COLLEGE OF FORESTRY AND NATURAL RESOURCES
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Thesis/Practicum Reports
Institute of Renewable Natural Resources
2024

Title:	**Estimation of Tourism Carrying Capacity of Recreational Activities in Hinulugang Taktak Protected Landscape, Philippines**
Author:	**Acebedo, Romdel Agustin**
Adviser:	**Lo, Frechie Belle O.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	In 2023, the travel and tourism sector contributed 9.1% to the global GDP, an increase of 23.2% from 2022 (WTTC, 2024). Even so, this raises environmental concerns in protected areas (PAs) promoting recreation. Hence, requiring the establishment of a more sustainable tourism approach, as such the application of tourism carrying capacity (TCC). TCC has been conducted in various PAs in the Philippines, however, this concept is not applied in Hinulugang Taktak Protected Landscape (HTPL) in Antipolo, Rizal Province, Philippines. The research aims to profile the activities of ITPL. and determine the activity preferences and crowding perception while it mainly aims to calculate the TCC of major recreational activities of ITPL. The TCC was determined using Boullon's Carrying Capacity Mathematical Model (BCCMM) while activity preferences and crowding perception were determined using descriptive statistics. Data collection was from December 2023 to March 2024. The results for TCC estimates were found to be 138, 122, 113, 103, 78, 71, and 63 visitors for sightseeing (view deck), picnic, spider web, canopy walk, rock wall climbing, function hall, and swimming, respectively. Whereas, the most preferred activity of visitors is sightseeing while visitor crowding perception that will cause disturbance is 200 visitors per day. The study reveals that the present visitor influx in HTPL is more than the TCC estimates and crowding perception indicating a possible overcrowding and unsustainable management. Thus, it is recommended to observe crowding and limitations to visits.

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	Application of the TCC values can be employed through various visitor management strategies. These strategies if implemented properly may signify a profound step for HTPL towards sustainable tourism as it may decrease the pressures on the overall biodiversity of HTPL. and increase the satisfaction of visitors. Lastly, the results may provide inputs in future studies in HTPL and other PAs towards sustainable tourism.
Title: Author: Adviser: Stream: Access: Type: Abstract/Executive Summary:	**Documentation of the Arboricultural Practices of Fieldmen Janitorial Services Corporation (FJSC) in Selected Areas in Metro Manila, Philippines** **Alcantara, Ruth Bacani** **Visco, Roberto G.** **Environmental Forestry** **General Public** **Practicum Report** The practicum was designed not only to gain knowledge, experience and skills but to as the arboricultural practices performed by Fieldmen Janitorial Services Corporation (FISC) in some selected urban areas. The company is well-known for its outdoor landscape maintenance in most part of Metro Manila and Luzon. The practicum was conducted in one month, from June 11 to July 11, 2018. Result of the assessment revealed that the company have a strong background on greenspace management or arboricultural practices. These arboricultural practices includes proper selection of plants and location that can withstand the harsh environment of an urban area. Watering/irrigation through the use of drip irrigation, and overhead sprinkler system were documented. Plant nutrition through the application of organic and inorganic fertilizers were done in the sites. Managing post and diseases through the proper application of pesticide, insecticide, and herbicide were also given importance. Proper pruning and how to minimize any damages to each trees through guying and staking were common maintenance activities conducted by FJSC.
Title: Author:	**Analysis of Makiling Botanic Gardens Visitors' Motives and Recreational Activity References to Ecotourism Sites** **Amparo, Mitzie Faye Moldez**

