

Supplementary material

Local and expert knowledge improve conservation assessment of rare and iconic Fijian tree species

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Part 1: Overview of conservation status for each study species before this study.

Acmopyle sahniana Buchholz & N.E. Gray (Podocarpaceae) is a rare conifer to 12 m tall, previously only reported from forested mountain ridges from central Viti Levu (Bush and Doyle 1997, Thomas 2013a). A detailed survey of the species recorded a total of 46 adult and 17 juvenile trees in 2 subpopulations (Bush 1997). A recent (2011) assessment reported another subpopulation near Fiji's highest mountain, Mt. Tomanivi, and estimated the total size of that subpopulation at <100 mature individuals (Thomas 2013a). The species is listed as critically endangered (CR), based on small population size and low area of occupancy (<10 km²) (Thomas 2013a).

Cynometra falcata A.Gray (Leguminosae) is reported as a slender tree to 4 m in height that until recently had only been known from two locations, one on Vanua Levu and another on Viti Levu (Smith 1985, WCMC 1998). These subpopulations are of unknown size and the species is listed as critically endangered (CR) based on the known population size being smaller than 50 mature individuals (WCMC 1998). Four additional subpopulations of unspecified size were reported to occur in tropical dry forest (Keppel and Tuiwawa 2007).

Dacrydium nausoriense de Laub. (Podocarpaceae) is a conifer to 24 m tall and restricted to the Nausori Highlands in western Viti Levu and a subpopulation in northern Vanua Levu. The species is morphologically and genetically distinct from the congeneric *D. nidulum* de Laub. (Smith 1979, Keppel *et al.* 2011, Smith 1979) and occurs in sub-montane forest (300-600 m a.s.l.) with a distinct dry season (Ash 1986, Thomas 2013b). The species is classified as endangered (EN) based on a recent (2011) assessment because it is only known from 2 subpopulations and has a small area of occupancy, with declining numbers and habitat quality. Subpopulation sizes are unknown (Thomas 2013b).

Podocarpus affinis Seem. (Podocarpaceae) is a conifer to 9 m tall and restricted to high ridges and peaks in central Viti Levu, where it has been collected from 6 locations (Smith 1979). The species is widespread but its population size is unknown. Although the species' extent of occurrence is less than 5,000 km², which would qualify it as vulnerable (VU), a recent (2011) assessment (Thomas 2013c) considered the species not currently threatened, but Near Threatened (NT).

References for part 1

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- WCMC (World Conservation Monitoring Centre), 1998. *Cynometra falcata*. IUCN Red List of Threatened Species v. 2013.1. Retrieved August 22 2013, from <http://www.iucnredlist.org>.

Part 2: Participatory field questionnaire used in this study

Species Name:

Population:

Date:

Evaluator & Informants:

Land Tenure:

- 1) Is the population located in a nature reserve or otherwise protected area?
- 2) Is the tree (or parts of it) harvested?
- 3) Are there any signs of previous/ongoing disturbances (e.g., fire, logging, stock grazing)?
- 4) What are potential future disturbances and their likelihood of occurrence?
- 5) What is the distance of the population to the nearest human settlement?
- 6) Approximately how many people access the population per month?
- 7) What invasive plant species (species not native to Fiji with established populations) are found in or close to the population?
- 8) Is there evidence of feral animal species (wild populations of non-native animal species) in or close to the population?
- 9) Does the species show any microhabitat preferences (i.e., affinities for certain habitat types, such as ridges and stream banks)?
- 10) What is the density (number of individuals per unit area) of adult individuals?
- 11) How many seedlings are found in 10 × 10 m plots?
- 12) What other common plant species are found in the location of the population?
- 13) Estimate of total population size:
- 14) Is there any existing knowledge about the species' ecology (e.g., pollination, germination)?

Part 3: Provisional revised IUCN assessments for *Acmopyle sahniana*, *Cynometra falcata*, *Dacrydium nausoriense*, and *Podocarpus affinis* based on data collected in this study.

