Problem Chosen	2024 MCM/ICM Summary Sheet	Team Control Number
F		2422656

Using Data and Silviculture to Save Rosewood

Abstract

Due to rosewood's high market value and its rarity, illegal harvesting of these trees has driven them close to extinction. Protections put in place by individual nations as well as the United Nations have had little effect at stemming the one billion dollar illegal marketing of rosewood. We propose a two-pronged approach to addressing the illegal trafficking of rosewood, using Madagascar as a test case. Our first approach is to support the sustainable cultivation of rosewood. This first requires workers (preferably from the local communities) to collect seedlings from mother trees. Seedlings will then be germinated and planted in cleared areas that must be tended for at least five years. Rosewood trees require at least 40 years before they can be cultivated. Our model suggests that even 50 acres of cultivation would yield a present value net of the first five years of costs (excluding the collecting of seeds) of just under $12M. Given that poachers receive an estimated $20 per log harvested, there should be sufficient funds to deter poachers from engaging in their illegal activity.

Even so, a necessary second arm of our proposal involves developing a model for improved poacher detection in existing stands of rosewood. Protecting old-growth trees is critical as they are the source of the seeds, and also have substantial benefits in terms of their role in protecting the soil, biodiversity, and habitat. Furthermore, they are an important contributor to carbon sinks.

Our poacher-detection model makes use of elevation maps to determine where the highest-value trees are located and identify the most profitable harvesting routes through the existing stand of trees. Once these routes have been identified, deterrence techniques can be implemented to prevent poaching and provide protection to workers who are cultivating rosewood seedlings.

Taken together, our two-pronged approach suggests that over a 5-year period, so long as the cost of seed collection and deterrence are less than $11.5M, the net present value of our proposal will be greater than zero.

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1 Introduction

The annual economic value in 2019 of illegal logging, fishing, and wildlife trade, is estimated to be in excess of $1 trillion (US)[1]. Within these categories, rosewood, a multi-genera species of hardwood that is valued for its deep red hue and its tonal qualities, is the single most widely trafficked renewable resource, making up as much as 35% of the value of all illegal wildlife trade[2]. Because of rosewood's value, however, it has been over-harvested around the world, and in many areas, has been driven close to extinction. As early as 1967, in an effort to protect rosewood, Brazil banned the export of timber, and in 1991, the United Nations Convention on International Trade in Endangered Species (CITES) listed Brazilian rosewood as an endangered species. By 2017, CITES listed 300 different species of rosewood to be placed under protection, limiting the trade of this endangered wood[3].

A 2019 World Bank report summarized the key risks to *capital* from the illegal exploitation of natural resources[1]. These include lost tax revenues that could be used to support local, regional, and national programs, wages from lost jobs, costs associated with soil erosion, and lost biodiversity and habitat. An important cost that is not captured in this table includes the cost to society of losing an important carbon sink. Rosewood trees can live for hundreds of years. It is also an important source of shade and cooling where it grows. This will be increasingly valuable in a warming world.

The driving force behind the illegal harvesting and trafficking of rosewood is poverty (and greed). For any program whose aim is the conservation of rosewood, success will require that the program address all the relevant stakeholders. To promote the protection of rosewood, we propose to take a two-pronged approach. The first is to engage local communities to collect rosewood seeds and work towards developing rosewood habitats that can be harvested sustainably while also being ecologically sensitive to the local wildlife. This effort will support the local economy and the government. A long-run, sustainable resource that is managed properly can bring in a steady stream of income, whereas over-harvesting the resource will lead to its extinction - an outcome that is not only possible but probable in the near future given the current rates of illegal harvesting. This may help reduce the corruption that drives the trafficking of rosewood.

The second is to develop a model that can more effectively predict where poachers may attack the rosewood stands. This will allow for better surveillance and protection - not only of the rosewood timber but also for the local community members who will benefit from protecting and maintaining the rosewood resource. Given the high demand for rosewood and the extraordinary value that it demands in the marketplace, excluding seed cost and assuming that maintenance costs of the seedlings are approximately zero after year 5, the rate return on our sample investment is 14 percent.