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Adviser:	**Jugado, Vicmar F.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	This study analyzed the Makiling Botanic Gardens visitors' activity preferences and the motivations that drive them to visit ecotourism destinations. It used a quantitative research design, employing a descriptive-correlational analysis with 156 respondents who completed face-to-face and online Likert scale survey questionnaires. The results were evaluated using descriptive statistics and Pearson correlation coefficient (r) in SPSS. The study revealed that the visitors' pull motives (x-4.36) are more common drivers than push motives (x=3.90) in visiting ecotourism sites. Furthermore, the study found a direct relationship between the active and passive activities and the push and pull motivations of Makiling Botanic Gardens visitors with all correlations being significant at 0.01 level, ranging from weak to strong correspondence. Hence, it is recommended that the Makiling Botanic Gardens management come up with a picture-perfect, tranquil, and peaceful attraction that will entice the tourists. Additionally, it would be helpful to improve or maintain the landscape of the area and focus more on the aesthetics of the place.
Title:	**Land Use and Land Cover Change Analysis Using Remote Sensing and GIS in Upper Marikina RIver Basin Protected Landscape, Philippines**
Author:	**Apilado, Alexander De Guzman**
Adviser:	**Bantayan, Nathaniel C.**
Stream:	**Production and Industrial Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Land use and land cover change analysis is a tool that investigates the dynamics of an area between periods that aid in the sustainable management of resource use. Upper Marikina River Basin Protected Landscape is a proclaimed Protected Area under the virtue of PP 296 in Rizal, Philippines due to the catastrophic event of Typhoon Ketsana in 2009. This study

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	investigated the performance of different satellite imageries between two time periods and factors that may have affected land use and land cover dynamics. Satellite imageries of Landsat 8 (2015), Landsat 9, and Sentinel 2 (2023) were obtained from the USGS website and Copernicus browser and were preprocessed to obtain optimal image quality. The images were classified using six land use and land cover categories: inland water, built-up, forest, grassland, agriculture, and barren. The resulting maps were then compared and found that the higher spatial resolution of Sentinel 2 poses higher accuracy than the Landsat satellites, and higher detection of forest cover with a value of 74.79% as compared to the 74.42% of Landsat 9. The overall accuracy for Landsat 8 (2015) was 92.90% with a K value of 0.82, the overall accuracy for Landsat 9 (2023) was 90.71% with a 0.80 K value, and the overall accuracy for Sentinel 2 (2023) was 95.13% with 0.89 K value. Landsat images from different periods were then analyzed for land use and land cover change between 2015 and 2023 using QGIS. They showed that the built-up area had the most significant change with an increase of 174.81% (041.75 hectares), with an annual decrease in forest cover amounting to 129.21 hectares per year (1,033.72 hectares) Management zones revealed that 84.93% of the changes occurred in the MUZ, while the remaining changes that are observed in SPZ are in the proximate location of its border to MUZ The results of this study provide knowledge and techniques that can aid in the development of future sustainable planning and management, especially for protected.
Title:	**Quantification and Validation of Sediment Retention and Carbon Sequestration Ecosystem Services of Bio-Production Systems in Nagcarlan, Laguna, Philippines**
Author:	**Arbilo, Clyde Louise, Dimaguila**
Adviser:	**Predo, Canesio D.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Nagcarlan, Laguna is an agriculture-dependent municipality that serves as its primary economic source. Intensive agricultural and land practices are done in the municipality to produce rice, coconut, fruits like rambutan and mango, vegetables like tomato and snap beans and has been subjected to agricultural expansion,