Acmopyle sahniana

Threat category: CRITICALLY ENDANGERED (CR)

- B.2.a Area of occupancy less than 10 km², constituting of five severely fragmented small (10-100 mature individuals) subpopulations in isolated locations.
- B.2.b.(i) Area of occupancy less than 10 km², and observed decline in area of occurrence through extirpation of a subpopulation.
- B.2.b.(ii) Area of occupancy less than 10 km², and observed decline in area of occupancy through extirpation of a subpopulation.
- B.2.b.(iii) Area of occupancy less than 10 km², and observed decline in extent and quality of habitat (mining, cyclone disturbance). Climate change also poses serious threats to this species (increase in cyclone intensity, lifting of cloud layer)
- B.2.b.(iv) Area of occupancy less than 10 km², and observed decline in number of location through extirpation of a subpopulation.
- B.2.b.(v) Area of occupancy less than 10 km², and observed decline in number of individuals through cyclone and mining-related road.

Geographic Range:

Endemic to Fiji and only found above approximately 400 m elevation in central and north-eastern Viti Levu. A subpopulation reported from the Mt. Koroyanitu (Mt. Evans) Range in the western part of this island has been confirmed extirpated (although an undiscovered subpopulation could potentially exist in the same mountain range).

Habitat:

Restricted to some ridges just below tropical montane cloud forest (IUCN habitat classification: 1.9 Subtropical/Tropical Moist Montane Forest).

Subpopulations:

Five extant, one extirpated, with at least 200 adult individuals in total. About half of the known adults are located in the Wabu Forest Reserve (vicinity of Mt. Tomanivi), with good regeneration. The Mt. Vakarogasui subpopulation shows no regeneration. The size and health of a recently discovered subpopulation in Emalu is yet to be determined.

Subpopulation sizes (mature individuals only) estimates (regeneration in brackets):

Wabu Forest Reserve:	100 (good)
Korobasabasaga Range:	40 (good) (Bush 1997, Tuiwawa 1999)
Emalu:	50* (good)
Nakorotubu:	15 (good)
Mt. Vakarogasui	10 (none) (Bush 1997)

* = detailed survey required to verify subpopulation estimate

Direct Threats:

- 2.1.1 Shifting agriculture
- 2.3.2 Small-holder grazing
- 3.2 Mining (copper and potentially other)
- 4.1 Roads (logging roads)
- 11.1 Climate change – Habitat shifting & alteration (lifting of cloud layer)

- 11.2 Climate change – Droughts (unlikely to be drought tolerant)
- 11.5 Climate change – Other impacts (susceptible to cyclone disturbances)

Stresses:

- 1.2 Ecosystem degradation (traditional tracks between villages, mining access roads)
- 2.1 Species mortality (documented as result of cyclones and mining road construction)

Research Needed:

- 1.3 Life history and ecology (microhabitat requirements for adults and germination; pollination and dispersal ecology)
- 1.5 Threats (impact of pigs and *Clidemia hirta* on regeneration; impact of climate change)

Conservation Actions In-place:

- 1. Is there an action recovery plan?** Currently not a major priority, as there is no evidence for rapid decline.
- 2. Is there a systematic monitoring scheme?** No, and this would be potentially threatening, as the species appears to be highly sensitive to disturbance.
- 3. Have conservation sites been identified?** Yes, and efforts are underway to include two subpopulations (Emalu and Nakorotubu) in a revised national protected area network.
- 4. Does the taxon occur in at least one protected area?** Yes, the largest subpopulation (comprises about 50% of the total population) occurs in the Wabu Forest Reserve, a watershed reserve (IUCN Protected Area Category VI: Protected area with sustainable use of natural resources).
- 5. Is there an area based regional management plan?** No, and currently not required, as the Wabu Forest Reserve is only occasionally visited by hunters.
- 6. Is there invasive species control or prevention?** No, and the threats by invasive species (*Climemia hirta* and pigs) need to be understood first. The fact that many subpopulations appear to be regenerating well in the presence of these species suggests that there is no immediate threat.
- 7. Is there a harvest management plan?** No, the species is not harvested.
- 8. Has the taxon been successfully reintroduced or introduced benignly?** No, this has not been attempted.
- 9. Is the taxon subject to *ex-situ* conservation?** Yes and no, while there is no *ex-situ* conservation plan, individuals have been successfully grown in Tasmania.
- 10. Is the taxon the subject of any recent education or awareness programmes?** Yes, the leaf of the species is in the logo of NatureFiji-MareqetiViti, Fiji's only local conservation non-government organisation. The species also featured on a 20-cent stamp in a series on Fiji's endangered flora.
- 11. Is the taxon included in international legislation?** CITES.
- 12. Is the taxon subject to international management/trade controls?** CITES.