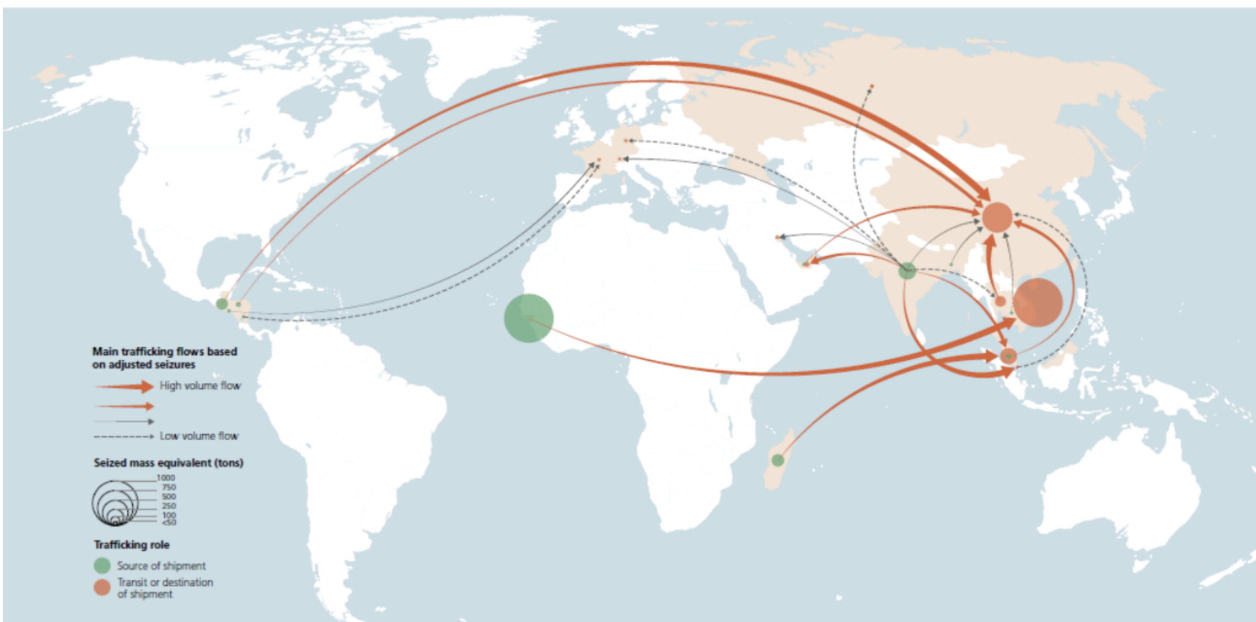
Financial Capital	Natural Capital (Ecosystem Services)	Social Capital	Political Capital
» Government Revenue	» Forests (Flood retention, water, pollination, soil erosion, carbon, wildlife reduction)	» Jobs and livelihoods	» Governance (Corruption, land rights)
» Evasion (Tax, Non-tax, fees)	» Fishing (Bycatch reduction)	» Crime and conflict	» Reputation
» Economy (Size, productivity, profitability)	» Wildlife (Biodiversity)	» Health (Morbidity, mortality)	» Social Investments
» Investments			
» Macro/fiscal (Trade balance/ payments)			

Figure 1: At Risk Capital Due to Illegal Trade in Natural Resources
Source: World Bank (2019), Illegal Logging, Fishing, and Wildlife Trade: The Costs and How to Combat It.

2 Background

Rosewood is a highly valued hardwood that is prized in the construction of traditional Chinese furniture, where it is known as 'hóngmù' (literally translated as red wood*). The wood used for traditional Chinese furniture generally belong to the genera Pterocarpus and Dalbergia. The term 'rosewood' does not refer to a specific genus of tree, instead being used to describe any number of sturdy hardwoods with a specific range of coloring[4]. True rosewood comes from the genus Dalbergia, species of which are native to southern Asia but, which also encompasses other woods that are valuable in their own right, such as kingwood and tulipwood, both of which are found in Brazil. The absence of an unambiguous definition of what qualifies as rosewood has made trade in the timber much harder to track.

Map 1 Trafficking flow map - Rosewood (2015-2018)*



Source: UNODC World WISE Database *The year 2018 is based on partial data.
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

Rosewood is found all over the world. The vast majority of illegally harvested rosewood is imported into China. (See Map 1 and Figure 2.) Over time, rosewood stocks have been depleted by overexploitation. It should be noted that as species have become commercially extinct, both the source location and type of rosewood being used have changed over time. As shown in Figure 1, Africa is now the largest source of rosewood, whereas the percentage contribution from Asian Pacific countries has declined significantly. CITES has listed all 300 species of rosewood in the appendices to their Convention, which aims to provide protection to wildlife that has been overexploited. Rosewood species are slow growing, taking 40 years to