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	slash and burn, and use of inorganic fertilizer. This study aims to quantify and value the sediment retention and carbon sequestration of the study site using the sediment delivery ratio (SDR) model and Carbon Storage and Sequestration model in InVEST. Specifically, this aims to: (1) describe the existing bio-production systems in the study area; (2) quantify the carbon sequestration and sediment retention ecosystem service of the existing and improves bio- production systems; (3) estimate the economic value of carbon sequestration and sediment retention of both the existing and improves bio-production systems; and (4) draw policy implications and recommendations towards improving ecosystem services and sustainable land management of bio-production systems in the study area. The current land cover of the area was from NAMRIA and the future land cover is generated through InVEST Scenario Generator to create another map depicting the future scenario. The results from the SDR model exhibits the Business as Usual (BAU) and conservation scenario that results to avoided erosion of 13,018 t/year and 16,673 t/year for each scenario respectively. The Carbon model shows a significant development on the sequestered carbon since there is an additional 1,219,364 USD or 70,723,117 PHP on having the conservation scenario as compared to the BAU. Overall, the study suggests to integrate ecosystem services valuation into the decision-making process to be more inclusive and to ensure that the sustainable land management practices are being attained.
Title:	**Modeling Soil Erosion and Sedimentation in the Ipilan Nickel Project Area, Brookle's, Palawan, Philippines**
Author:	**Arlegui, Marvin Louie Odal**
Adviser:	**Tiburan, Cristino L., Jr.**
Stream:	**Environmental Forestry**
Access:	**Restricted**
Type:	**Thesis**
Abstract/Executive Summary:	Mining plays crucial roles in stimulating the Philippine economy. However, the industry faces challenges in terms of environmental and social impacts. Palawan, known for rich biodiversity and natural beauty, is a significant hub for mining including the Ipilan Nickel Project (INP). In response to the environmental conflicts with mining, tools like the InVEST software, were developed to assess ecosystem benefits, and assist

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	stakeholders in decision-making that prioritize both economic gains and environmental protection for sustainable resource management in mining. This study utilized the InVEST model to evaluate soil erosion and sedimentation prior to INP mining operation as part of baselining of the impacts vis-à-vis the company's mine development program to identify erosion windows and actionable decisions. Data inputs included soil erodibility, USLE C & F factor, digital elevation model (DEM), land use and land cover (LULC) map, threshold flow, and Borselli K & ICO parameters. Results showed that the estimated accumulated soil erosion in the watershed significantly increased from 3,437,107 tons in 2020 to 3,503,862 tons in 2023 to 3,001,854 tons in 2026 and decreased to 3,561,382 tons in 2030. Meanwhile, the rate of sediment deposition relative to soil loss increased from 36% in 2020 to 37% by 2023, and further to 38% by 2020. This rate would then revert back to 37% by 2030. The decrease from 2026-2030 could be attributed to the planned progressive rehabilitation effort of the company. These outcomes have Implications for both the Ipilan Nickel Corporation and the Brooke's Point community by providing insights on the dynamics of soil erosion and sedimentation in implementing effective mitigation measures and sustainable land management practices.
Title:	**Determining Carrying Capacity Standard for Sulok Beach in General Nakar, Quezon**
Author:	**Astejada, Piel Amihan Tena**
Adviser:	**Andrada, Rogelio T., II**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Carrying capacity is significant in any tourist site to manage visitor use impacts on the natural resources in the area by setting the basis for the maximum number of visitors that the site can sustainably support. As an emerging ecotourism site, determining Sulok Beach's carrying capacity is important for the local government, particularly the Tourism Office, for monitoring and operations management. Through a key informant interview (KI), this study assessed the ecotourism resources and activities, and then calculated the carrying capacity values using Boullon's carrying capacity mathematical model (BCCMM). Results show that Sulok Beach is an ecotourism site