Conservation Actions Needed:

- 1.1 Area Protection: Incorporate the Emalu and Nakorotubu subpopulations in the national protected area network (currently underway).
- 1.2 Habitat Protection: Protect Korobasabasaga subpopulation from possible mining impacts (possibly by creating buffers around subpopulations).
- 2.1 Site management: Enforce Korobasabasaga subpopulation protection during mining-related activities.

Cynometra falcata

Threat category: ENDANGERED (EN)

- B.2.a. Area of occupancy less than 500 km², constituting eight severely fragmented subpopulations in isolated locations.
- B.2.b.(i) Area of occupancy less than 500 km², and observed decline in area of occurrence through extirpation of a subpopulation.
- B.2.b.(ii) Area of occupancy less than 500 km², and observed decline in area of occupancy through extirpation of a subpopulation.
- B.2.b.(iii) Area of occupancy less than 500 km², and projected decline in habitat through agriculture, cattle grazing, and fire.
- B.2.b.(iv) Area of occupancy less than 500 km², and reported decline in number of subpopulations.
- B.2.b.(v) Area of occupancy less than 500 km², and reported decline in number of mature individuals.

Geographic Range:

Endemic to Fiji and found on Viti Levu, Vanua Levu and several smaller islands.

Habitat:

Restricted to rocky slopes in tropical dry forest (IUCN habitat classification: 1.5 Subtropical/Tropical Dry Forest). Fire, agriculture and clearing have almost eliminated this forest from the two major islands and the species (and tropical dry forest) is now restricted to small remnant patches. One subpopulation (Mt. Nubuiloa) occurs on steep, rocky cliffs surrounded by moister forest (IUCN habitat classification: 1.6 Subtropical/Tropical Moist Lowland Forest).

Subpopulations:

Eight extant, one extirpated (near Ba town), totalling at least 2,500 adults. Key subpopulations are on Mt. Nubuiloa (500-1000 adults) and Vatia Peninsula (at least 1,000 adults). The former is threatened by urbanization and expansion of Labasa town, and the latter is in a densely settled farming area near Tavua town. Namena-lala and Yaqaqa islands have subpopulations exceeding 200 adults. Most other subpopulations are restricted to small patches, with regeneration restricted to below parent trees.

Subpopulation sizes (mature individuals only) estimates (regeneration in brackets):

Vatia Peninsula:	1000 (good)
Mt. Nubuiloa:	750 (good)
Namena-lala Island:	250 (good)
Yaqaqa Island:	250 (good)
Naicobocobo Peninsula:	100* (?)
Macuata Island:	75 (good, but under parent trees only)
Emalu:	50 (moderate)
Yadua Tabu Island	25 (good, but under parent trees only)

* = detailed survey required to verify subpopulation estimate

Direct Threats:

- 1.3 Tourism & recreation areas (construction of new resorts, ecotourism trails through subpopulations)
- 2.1.1 Shifting agriculture
- 2.3.2 Small-holder grazing

- 5.3.2 Intentional use: subsistence/small scale (firewood, construction)
- 7.1.1 Increase in fire frequency/intensity (escaped agricultural fires)
- 8.1.2 Named non-native species (goats; *Samanea saman*, *Leucaena leucocephala*)
- 11.4 Storms and flooding (through flooding and tsunamis)

Stresses:

- 1.1 Ecosystem conversion for grazing and development
- 1.2 Ecosystem degradation (wild goats, hunting and ecotourism tracks)
- 1.3 Indirect ecosystem effects (fragmentation with possible impacts on dispersal and regeneration)
- 2.1 Species mortality (documented as result of goat grazing and fire)
- 2.2 Species disturbance (goats on regeneration)
- 2.3.2 Competition with invasive species

Research Needed:

- 1.3 Life history and ecology (microhabitat requirements for adults and germination; pollination and dispersal ecology)
- 1.4 Harvest, use and livelihoods (extent of utilization for firewood and construction)
- 1.5 Threats (impact of goats, *Samanea saman*, *Leucaena leucocephala*; impact of fire)
- 2.2 Conservation Planning: area-based management plan (for the large subpopulations at Vatia and Mt. Nunuiloa, which are subject to strong and diverse anthropogenic impacts)
- 3.1 Monitoring: subpopulation trends
- 3.4 Monitoring: habitat trends

Conservation Actions In-place:

- 1. Is there an action recovery plan?** No. There is no evidence for rapid decline.
- 2. Is there a systematic monitoring scheme?** No.
- 3. Have conservation sites been identified?** Yes, Mt. Nubuiloa (several plants are endemic to this mountain) and Vatia (largest remnant of Fijian tropical dry forest) should be national conservation priorities. The subpopulations on Namena-lala and Yaqaqqa are also important, as they continue little disturbed remnants of dry forest. The Namena-lala subpopulation is on a 43 ha island, which is under lease for a small, low impact eco-resort since 1983, which uses less than 10 ha of the island.
- 4. Does the taxon occur in at least one protected area?** Yes, but only the smallest (comprises < 1% of the known total subpopulation) on Yadua Taba. The island is a sanctuary (IUCN Protected Area Category Ia: Strict nature reserve) for the critically endangered Fiji crested iguana (*Brachylophus vitiensis*).
- 5. Is there an area based regional management plan?** Yes, for Yadua Taba only.
- 6. Is there invasive species control or prevention?** Yes, but only on Yadua Taba.
- 7. Is there a harvest management plan?** No.
- 8. Has the taxon been successfully reintroduced or introduced benignly?** No, this has not been attempted.
- 9. Is the taxon subject to *ex-situ* conservation?** No.
- 10. Is the taxon the subject of any recent education or awareness programmes?** No, except as part of a research initiative for the conservation of Fijian dry forest by Thomas W. Gillespie (University of California, L.A.) (<http://www.geog.ucla.edu/tdfpacific/fiji.html>).
- 11. Is the taxon included in international legislation?** CITES.
- 12. Is the taxon subject to international management/trade controls?** CITES.

Conservation Actions Needed:

- 1.1 Area protection: Need to incorporate subpopulations in the national protected area network.
- 1.2 Habitat protection: Protect subpopulations from clearing and livestock impacts.
- 2.1 Site management: Protection from fires.
- 2.2 Invasive control: Control of goat, *Samanea saman* and *Leucaena leucocephala*.
- 2.3 Habitat restoration: Important at Vatia with high density of invasive threats.
- 3.4 Ex-situ conservation: Could be achieved through cultivation in nurseries, as the species has potential to be used as an ornamental, and as wind break or shade tree.
- 4.1 Formal education: Include importance of Fiji's tropical dry forest in school and university curricula.
- 4.2 Training: Enhance stakeholder knowledge about tropical dry forest in Fiji.
- 4.3 Awareness: Increase awareness about tropical dry forest in Fiji.
- 5.1/2/4 Legislation, policy & enforcement: Protection of dry forest remnants is required or a policy to support communities protecting such remnants. The latter would ease enforcement, as it becomes the responsibility of landowning communities.
- 6.1 Linked enterprises & livelihood: Alternative income generating activities (such as ecotourism or certified sustainable agriculture) are required as incentives for forest protection.
- 6.4 Conservation payments: direct or indirect payments to ensure the protection of subpopulations and remaining dry forest patches should be considered.

Dacrydium nausoriense

Threat category: ENDANGERED (EN)

- B.2.a. Area of occupancy less than 500 km², and known to exist only in two locations.
- B.2.b.(iii) Area of occupancy less than 500 km², and projected decline in habitat through timber and crop plantations.
- B.2.b.(iv) Area of occupancy less than 500 km², and reported decline in number of locations.
- B.2.b.(v) Area of occupancy less than 500 km², and reported decline in number of mature individuals through timber harvesting.

Geographic Range:

Endemic to Fiji and there only found in 2 locations; the Nausori Highlands in western Viti Levu and Sarava in Northern Vanua Levu.

Habitat:

Both subpopulations are in mesic forest (intermediate between moist tropical rain forest and tropical dry forest) above 300 m elevation (IUCN habitat classification: 1.6 Subtropical/Tropical Moist Lowland Forest).

Subpopulations:

The Nausori Highlands support the major subpopulation, which is composed of nine extant (one extirpated) stands, with a total estimate of about 3200 adults. These stands are remnants of native vegetation in a landscape that is highly disturbed as a result of logging, exotic timber plantations and agriculture. Regeneration is poor to moderately good, depending on the stand. A stand near Nausori Village has reportedly disappeared due to overharvesting of the species for firewood. The Sarava subpopulation is much smaller and estimated at 200 individuals.