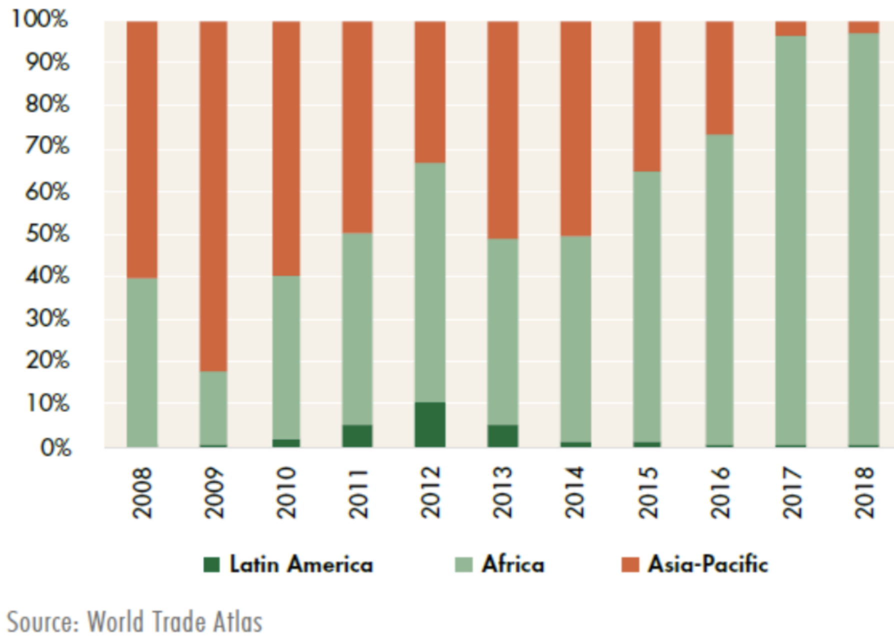


Figure 2: Share of the Volume of Rosewood Log Imports to China from Different Regions (2008-2018) (From the World Wildlife Report (2020))

grow to a commercially viable size to harvest[5]. In comparison, pine trees only require 8-10 years before they are commercially viable. Because the heartwood of the rosewood is the most valuable part of the tree, older trees are of greater value. Rosewood trees can be cultivated by collecting seeds from mother trees. According to one company, seedling germination takes approximately 20 days, and within 3 years seedlings can grow to 10 feet in height. They assume a germination rate of approximately 50 percent[5].

3 Approach

There are two main things that can be done to revitalize and protect the population of rosewood, regardless of location: one can replant trees and attempt to replenish the increasingly depleted stock, or one can attempt to prevent poachers from illegally harvesting the trees to begin with. Due to the unique circumstances of rosewood, we believe that what makes the most sense is a two-pronged approach, using both methods; **planting new trees**, while simultaneously attempting to **improve the detection of poachers**. The first involves actively cultivating rosewood as a sustainable renewable resource. This will provide local communities with jobs and give them an important stake in the development and protection of the resource. Efforts have been undertaken by researchers at Oxford University and they have been shown to be promising: involving the local communities in seed collection in silviculture may serve to help revive the forests of rosewood to their former glory. Furthermore, cultivated rosewood "plantations" are being marketed to investors, further supporting the idea that such cultivation can be commercially successful[6].

If such efforts can be widely adopted to other areas with deplenished rosewood populations, it may help to prevent the species from disappearing entirely; for species that have already been cut down to commercial extinction, it has the potential to bring them back from the brink of extinction. This alone, however, will not solve the problem; it simply means that more trees will be planted, and eventually, exploited once again.

The second approach addresses the illegal poaching of rosewood. According to N. Leader-Williams and E. J. Miler-Gulland, enhanced detection of poaching or smuggling is believed to be a more effective preventative measure than increasing the punishment associated with illegally trading rosewood. Yet, most discussions focus on punishment and addressing the corruption and the violence associated with poaching. Instead, we propose to develop a model of improved detection to curb illegal harvesting to begin with. In particular, we propose a model that predicts the optimal route to tree stands based on their height (which we assume is correlated with age and density) that poachers may use to illegally harvest trees. Once optimal routes are identified, detection devices, as well as other deterrents may be adopted to discourage poachers. If measures can be put into place to detect, catch, and prevent poachers from accessing the timber in the first place, that may serve to retard the rate at which rosewood trees are disappearing, and allow them to potentially regrow. Another benefit of this approach is that if "poacher routes" can be identified, protections may also be put in place to protect workers who are collecting seed pods and maintaining cultivated areas for sustainable harvesting. As well, instead of requiring more manpower or technology scattered randomly throughout forests, the model will allow technology to be used to detect the presence of poachers more effectively.