	that offers activities such as swimming and sightseeing. With a total area of 334,600 sq. m., the carrying capacity for Sulok Beach is 4,178 visitors per day. Furthermore, the swimming beach area, mearing 221,400 sq.m., can accommodate 3,225 visitors daily. Lastly, the shoreline measured at 1,631.80 sq.m. used for sightseeing activity has a carrying capacity of 118 visitors per day; these values are exceeded during the peak season of every April. Generally, the estimated daily tourist arrivals in 2023 did not surpass the values; however, management is still advised to consider carrying capacity standards when monitoring the tourism activities at Sulok Beach.
Title:	**Soil Physical Properties and Symbiotic Mycorrhizal Fungi From Selected Rhizospheres in the Upper Agno River Basin, Philippines**
Author:	**Bandian, Angeline Rose Fabro**
Adviser:	**Padrones, Jenielyn I.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Soil is a mixture of minerals and organic matter that is highly valuable as a natural resource. Thus, assessing the soil condition in an area is essential due to soil influences in other environmental processes. This study delves into the physical attributes of soil and the presence of symbiotic mycorrhizal fungi across different soils within the Upper Agno River Basin. Key soil properties, including texture, pH, color, bulk density, particle density, and porosity, were evaluated using the hydrometer method, potentiometric method, Munsell soil color chart, and gravimetric and approximation methods, respectively. The results show predominant textures of sandy loam/loamy sand and sandy clay loam in the studied soils. Notably, the soil pH of the samples ranges from 4.9 to 6.83, which signifies that the soil types contain the ideal pH for plant growth. Bulk density values range from 1.01 g/cm3 to 1.58 g/cm3 while particle density values range from 2.38 g/cm3 to 2.63 g/cm3. Mycorrhiza samples from the study sites were inoculated in the laboratory wherein soil samples collected were combined with a sandy planting medium and planted with Bahia grass species. The seedlings were planted in December 2022 and harvested in June 2023. Mycorrhizal analysis used the procedures provided by Brundrette et al. (1996). After the harvest, the length, fresh

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	and oven-dry weight of shoots and roots, and the spore counts were measured while visual estimation of fungi on roots was done. Results indicate higher plant biomass in Bahia seedlings with treatments compared to control samples, emphasizing the beneficial role of mycorrhizal fungi found in the Upper Agno River Basin soil samples as biofertilizers for diverse plant species. This research provides preliminary insights on the characteristics of soil and the potential of mycorrhizal fungi in the study area.
Title:	**Analysis of Urban Green Space Distribution in Metro Manila, Philippines using Remote Sensing and Graphic Information System Techniques**
Author:	**Banguilan, Ynah Joy Tarun**
Adviser:	**Gabriel, Marie Jessica C.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Urban green spaces (UGS) have been recognized as critical elements in sustainable and livable cities. However, Metro Manila (MM) has faced a drastic green space decline due to unabated population growth and urban developments in the past decades. These losses have also exacerbated environmental issues such as air and water pollution, flooding, and the Urban Heat Island effect. Local government units were given the responsibility to manage and formulate policies blessing these concerns individually. Hence, this study was conducted to understand the dynamic trends in UGS cover in MM. Particularly, the study analyzed the land cover changes, per capita area, and distribution of UGS for 2000, 2007, 2010, 2015, and 2020. Using the Support Vector Machine (SVM) Algorithm, the classified images generated high overall accuracies 9876, 96, 97%, 9996, and 98% for the respective years. These maps were used for change detection analysis, revealing consistent UGS net loss from 2000 to 2015, followed by a notable net gain in 2020. Similarly, the regional green space per capita (GSPC) exhibited a downward trend from 2000 to 2015 and peaked in 2020, although a number of cities and municipalities steadily scored below the 9 square meters minimum threshold set by the United Nations-World Health Organization. Moreover, spatial autocorrelation analysis indicated the presence of clustering patterns in per capita area and density of green spaces in most