Subpopulation sizes (mature individuals only) estimates (regeneration in brackets):

Nausori Highlands:	3200 (poor to good)
Labo	700
Veitagitagi	500
Nakakasi	500
Ravulevu	500
Nadua	200
Bolabola	200
Qwalibalavu	200
Nalau	200
Road to Nanoko	200

Sarava: 200* (good)

* = detailed survey required to verify subpopulation estimate

Direct Threats:

- 1.1 Housing (expansion of village due to increasing human population)
 - 2.1.1 Shifting agriculture
 - 2.1.3 Agro-industry farming (government initiative to farm potatoes)
 - 2.2.2 Small-holder plantations (some subpopulations in or bordering mahogany plantations)
 - 2.3.2 Small-holder grazing
- 4.1 Roads (logging roads)
 - 5.2.1 Intentional use (firewood, Christmas trees)
 - 5.3.2 Intentional use (logging)

- 7.1.1 Increase in fire frequency/intensity (escaped agricultural fires)
- 8.1.2 Named invasives (mahogany – *Swietenia macrophylla*, *Piper aduncum*)
- 11.2 Droughts

Stresses:

- 1.1 Ecosystem conversion for grazing, development, and timber plantations
- 1.2 Ecosystem degradation (wild goats, invasive plants, agroforestry)
- 1.3 Indirect ecosystem effects (impacts on dispersal and regeneration by invasives)
- 2.1 Species mortality (documented as result of harvesting for firewood and Christmas trees)
- 2.2 Species disturbance (invasives on regeneration)
- 2.3.2 Competition with invasive species

Research Needed:

- 1.2 Population size (better estimate for Sarava subpopulation)
- 1.3 Life history and ecology (microhabitat requirements for adults and germination; pollination and dispersal ecology)
- 1.4 Harvest, use and livelihoods (extent of utilization for firewood and Christmas trees – extirpation of a subpopulation near Nausori Village demonstrates potential impact)
- 1.5 Threats (current and potential impact of pigs, cows, mahogany, *Spathodea campanulata*, *Clidemia hirta*, *Psidium guajava*, *Cordia alliodora*, *Maesopsis eminii* and *Piper aduncum*).
- 2.2 Conservation Planning: area-based management plan (for Nausori Highlands)
- 2.3 Conservation Planning: harvest and trade management plan (control harvest of species for firewood and provide alternative for Christmas tree trade)
- 3.1 Monitoring: subpopulation trends
- 3.4 Monitoring: habitat trends

Conservation Actions In-place:

1. **Is there an action recovery plan?** No. There is no evidence for rapid decline.
2. **Is there a systematic monitoring scheme?** No.
3. **Have conservation sites been identified?** Yes, Nausori Highlands (several plants are endemic to this mountain) should be national conservation priority.
4. **Does the taxon occur in at least one protected area?** No.
5. **Is there an area based regional management plan?** No.
6. **Is there invasive species control or prevention?** No.
7. **Is there a harvest management plan?** No.
8. **Has the taxon been successfully reintroduced or introduced benignly?** No, this has not been attempted.
9. **Is the taxon subject to *ex-situ* conservation?** No.
10. **Is the taxon the subject of any recent education or awareness programmes?** No.
11. **Is the taxon included in international legislation?** CITES.
12. **Is the taxon subject to international management/trade controls?** CITES.

Conservation Actions Needed:

- 1.1 Area protection: Protect native vegetation remnants in Nausori Highlands.
- 1.2 Habitat protection: Protect subpopulations from plantation establishment, agriculture, logging.
- 2.1 Site management: Manage subpopulations in disturbed habitats of Nausori Highlands.
- 2.2 Invasive control: Likely to be required, but impact of invasives has to be established first.
- 2.3 Habitat restoration: Restore disturbed subpopulations.

- 3.1.1 Harvest management
- 3.4 *Ex-situ* conservation: Could be achieved through establishment of a nursery for sale as Christmas trees and ornamentals.
- 4.2 Training: (low impact firewood collection, nursery establishment for Christmas trees)
- 4.3 Awareness: Increase awareness about the species in villages accessing the subpopulations.
- 6.1 Linked enterprises & livelihood: Alternative income generating activities as incentives.
- 6.4 Conservation payments: Direct/indirect payments for protection of subpopulations should be considered.

Podocarpus affinis

Threat category: VULNERABLE (VU)

- B.1.a. Extent of occurrence is less than 20,000 km² (restricted to high altitude ridges on Viti Levu, known to exist in 9 locations).
- B.1.b.(iii) Extent of occurrence is less than 20,000 km², and continuing decline of habitat extent and quality due to mining and, possibly, climate change.
- B.1.b.(v) Extent of occurrence is less than 20,000 km², and continuing decline in the number of mature individuals through mining and logging.