4 Model - Planting new trees

4.1 Value of Rosewood Cultivation

To estimate the value of rosewood cultivation, we based our model on data from a rosewood cultivation company that proposed a plantation in the US Virgin Islands [7] as well as cost estimates for different silviculture activities from the province of British Columbia[8].

4.2 Assumptions

For illustrative purposes, we make the following assumptions:

- 50 acres to be cultivated
- 170 seedlings to be planted per acre
- Assume 76% of seedlings (130 seedlings per acre) survive the first 5 years after planting and survive until harvest
- Harvest rotation is 40 years
- Discount rate is 4%
- Upfront preparation of soil cost for planting per acre $400
- Upfront planting costs per acre $400
- Annual per acre cost of maintenance for saplings per year for the first 5 years $1000
- Value of harvested tree in year 40: $8896 (estimated standing timber wood value)

For the above values, the present value of the 50-acre stand of rosewood trees is just over $12M, whereas the cost of planting and cultivating the 50 acres is under $265,000. (See Table 1.) The rate of return on investment of this policy is 14.4 percent. Given that this investment must be made in the first 5 years, while the returns are not realized for 40 years, this would require marketing the cultivation effort to investors who would put up the costs upfront. This rate of return could be sufficiently attractive to generate the necessary investment.

Table 1: Present value calculations for 50 acres of cultivation and 40-year harvest period

Description	**Value**
Acres cultivated	50
Seedlings per acre	170
Seedlings surviving at 3 years per acre	130
Value of a tree in year 40	89%
Discount rate	0.04
Initial period requiring maintenance(years)	5
Value in year 40 dollars	$57,824,000.00
Present Value	$12,044,105.72
Prep cost per acre	400
Planting cost per acre	400
Upfront cost total	$40,000,000.00
Annual maintenance cost per acre for the first 5 years	1000
Present value of costs	$222,591.12
Total present value of costs (assumes no additional costs after year 5)	$262,591.12
Compound annual rate of return	14.4%

Because the return on investment cannot be realized for forty years, the investment needs to be protected from poachers and natural threats. But at an estimated $20 per log received by poachers, there should be opportunities to provide work to potential poachers that would make it more financially beneficial to protect the rosewood than to illegally harvest it. For example, based on the data on illegal exports from Madagascar in 2009 in the next section, we estimate that it involved some 2100 trees. To compensate poachers for the revenue lost from the poaching of 2100 trees would cost $42,000. And if we added $58,000 to account for the cost of corruption, this would add $100,000 to the estimated upfront cost. Even with that additional cost, the rate of return would still be 13.5%.

The protection of the existing stand of rosewood is also critical as it is the mature mother trees that provide the seeds for cultivation. However, given the present value of the estimated profits after the first five years of investment, we believe that the deterrence costs of our improved detection model will be more than covered and will allow for positive net profits to be realized. Furthermore, if there is sufficient land and seed stock, 50 acres could be cultivated every year, providing a sustainable model of rosewood harvesting, without depleting the resource. And if more than 50 acres are available to be planted, the realized gains will be larger.

5 Model - Improving detection of poachers

This model works by using elevation data to calculate the most profitable areas of the national park for loggers based upon a combination of the areas with the most trees, which places are the easiest to access, and when finding the most optimal path through the national park, the areas that will have the most traffic.

The elevation data of a forest is converted to a graph and Dijkstra's and Kruskal's algorithms were used to identify the hot zones.

5.1 Assumptions

To define our problem in workable terms, we employ the following assumptions:

1. **Elevation Level**: Ground elevation is zero at sea level and that the elevation data directly corresponds to the number and density of Rosewood trees.

2. **Greedy Poachers**: As poachers travel around the forest, they cut down a proportion of Rosewood trees that they encounter.

3. **Location of Rosewood trees**: The distribution of Rosewood trees amongst all other types of trees is uniform.

5.2 Key terms and definition

1. **weight**: a numerical value assigned to each edge λ in E that reflects the distance to earning ratio

2. **degree**: the number of edges λ in E that are incident to a vertex v in V

3. **graph**: Let a graph be an ordered pair $G = (V, E)$ consisting of a non-empty finite set V whose elements are called vertices and a set E whose elements are called edges that connect two vertices in V. An edge, λ, connecting vertices u and v in V is denoted by $\lambda = (u, v)$.

5.3 Dijkstra's Algorithm for Determining Optimal Poaching Paths

The input to an optimal-path problem is a weighted graph $G = (V, E)$, with a weight function $w : E \to \mathbb{R}$ mapping edges to real-valued weights.