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	years. The findings of this study shed light on the persistence of uneven distribution of UGS in MM, which may denote the existence of inequitable access to UGS benefits. Therefore, this study provides insights on the priorities for improving the distribution and accessibility of UGS in MM. Moreover, the study can inform decision-making processes regarding urban planning, land use zoning and management, and green infrastructure development, all geared towards enhancing the quality of life for MM residents.
Title:	**Modeling Future Land Cover Scenarios of Caliraya-Lumot Watershed, Laguna, Philippines**
Author:	**Bataller, Clenjia Bangcal**
Adviser:	**Tiburan, Cristino L., Jr.**
Stream:	**Environmental Forestry**
Access:	**Restricted**
Type:	**Thesis**
Abstract/Executive Summary:	Land Use and Land Cover (LULC) studies play a significant role in understanding the dynamics of an area across different periods in time. Changes that happen during land transitions usually pose various impacts such as shifts in development directions, threats to biodiversity, and disruption in the ecosystem services that these areas provide, among many others. Hence this study examined the land use and land cover changes in the Caliraya-Lumot Watershed (CLW) and generated future land cover scenarios through the use of predictive modeling. CLW has an approximate area of 13,526 hectares and is considered as one of the major watersheds supplying not only water for domestic use but also as a source for power generation, irrigation, and recreation in the area. The study mainly utilized land cover data from NAMRIA and it investigated the temporal changes between 2010 and 2020. Furthermore, a predictive modeling technique in QGIS, the MOLUSCE plugin, was employed to predict land cover scenarios for 2025 and 2030. The results revealed that from 2010 to 2015, the open forest in the watershed has significantly decreased by 9%, while the grassland areas increased by 7%. But during the subsequent period (2015-2020), the trend showed that the grassland area has decreased by 5% and the brush/shrubs cover has increased by 19%. Meanwhile, the projected land cover in 2025 showed a decrease in all land cover classes except for inland water, which increased by 3%. The most affected areas due to the increase in

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	inland water in the future are the perennial crops, annual crops, and open forests. In the 2030 land cover scenario, it was found that open forests will be receiving the highest decline of about 28% from the 2020 land cover map. This is followed by a decrease in the perennial crops of about 18%. As for the affected areas due to increased inland water, the affected land cover types are the perennial crops and the built-up areas. This study provided an avenue of what may happen in the future, which in turn can be utilized by management in addressing future risks that may be posed by the different transitions in the land use and land cover of CLW.
Title:	**Effects on Land Use of the Soil Loss and Sediment Delivery in the Imus River Watershed Using the Integrated Valuation of Ecosystem Services and Tradeoffs Model**
Author:	**Bautista, Jason Maurice Licudine**
Adviser:	**Reyes, Tomas D., Jr.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Data on soil loss and sediment export are required to pinpoint areas of soil erosion and inform conservation activities in a given watershed. The Imus River Watershed encompasses some areas of the Cavite province. Various land use/land cover (LULC) within the watershed are present and affect how sediments are delivered in the streams. This study provides valuable information about land use management and its consequences on the watershed, particularly during changing precipitation intensity. Such effects are determined using the Sediment Delivery Ratio (SDR) of the Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) Model. The data in the study are all secondary data collected from various sources that provide geospatial data and services. These data were processed in ArcGIS and the InVEST application. Results have demonstrated that sediment delivery and potential soil loss are usual in areas dominated by built-up areas and perennial crops. Dasmariñas City has the highest value for sediment export and soil loss, with a value of 3122.85 tons/yr and 41736.28 tons/yr, respectively. High soil erodibility and rainfall erosivity in built-up areas also contributed to high sediment delivery and potential soil loss. The data on erosion-prone areas are given in this study to enable the prioritization of watershed segments that

