate now. There are a couple of exposed sections where a rope or wire would be desirable, but when this has been put in in the past, the material has been taken. This also indicates the need for improved surveillance and a ranger presence in the park.
28. Commercial tourism operators	1	People just show up at the park. There is no contact with customary landowners. The lodge outside the park has contributed to furnishing and upkeep of the huts. Tourism operators have trained local guides.	The Minister for tourism has recently provided money to construct a new resource centre building and this will be useful to provide information for visitors.
29. Fees	3	Section landowners collect fees and support the building of the track	
30. Condition of values	3	The landscape is in very good condition, with very few impacts.	
30a. Condition of values – basis of assessment	0	There is no comprehensive monitoring to assess the values.	
30b. Condition of values – threat abatement	0	There is no threat management planning.	
30c. Condition of values – routine management	0	There are no routine management activities.	

## Part 5: Condition and trends of protected area values

**Table 7. Values, condition and trend**

Key value (from Table 2)	Condition Score (VG, G, F, P, DK)	Trend Score (I, S, D, DK)	Information source and justification for Assessment and HOW the condition can be IMPROVED
Landscape	VG	S	Most of the national park is undisturbed, although there is a lot of rubbish around the lake.
Fauna and Flora	G	S	Very little hunting and no gardens in the area. Only minor collection of plants.
National Icon	VG	S	TPA is supporting the park and improving that with the support of the Minister

**Table 8. Recommendations and ways forward**

1.	2.	3.
CEPA should appoint a park manager and develop and implement a management plan to better manage the park.	Find funding for the plan implementation and development of the park.	Appoint rangers and management committees to implement and manage projects.

**Table 9. Strengths and challenges (facilitator/recorder synthesis)**

	Strengths	Challenges
1	<b>Iconic area in very good condition.</b>	Improving government and landowner <b>communication</b> .
2	Established <b>tourism/ trekking route</b> with great potential for local <b>ecotourism</b> industry. Good accommodation close to park.	Improving <b>tourism</b> opportunities in the face of limited <b>infrastructure</b> for climbers/tourists, including roads leading to the area (only rough 4WD access) and the high expense for people to reach the area.
3	At least some community members are very keen on the national park continuing.	Developing and implementing effective <b>training</b> in protected area management and tour guiding (i.e. making sure that the trekkers are safe) with limited available funds.
4	Good opportunity to develop <b>tourism</b> – not many other opportunities in the area so people are very dependent on the national park and there are no immediate threats from other industries.	Improving <b>tourism management</b> and setting consistent fees for use of huts (there is a lack of information and maps for tourists).
5	Good <b>research history</b> and future potential for further research.	Addressing the impacts of <b>climate change</b> , which will affect the montane species.

**References** (cited in Rappam 2006)

Antiko S 1991. Draft Plan of Management, PNG National Parks Service.

Hnatiuk RJ, Smith JMB, McVean NN 1976. Mt Wilhelm Studies: the Climate of Mt Wilhelm.

Hope GS 1970. Vegetation History of Mt Wilhelm, *Journal of Ecology*, 64:677- 863.

Wade LK & McVean DN 1969. Mt Wilhelm Study 1: The Alpine and Sub-Alpine Vegetation, Research School of Pacific Studies, ANU, Canberra.

Smith JMB 1977. Vegetation and Microclimate of the East and West Facing Slopes in Grasslands of Mt Wilhelm, np.

Smith JMB 1990. Environmental Change on Mt. Wilhelm, *Science in New Guinea* 16:13-21.