For the purposes of our model, we first defined the profit function of a trip between vertex u from vertex v as a simple earn-loss function described as follows:

Let edge $\lambda = (u, v)$ and h be a function such that $h(\lambda)$ denotes the profit at vertices u and v.

$$h(\lambda) = \epsilon_\lambda p - d_\lambda c_\lambda \tag{1}$$

where:

- ϵ_λ denotes the amount of Rosewood to be cut at vertices u and v
- p denotes the market value of Rosewood
- d_λ denotes the distance between the two vertices
- c_λ denotes the cost in transportation between the two vertices

With this, we can calculate the weight, or the distance to earning ratio, between two vertices.

The weight $w(\lambda)$ is defined as:

$$w(\lambda) = \begin{cases} \infty, & \text{if } h(\lambda) = 0, \\ \frac{d_v + d_u}{h(\lambda)}, & \text{otherwise.} \end{cases} \tag{2}$$

We define the weight $w(p)$ of path $= (v_0, v_1, \cdots, v_k)$ as the sum of the weights of its constituent edges:

$$w(p) = \sum_{i=1}^{k} w(v_{i-1}, v_i) \tag{3}$$

With this, the most optimal/profitable path weight $\delta(u, v)$ between u to v can be described by

$$\delta(u, v) = \begin{cases} \min\{w(p) : u \overset{p}{\rightsquigarrow} v\} & \text{if there is a path from } u \text{ to } v, \\ \infty & \text{otherwise.} \end{cases} \tag{4}$$

and by running Dijkstra's algorithm on all vertices, the most profitable paths the poachers will take to poach the trees are found.

5.4 Kruskal's Algorithm for Determining Hot Zones

To model the most profitable route between all vertices, we construct a graph $G = (V, E)$ with the optimal weights $\delta(u, v)$. The goal is to find an acyclic subset $T \subseteq E$ that connects all

Algorithm 1 Dijkstra's Algorithm for Shortest Path

```
procedure DIJKSTRA(G, s)
    dist[v] ← ∞                                  ▷ Initialize the distance to all vertices to infinity
    prev[v] ← undefined                          ▷ Previous node in optimal path initialization
    dist[s] ← 0                                  ▷ Distance from source to source
    Q ← the set of all nodes in G                ▷ All nodes in the graph are unoptimized - thus in Q
    while Q is not empty do                      ▷ The main loop
        u ← vertex in Q with min dist[u]         ▷ Node with the least distance will be selected first
        Q ← Q − {u}                              ▷ Remove u from Q
        for each neighbor v of u do              ▷ where v is still in Q
            alt ← dist[u] + length(u, v)
            if alt < dist[v] then                ▷ A shorter path to v has been found
                dist[v] ← alt
                prev[v] ← u
            end if
        end for
    end while
    return dist[], prev[]
end procedure
```

of the vertices and whose total weight

$$w(T) = \sum_{(u,v)\in T} \delta(u, v)$$

is minimized. Since T is acyclic and connects all of the vertices, it must form a tree, which we call a **spanning tree** as it "spans" the graph G. Then, we call the problem of determining the tree T the **minimum-spanning-tree problem**.

By constructing a minimum-spanning-tree with all the optimal edges between all the vertices found using Dijkstra's Algorithm, the most profitable locations or what we call '**hot zones**' can be identified by looking at the **most congested vertices** with the **highest number of degrees**. By identifying the most attractive areas for the poachers, we can implement deterrence techniques in these areas to increase the chances of catching the poachers.

Algorithm 2 Kruskal's Algorithm for Minimum Spanning Tree

$A \leftarrow \emptyset$ ▷ A will ultimately contain the edges of the MST
Create a forest F where each vertex in the graph is a separate tree
Create a set S containing all the edges in the graph
Sort the set S by increasing weight of edges
while $S \neq \emptyset$ and F has more than one tree **do**
    Remove an edge with minimum weight from S
    if that edge connects two different trees **then**
        Add it to the set A
        Union the two trees into a single tree in F
    end if
end while
return A ▷ A is the set of edges in the Minimum Spanning Tree

5.5 Deterrence

With the knowledge of which areas are most attractive and profitable to poachers, policymakers can introduce deterrence techniques to minimize the profits of the poachers and eventually put them out of business.

We have previously defined the profit function of poachers in equation 1 as:

$$h(\lambda) = \epsilon_\lambda p - d_\lambda c_\lambda$$

Now, with the introduction of deterrence techniques, we can derive a new profit function of poachers as:

$$h'(\lambda) = l_\lambda(\epsilon_\lambda p - d_\lambda c_\lambda) \tag{5}$$

where l_λ is a proportionality constant of loss of earnings due to the deterrence at edge λ.