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	require rapid implementation of refined managerial interventions and decision-making procedures.
Title:	**Mangrove Aboveground Biomass Estimation Using ALOS-2 PALSAR-2 Imagery in San Juan, Batangas, Philippines**
Author:	**Bilolo, John CJ Jara**
Adviser:	**Dida, Jan Joseph V.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Mangroves are critical coastal ecosystems that provide many services. However, they are facing a lot of threats from human activities such as coastal land conversion and illegal logging. To create better policies for mangrove protection, timely and accurate data is needed. Aboveground biomass (AGB) is commonly used in studying mangrove productivity. Unfortunately, traditional AGB estimation methods are inefficient and laborious. The advent of synthetic aperture radar (SAR) technology paved the way for more efficient mangrove AGB estimation. With that, this study aims to estimate the AGB of a mangrove forest by correlating observed AGB values with ALOS-2 PALSAR-2 backscatter values and evaluating the relationship between them. Observed AGB data (indicator variable) was gathered from 42 randomly selected sampling plots, 32 of which were used in the training while 10 were used for validation. On the other hand, the ALOS- 2 PALSAR-2 data (predictor variable) was in L-band and had dual HH and HV polarization. The values were extracted from the pixels that mostly overlap the observed AGB sampling plots. Twenty-one regression models were created by correlating the observed AGB with the backscatter values and their derivatives. Based on the results, the backscatter derivative HV/HH that was regressed with the observed AGB had the best correlation yielding an R2 of 0.1109 and an RMSE of 8.6876 Mg ha". However, compared to past studies, this is suboptimal and unsatisfactory. This means that the resulting model from this specific study cannot accurately and reliably estimate mangrove AGB. Potential reasons for this were identified, including the small sample size, limited modeling method, as well as the coarse resolution of the SAR data. Refining the model by increasing the sample size and incorporating more variables and parameters is suggested. Furthermore, employing more complex modeling methods such

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	as machine learning algorithms, and considering SAR data with finer resolution could also be done to improve the model.
Title:	**River Styles Analysis of the Ambuklao Sub. Watershed in Benguet Philippines**
Author:	**Caparros, John PJ Gutierrez**
Adviser:	**Tiburan, Cristino L., Jr.**
Stream:	**Environmental Forestry**
Access:	**Restricted**
Type:	**Thesis**
Abstract/Executive Summary:	A river is a naturally flowing water body that sustains diverse ecosystems and provides various societal and ecological benefits. With this, effective river management requires accurate hydromorphological characterization to understand the dynamics and behavior of rivers. However, in tropical areas such as the Philippines, methods of river management are limited only to those that address water quality and quantity. The river characterization throughout this study is based on Stage 1 of the River Styles Framework which involved knowing the river dynamics of the catchment area. In this framework, topographic controls of the river are analyzed spatio-temporally conjunction with a GIS- based river characterization approach. The latter process involved identifying site characteristics, understanding topographic controls, conducting ground-truthing, and characterizing and explaining the behavior of each River Styles. Within their catchments, rivers exhibit a variety of characteristics and behaviors. Whether intentional or unintentional, they highly influence the natural patterns and dynamics of river systems, leading to alterations in their appearance and behavior. Based on the framework applied, the Ambuklao sub-watershed resides in a confined valley setting having four (4) geologic formations, residing in a steep upland landscape unit, and dominated by open forest land cover classification that describes the characteristics of the sub-watershed. There are also thirteen (13) identified river longitudinal profiles along the streams that drain the Ambuklao sub-watershed. In addition, the study found that there were two types of River Styles in the Ambuklao sub-watershed, and these are the gorge and occasional floodplain pockets. Both categories belong to the confined valley setting type. The findings of the study highlight the River Styles of Ambuklao sub-watershed which can be of significant information in understanding the river dynamics in the area as well as a vital input in the future