Geographic Range:

Endemic to Fiji and there mostly found above approximately 500 m elevation in central Viti Levu.

Habitat:

Restricted to dryer (leeward) ridges just below tropical montane cloud forest (IUCN habitat classification: 1.9 Subtropical/Tropical Moist Montane Forest).

Subpopulations:

Nine documented subpopulations, numbering a total of at least 4,700 adults, and possibly others on remote and difficult to accessible ridges. Some subpopulations show good regeneration. The biggest known subpopulation is that on Mt. Voma with more than 1,000 adults.

Subpopulation sizes (mature individuals only) estimates (regeneration in brackets):

Mt. Voma:	1000 (good)
Mt. Delaitoga:	700 (good)
Emalu:	700 (good)
Korobasabasaga Range:	500 (good) (Tuiwawa 1999)
Tomanivi Area:	500* (poor/good)
Mt. Naitaradamu:	500* (good)
Mt. Tuvutau:	500* (?)
Nakauvadra:	200* (good)
Koronayalewa:	100* (?)

* = detailed survey required to verify subpopulation estimate

Direct Threats:

- 2.1.1 Shifting agriculture
- 2.3.2 Small-holder grazing
- 3.2 Mining (copper and potentially other)
- 4.1 Roads (logging roads)
- 5.2.1 Intentional use (timber, firewood, taro planting stick)
- 11.1 Climate change – Habitat shifting & alteration (lifting of cloud layer)
- 11.2 Climate change – Droughts (unlikely to be drought tolerant)
- 11.5 Climate change – Other impacts (susceptible to cyclone disturbances)

Stresses:

- 1.2 Ecosystem degradation (traditional tracks between villages, mining access roads)
- 2.1 Species mortality (harvesting)

Research Needed:

- 1.3 Life history and ecology (microhabitat requirements for adults and germination; pollination and dispersal ecology)
- 1.5 Threats (impact of pigs and *Clidemia hirta* on regeneration; impact of climate change)
- 3.1 Monitoring: subpopulation trends
- 3.4 Monitoring: habitat trends

Conservation Actions In-place:

- 1. Is there an action recovery plan?** Currently not a major priority, as there is no evidence for rapid decline.
- 2. Is there a systematic monitoring scheme?** No.
- 3. Have conservation sites been identified?** Yes, and efforts are underway to include the Emalu subpopulation in a revised national protected area network.
- 4. Does the taxon occur in at least one protected area?** Yes, the part of the Tomaniivi subpopulation occurs in the Wabu Forest Reserve and part of the Mt. Naitaradamu and Korobasabasaga subpopulations in the Sovi Basin Protected Area (both IUCN Protected Area Category VI: Protected area with sustainable use of natural resources).
- 5. Is there an area based regional management plan?** No for the Wabu Reserve but management plan exists for the Sovi Reserve.
- 6. Is there invasive species control or prevention?** No, and the threats by invasive species (*Climemia hirta* and pigs) need to be understood first. The fact that many subpopulations appear to be regenerating well in the presence of these species suggests that there is no immediate threat.
- 7. Is there a harvest management plan?** No.
- 8. Has the taxon been successfully reintroduced or introduced benignly?** No, this has not been attempted.
- 9. Is the taxon subject to *ex-situ* conservation?** No.
- 10. Is the taxon the subject of any recent education or awareness programmes?** No.
- 11. Is the taxon included in international legislation?** CITES.
- 12. Is the taxon subject to international management/trade controls?** CITES.

Conservation Actions Needed:

- 1.1 Area Protection: Incorporate the Emalu in the national protected area network (currently underway).
- 1.2 Habitat Protection: Protect Korobasabasaga subpopulation from possible mining impacts (possibly by creating buffers around subpopulations).
- 2.1 Site management: Enforce Korobasabasaga subpopulation protection during mining-related activities.

References for part 3:

- Bush, E.W., 1997. Ecology and conservation biology of *Acmopyle sahniana* (Podocarpaceae). MSc thesis, University of the South Pacific, Suva, Fiji.
- Tuiwawa, M.V., 1999. *The flora, ecology and conservation of the botanical biodiversity of Waisoi and the southeastern slopes of the Korobasabasaga Range in Namosi Province, Fiji*. MSc thesis. University of the South Pacific, Suva, Fiji.

Part 4: Approximate direct costing (in US dollars; using 2 Fiji dollars ≈ 1 US dollar) and time (in days) required for IUCN assessments for *Acropyle sahniana*, *Cynometra falcata*, *Dacrydium nausoriense*, and *Podocarpus affinis*. * = cost split with other subpopulations of surveyed during same trip.