We want to punish the poachers that visit the following two types of areas:

1. Areas that are naturally attractive to the poachers due to the high density of the trees
2. Areas that deemed as **hot zones** with more than threshold$_{degree}$ amount of degrees.

Given an edge $\lambda = (u, v) | \{u, v\} \in T$,

First, let a function to obtain the maximum degree of two vertices connected by the edge be defined as:

$$d(\lambda) = \max(\text{degree}_u, \text{degree}_v) \tag{6}$$

Then, define the function to obtain the average of the elevation of two vertices as:

$$k(\lambda) = \frac{\text{elevation}_u + \text{elevation}_v}{2} \tag{7}$$

With these, we define the proportionality constant l_λ as:

$$l_\lambda = \begin{cases} \frac{100}{k(\lambda)}, & \text{if } k(\lambda) \geq \text{threshold}_{elevation} \\ \frac{1}{\ln d(\lambda)}, & \text{if } d(\lambda) \geq \text{threshold}_{degree} \\ 1, & \text{otherwise} \end{cases} \tag{8}$$

where $\text{threshold}_{elevation}$ and $\text{threshold}_{degree}$ are parameters to be chosen.

6 Implementation - Improving detection of poachers

6.1 Setting up the model

To test our model for improved poaching detection, we began by choosing a location to map for our "proof of concept." Because Madagascar has a large volume of illegal logging, a national park was chosen from that area. **Masoala National Park** is the largest of Madagascar's national parks and has also historically been used for illegal rosewood logging. Furthermore, rosewood cultivation has been shown to be possible in this area.

Then, 700 random data points were chosen from the elevation map using **Quantum GIS**. In the year 2009, roughly 52,000 tons of wood were cut from the park[9]. The amount of harvested wood from 2009 was allocated across the 700 points based on their elevation, creating an "elevation-weighted-average" under the assumption that elevation is correlated with the location, length, and density of the trees. From this allocation, we estimate an average harvest rate of 0.28 tons per meter of elevation.

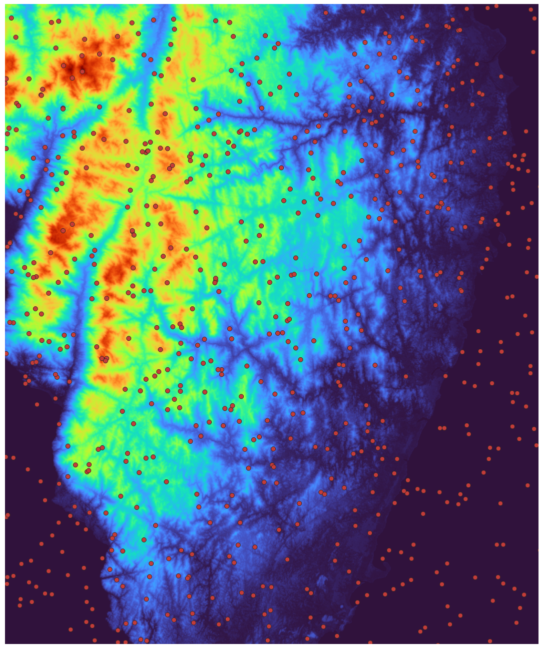


Figure 3: Elevation Heat map of Masoala National Park with 700 random data points

The data also states that 36,700 tons of illegal rosewood were shipped in 1,187 shipping containers, and were sold for $220 million U.S. dollars[9]. This comes out to approximately 30.9 tons of wood per shipping container, and $6,000 per ton of wood sold. Using those values, this suggests that if 52,000 tons of wood were harvested, this would be equivalent to approximately 1,682 containers of wood. Using the relative elevation weights, we then allocate the 1,682 wood containers across each of the 700 points to obtain the estimated proportion of wood that could be cut at each point.

A rough estimate of profit was made by accounting for the gas consumption of a truck in comparison to the price of wood sold. The average gas consumption of a truck in 2009 was approximately 0.00406L/m and we took the price of diesel in that year to be $2.292/gal, yielding a cost of $0.605/L[10].

Before we could run the model, the coordinates and elevation data extracted from the United States Geological Survey were using **EPSG:4326**, a widely used geographic coordinate system with units in degrees in latitude and longitude[11].