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	development of a sustainable river management plan of the watershed.
Title:	**Remote Sensing-Based Forest Ecological Quality Monitoring of Mangatarem Critical Habitat in Pangasinan, Philippines**
Author:	**Carranza, Marynelle Madrid**
Adviser:	**Tiburan, Cristino L., Jr.**
Stream:	**Environmental Forestry**
Access:	**Restricted**
Type:	**Thesis**
Abstract/Executive Summary:	This study investigated the changes in forest ecological quality of Mangatarem Critical Habitat over a 20-year period using remote sensing data. The study generated greenness, wetness, heat, and dryness indices from remote sensing data for the years 2003, 2013, and 2023; (2) analyzed the spatiotemporal changes in RSEI levels; and (3) assessed the overall spatial distribution of forest ecological quality using spatial autocorrelation analysis. Landsat 5 TM and Landsat 8 OLI/TIRS data were used to derive the necessary indices in Google Earth Engine, which were then normalized and analyzed using Principal Component Analysis (PCA) to calculate the RSEI for each period. Change detection analysis in ArcGIS examined spatiotemporal changes, while spatial autocorrelation was assessed using Moran's I and the Local Indicator of Spatial Association (LISA). Results showed positive trends in greenness and wetness, indicating improved vegetation cover and stable moisture dynamics, respectively. The dryness index decreased significantly, and land surface temperatures dropped between 2003 and 2013 before slightly increasing again in 2023. The mean RSEI values increased over time, reflecting an overall enhancement in the quality of ecological conditions, with a rise from 0.736 in 2003 to 0.792 in 2023. Areas with excellent RSEI levels, particularly Cabaluyan 2nd, Catarataan, and Malabobo, expanded significantly, while those with poor levels detected in Pacalat and Calomboyan Sur initially decreased before a slight increase in 2023. Spatial analysis revealed a clustered distribution of ecological quality, with high-quality areas in central and southern regions and lower-quality areas near riversides in the north disturbed mainly by frequent human activities. The findings revealed the effectiveness of conservation efforts while highlighting areas needing targeted intervention, particularly protective measures

	near human settlements and emerging economic zones. The study provided valuable spatiotemporal insights, including trends in forest ecological quality and spatial distribution mapping, that can enable informed strategy implementation and policymaking toward the sustainable management of Mangatarem Critical Habitat.
Title:	**Viability of Tourism in Supporting Rural Livelihoods: The Case of Panguil River Ecopark (PREP), Laguna, Philippines**
Author:	**Catapia, Patrisha Marie Bautista**
Adviser:	**Gabriel, Marie Jessica C,**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Tourism has been regarded as one of the frontrunner strategies in poverty alleviation and improving rural household conditions in developing countries. The Municipality of Pangil, Laguna, Philippines, is one of the earliest to invest in the tourism industry since the passing of the Tourism Act of 2009 in the country. However, the area's poverty indices and per-capita income status remained in the lower spectrum even after almost 15 years of operations of their municipal tourism enterprise-the Panguil River Ecopark (PREP). Through components of the Sustainable Livelihood Framework: Capital Assets, Vulnerability Context, and Structure and Processes, this study employed qualitative and quantitative data-gathering tools to gauge the viability of tourism in supporting livelihoods in Brgy. Natividad, Pangil, Laguna. Survey questionnaires were accomplished by household respondents from Barangay Natividad, and key informant interviews were carried out with individuals concerned with tourism and livelihood development. Data analysis was done through descriptive statistics, equality of means, and data triangulation. Results indicate that there is a need for recalibrating and improving structures and processes in Pangil to enable further development of tourism-based household livelihoods in the area, along with encouragement of community participation in tourism management.
Title:	**Assessment of the Environmental Conditions That Influence the Academic Performance of BS Forestry Students in the College of Forestry and Natural Resources, University of the Philippines Los Baños**

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Author:	**Celso, Chastine Phoebe Castro**
Adviser:	**Lo, Frechie Belle O.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	This study assesses the influence of environmental conditions on the academic performance of Bachelor of Science in Forestry students at the College of Forestry and Natural Resources, University of the Philippines Los Baños (UPLB). Key environmental factors investigated include noise levels, temperature and humidity, green areas, shading, and natural light availability within the learning environment. Data collection involved online surveys with open-ended questions, enabling students to provide detailed feedback on how these factors influence their learning experiences and academic performance. Descriptive statistics, including frequency and percentage calculations, were used for data analysis, facilitating a comprehensive understanding of the variables under study. The findings underscore the significant impact of environmental conditions on the academic performance of BS Forestry students at UPLB. Enhancing these factors is crucial for creating environmentally sustainable and student-friendly learning spaces within academic institutions. Such enhancements can promote student engagement, concentration, and overall academic success. By understanding the importance of optimizing these environmental factors, educational institutions can create a conducive learning environment that promotes student engagement, focus, and overall academic success.
Title:	**Identifying Soil Erosion and Sedimentation Hotspots in Pagsanjan-Lumban Watershed, Philippines**
Author:	**Chaylee, Eadralin Tristan Hernandez**
Adviser:	**Tiburan, Cristino L., Jr.**
Stream:	**Environmental Forestry**
Access:	**Restricted**
Type:	**Thesis**