Summary

Species	Cost	Time
<i>Acropyle sahniana</i>	0	1
<i>Cynometra falcata</i>	1,170	7
<i>Dacrydium nausoriense</i>	1,060	4.5
<i>Podocarpus affinis</i>	370	3

Acropyle sahniana

Wabu Subpopulation (30 minutes post-fieldtrip assessment):

No cost – surveyed by AN (Alifereti Naikatini) as part of a rapid biodiversity assessment in 2003.

Korobasabasaga Subpopulation (30 minutes interview with Marika Tuiwawa):

No cost – based on published surveys (Bush 1997, Tuiwawa 1999) and an interview with local expert Marika Tuiwawa during a field visit by GK (Gunnar Keppel) in 2006 for another project.

Emalu Subpopulation (30 minutes post-fieldtrip assessment):

No cost – surveyed by Fiji Department of Forestry staff as part of a rapid biodiversity assessment in 2013. However, detailed surveys to validate the number of mature individuals are urgently needed, because the estimate is not based on counts.

Nakorotubu Subpopulation (30 minutes post-fieldtrip assessment):

No cost – surveyed by AN as part of a rapid biodiversity assessment in December 2009.

Mt. Vakarogasui Subpopulation (30 minutes interview with Marika Tuiwawa):

No cost – based on published surveys (Bush 1997, Tuiwawa 1999) and an interview with local expert Marika Tuiwawa during a field visit by GK for another project.

Total direct cost = none.

Total time = 6 hours (2.5 hours for data collection + 3.5 hours for overall assessment)

Cynometra falcata

Vatia Subpopulation (2 days – 1 travel to site, 1 survey):

Transport (4-wheel drive, 2 days)*:	\$	150
Accommodation (1 night):	\$	50
Per diems (3 field assistants):	\$	60
Food (5 meals)	\$	100
Traditional gifts & access fees	\$	<u>10</u>
SUBTOTAL	\$	370

Mt Nubuiloa Subpopulation (2 days – 1 travel to site, 1 survey):

Transport (4-wheel drive, 1 day):	\$	100
Flight (Suva-Labasa-Suva)*:	\$	70
Accommodation (2 nights)*:	\$	80
Per diems (2 field assistants):	\$	40
Food (5 meals)	\$	100
Traditional gifts & access fees	\$	<u>10</u>
SUBTOTAL	\$	400

Namena-lala Subpopulation (30 minutes post-fieldtrip assessment):

No cost – surveyed by IR (Isaac Rounds) as part of other fieldwork.

Yaqqa Subpopulation (30 minutes post-fieldtrip assessment):

No cost – surveyed by AN as part of other fieldwork in 2012.

Naicobocobo Subpopulation (60 minutes for revisiting of detailed field notes and completion of questionnaire):

No cost – surveyed by GK as part of other fieldwork in 2004.

Macuata Subpopulation (2 days – 1 travel to site, 1 survey):

Transport (4-wheel drive, boat)*:	\$	180
Accommodation (1 night):	\$	50
Per diems (3 field assistants):	\$	60
Food (5 meals)	\$	100
Traditional gifts & access fees	\$	<u>10</u>
SUBTOTAL	\$	400

Emalu Subpopulation (30 minutes post-fieldtrip assessment):

No cost – surveyed by IR and AN as part of a rapid biodiversity assessment in 2013.

Yadua Taba Subpopulation (60 minutes for revisiting of detailed field notes and completion of questionnaire):

No cost – surveyed by GK as part of other fieldwork in 2004.

Total direct cost = \$ 1,170.

Total time = 7 days (6 days of fieldwork + 1 day for retrospective and overall assessments)

Dacrydium nausoriense

Nausori Highlands Subpopulation (3 days – 1 travel to site, 2 survey in 2 locations):

Transport (4-wheel drive):	\$	300
Accommodation (2 nights):	\$	100
Per diems (3 field assistants):	\$	120
Food (7 meals)	\$	120
Traditional gifts & access fees	\$	<u>20</u>
SUBTOTAL	\$	660

Sarava Subpopulation (1 day):

Transport (4-wheel drive):	\$	100
Flight (Suva-Labasa-Suva)*:	\$	70
Accommodation (2 nights)*:	\$	80
Per diems (2 field assistants):	\$	40
Food (5 meals)	\$	100
Traditional gifts & access fees	\$	<u>10</u>
SUBTOTAL	\$	400

Total direct cost = \$ 1,060.