To find the distance between each vertex, we had to project the coordinates onto a two-dimensional plane to convert the unit to meters. In order to do so, we have utilized The Haversine formula[12]:

$$d = 2r \cdot \arcsin\left(\sqrt{\sin^2\left(\frac{\Delta\phi}{2}\right) + \cos(\phi_1)\cdot\cos(\phi_2)\cdot\sin^2\left(\frac{\Delta\lambda}{2}\right)}\right)$$

Where:

- d is the distance between the two points (along the surface of the sphere),
- r is the radius of the sphere,
- ϕ_1, ϕ_2 are the latitudes of the two points in radians,
- $\Delta\phi = \phi_2 - \phi_1$ is the difference in latitudes,
- $\Delta\lambda$ is the difference in longitudes in radians, and
- λ_1, λ_2 are the longitudes of the two points in radians.

6.2 Determining 'hot zones' of Masoala National Park

We first ran the model by itself without deterrence and identified the hot zones that are most optimal/profitable to the poachers.

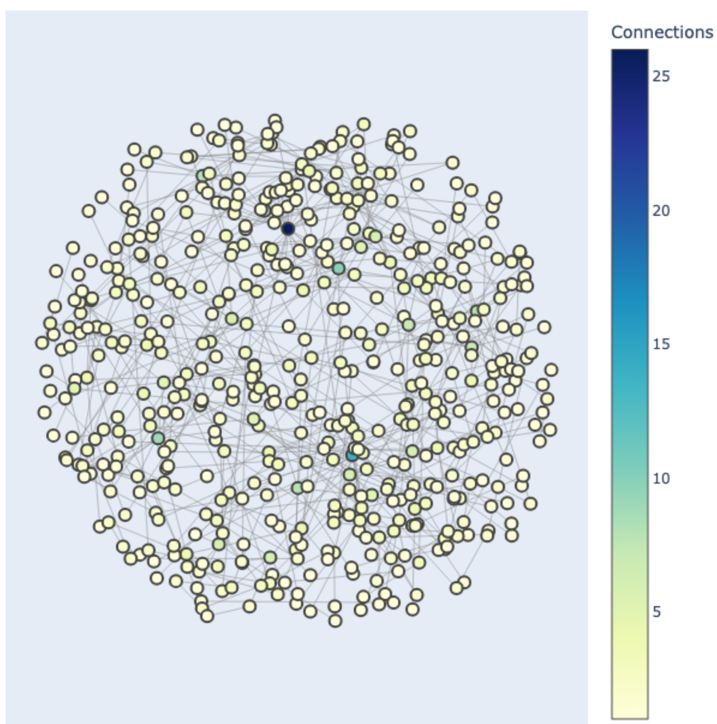


Figure 4: Minimum Spanning Tree representing the Masoala National Park

The nodes that are darker colored are determined as the hot zones.

Notable statistics:

1. The most congested vertex had a degree of **26**
2. The standard deviation of the connections of the tree was **1.679184**
3. The average elevation of nodes with at least 5 degrees was **537.75** meters.

6.3 Introduction of deterrence in Masoala National Park

To define our loss proportionality constant, l_λ, for our new profit function, $h'(\lambda)$, we chose $\text{threshold}_{elevation}$ and $\text{threshold}_{degree}$ as:

1. $\text{threshold}_{elevation}$ = upper quartile of elevation of all vertices = **533** metres
2. $\text{threshold}_{degree}$ = **5**

Then, our loss proportionality constant was defined as:

$$l_\lambda = \begin{cases} \frac{100}{k(\lambda)}, & \text{if } k(\lambda) \geq 533 \\ \frac{1}{\ln d(\lambda)}, & \text{if } d(\lambda) \geq 5 \\ 1, & \text{otherwise} \end{cases}$$

Upon re-running the model with the updated profit function, $h'(\lambda)$, the following result was obtained:

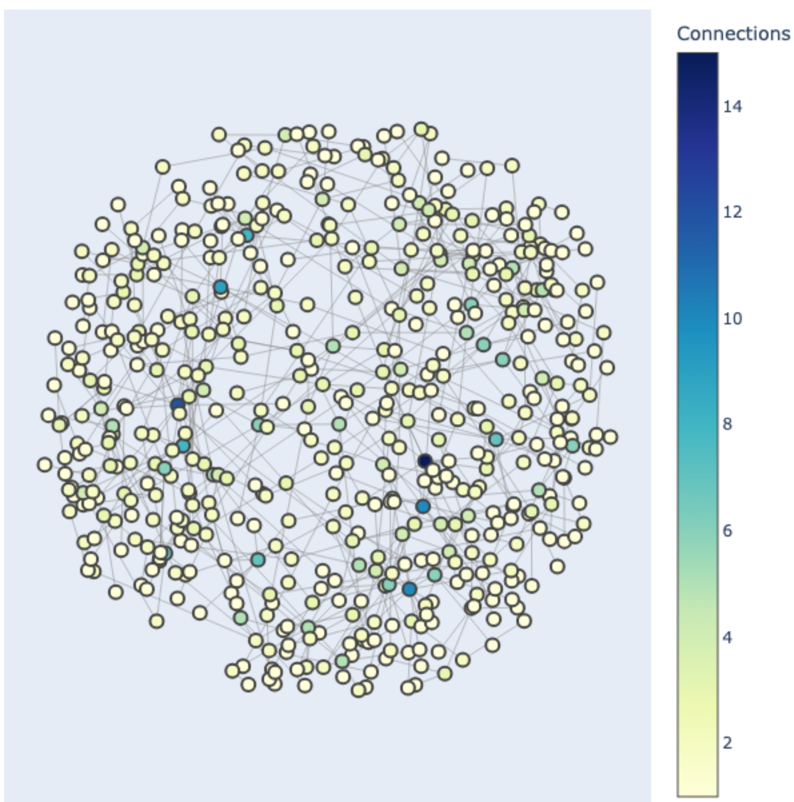


Figure 5: Minimum Spanning Tree representing the Masoala National Park with the introduction of deterrence

Notable statistics:

1. The most congested vertex had a degree of **15**
2. The standard deviation of the connections of the tree was **1.514948**
3. The average elevation of nodes with at least 5 degrees was **362.83** meters.

The outcome of the model run on Masoala National Park demonstrates that the model is effective in not only identifying the most profitable areas for poachers but also in minimizing their profits.

6.4 Improving the model

Due to a lack of data available on the whereabouts of the Rosewood trees, we had to establish assumptions such as

1. Elevation of the landscape
2. Location of Rosewood trees

With more accurate information on the surface elevation of the forest as well as the location of the trees, the model's accuracy can be drastically improved.

7 Conclusion

Conserving rosewood habitats by discouraging illegal trafficking in the wood is important not just economically for stakeholders, but environmentally for local flora and fauna, as well as globally in terms of preserving carbon sinks around the world. The difficulty in conserving rosewood is that promoting cultivation techniques to re-establish rosewood stocks is not sufficient. Poverty (and greed) are the primary drivers for the illegal harvesting of this timber. There is evidence to suggest that increasing punishments for illegal harvesting are less successful than increased monitoring and deterrence for protecting the resource.

Using modeling we have shown that cultivation techniques for rosewood are financially viable with a high net present value under reasonable assumptions. We have also developed a model for improved detection of poaching tracks that requires only existing data and does not rely upon manpower to implement. This is both a safer and more effective way to implement methods of deterrence and provide safety to workers cultivating rosewood seedlings. Preliminary results have been provided for the financial model based on a 5-year analysis, as well as over the harvest life of a rosewood tree (40 years).

8 Memo

To: International Consortium on Combating Wildlife Crime (ICCWC)
From: Team 2422656
Date: 2/5/2024

Re: Proposal for the Protection of Rosewood

We believe that given the mission of the ICCWC, and the political clout you possess through the "collaborative effort of five intergovernmental organizations" that makeup your organization, you are uniquely positioned to address the illegal logging of rosewood timber.

Illegal trafficking of rosewood is a large-scale issue that stretches beyond just the regional or even national level, so an international organization can support local authorities across different countries to implement our proposal. Harmonizing policies for the protection of rosewood across regions will reduce the potential for conflict and reduce the ability of poachers to relocate to different areas.

We propose a two-pronged approach to addressing the illegal trafficking of rosewood, using Madagascar as a test-case. Our first approach is to support the sustainable cultivation of rosewood. This first requires workers (preferably from the local communities) to collect seeds from mother trees. Seeds will then be germinated and planted in cleared areas that must be tended for at least five years. Rosewood trees require at least 40 years before they can be cultivated. Our model suggests that even 50 acres of cultivation would yield a present value net of the first five years of costs (excluding the collecting of seeds) of just under $12M. Given that poachers receive an estimated $20 per log harvested, there should be sufficient funds to deter poachers from engaging in their illegal activity.

A necessary second arm of our proposal involves developing a model for improved poacher detection in existing stands of rosewood. Our poacher-detection model makes use of elevation maps to determine where the highest-value trees are located and plots the most profitable harvesting routes through the existing stand of trees. Once these routes have been identified, deterrence techniques can be implemented to prevent poaching and provide protection to workers who are cultivating rosewood seedlings.

Taken together, our two-pronged approach suggests that over a 5-year period, so long as the cost of seed collection and deterrence are less than $11.5M, the net present value of our proposal will be greater than zero.

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