Total time = 4.5 days (4 days of fieldwork + 0.5 day for overall assessment)

Podocarpus affinis

Mt. Voma Subpopulation (60 minutes for revisiting of detailed field notes and completion of questionnaire):

No cost – surveyed by GK as part of a different research project in 2003.

Mt. Delaitoga Subpopulation (30 minutes post-fieldtrip assessment):

No cost – surveyed by AN and IR as part of a different research project in 2013.

Emalu Subpopulation (30 minutes post-fieldtrip assessment):

No cost – surveyed by IR and AN as part of a rapid biodiversity assessment in 2013.

Korobasabasaga Subpopulation (30 minutes interview with Marika Tuiwawa):

No cost – based on published surveys (Bush 1997, Tuiwawa 1999) and an interview with local expert Marika Tuiwawa during a field visit by GK for another project.

Mt. Tomanivi Subpopulation (2 days – 1 travel to site, 1 survey):

Transport (4-wheel drive, 2 days)*:	\$	150
Accommodation (1 night):	\$	50
Per diems (3 field assistants):	\$	60
Food (5 meals)	\$	100
Traditional gifts & access fees	\$	<u>10</u>
SUBTOTAL	\$	370

Mt. Naitaradamu Subpopulation (60 minutes for revisiting of detailed field notes and completion of questionnaire):

No cost – surveyed by GK as part of the Sovi Basin rapid biodiversity assessment in 2004.

Mt. Tuvutau Subpopulation (30 minutes post-fieldtrip assessment):

No cost – estimate based on information by local residents. This subpopulation requires surveys to validate this vague estimate.

Nakauvadra Subpopulation (30 minutes post-fieldtrip assessment):

No cost – surveyed by AN as part of a rapid biodiversity assessment in November 2008.

Koronayalewa Subpopulation (30 minutes post-fieldtrip assessment):

No cost – estimate based on information by local residents. This subpopulation requires surveys to validate this vague estimate.

Total direct cost = \$ 370.

Total time = 7 days (6 days of fieldwork + 1 day for retrospective and overall assessments)

References for part 4

Bush, E.W., 1997. Ecology and conservation biology of *Acropyle sahniana* (Podocarpaceae). MSc thesis, University of the South Pacific, Suva, Fiji.

Tuiwawa, M.V., 1999. *The flora, ecology and conservation of the botanical biodiversity of Waisoi and the southeastern slopes of the Korobasabasaga Range in Namosi Province, Fiji*. MSc thesis. University of the South Pacific, Suva, Fiji.

Part 5: List of seed plant taxa with restricted ranges that are endemic (or almost so) to Mt. Nubuiloa or the Nausori Highlands.

Seed plant taxa primarily or entirely known from Mt. Nubuiloa:

Acacia mathuataensis A.C.Sm. (Leguminosae; Mt. Nubuiloa only)

Ixora decora A.C.Sm. (Rubiaceae)

Litsea mathuataensis A.C.Sm. (Lauraceae; Mt. Nubuiloa only)

Melochia grayana A.C.Sm. (Sterculiaceae)

Peperomia orbiculima var. *mathuatensis* Yuncker (Piperaceae)

Polyalthia amoena A.C.Sm. (Annonaceae)

Terminalia luteola A.C.Sm. (Combretaceae; Mt. Nubuiloa only)

Terminalia simulans A.C.Sm. (Combretaceae; Mt. Nubuiloa only)

Seed plant taxa primarily or entirely known from the Nausori Highlands:

Dacrydium nausoriense de Laub.

Psychotira valleculata A.C.Sm.

Seed plant taxa restricted to mesic forests on Viti Levu and found in the Nausori Highlands:

Astronidium degeneri A.C.Sm. (Melastomataceae)

Cryptocarya parinarioides A.C.Sm. (Lauraceae)

Melochia mollipila A.C.Sm. (Sterculiaceae)

Pterocymbium oceanicum A.C.Sm. (Sterculiaceae)

Syzygium concinnum (A.C.Sm.) Craven & Biffin (Myrtaceae)

Source:

Smith, A.C., 1979-1996. Flora Vitiensis nova: a new flora of Fiji (spermatophytes only), 5 volumes and comprehensive indices, Pacific Tropical Botanical Garden, Lawai, Kauai, Hawai'i.