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Abstract/Executive Summary:	Soil erosion presents a formidable global challenge, particularly in regions with complex terrain and adverse environmental conditions, such as the Philippines. Despite widespread soil conservation efforts, funding prioritization often overlooks areas with the most urgent conservation needs, favoring catchment size instead. Addressing this gap, the study employs Geographic Information System (GIS) and spatial statistics to identify soil erosion and sedimentation hotspots within the Pagsanjan-Lumban watershed. The research objectives encompass estimating erosion rates, quantifying sediment export, and developing spatially explicit hotspot models. Utilizing the InVEST Sediment Delivery Ratio (SDR) model, which incorporates the Revised Universal Soil Loss Equation (RUSLE), the study estimated a potential annual soil loss of 3,915,731 tons, with 45.54% of the area subject to high to severe erosion rates. Similarly, the annual sediment export stood at 442,853 tons, with 20.61% of the area experiencing high to severe sediment export. The hotspot analysis revealed significant clustering of erosion and sediment export, notably along river networks. Barangays such as Ibaba Del Norte, Magdapio, San Salvador, Pook, Banti, Bagong Silang, Ibabang Banga, Dingin, Munting Kawayan, Barangay II, Balubad, Lewin, Anibong, and Bukal emerged as key hotspots for soil erosion. Similarly, Magdapio, Ibaba Del Norte, San Salvador, Munting Kawayan, Balubad, Ibabang Banga, Pook, Bukal, Lewin, Banti, Dingin, and Anibong were identified as hotspots for sediment export. These hotspots follow a similar trend that spans across the watershed, starting from the municipality of Majayjay, through Pagsanjan and Lumban, and extending all the way to Paete. The findings highlight areas with heightened erosion and sediment export, which are crucial data for targeted interventions that allow a more efficient and focused resource allocation for control measures and land use planning.
Title:	**Estimation on Regulating Ecosystem Services Provided by Selected Greenspaces in Santa Cruz, Laguna, Philippines Using i-Tree Canopy**
Author:	**Concio, Charlene Kaye Constanino**
Adviser:	**Marza, Ma. Cecili C.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**

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Abstract/Executive Summary:	Urbanization encompasses the process of urban expansion within modern society, indicating shifts in socio-economic and demographic structures, the adoption of urban lifestyles, and the emergence of new settlements. This transformation often leads to a decrease in the number of greenspaces (GS), thereby affecting the regulating ecosystem services they provide. The characteristics of GS significantly influence the amount and the monetary value of these services. Therefore, there is a need for localized studies on GS. This study aims to estimate the canopy cover, amount, and monetary value of the regulating ecosystem services provided by selected GS in Santa Cruz, Laguna using a web-based application called i-Tree Canopy. Findings reveal that there is a correlation between the area of GS and the benefits it provides. Moreover, among the three GS assessed, Plaza Valenzuela is the only one that satisfies the at least 30% canopy cover prescribed in the 3-30-300 rule, indicating a need to plant more trees in the Laguna Provincial Capitol and San Luis RECS Village. Meanwhile, CO2 storage is the regulating ecosystem service with the highest monetary value based on the results generated by the i-Tree Canopy on April 7, 2024. The monetary values of CO2 storage are Php 89,776 ± 2,352 for Plaza Valenzuela; Php 1,059,151 ± 62,701 for Laguna Provincial Capitol; and Php 3,971,583 ± 215,237 for San Luis RECS Village. However, the estimated monetary value may be overestimated or underestimated due to the difference of localities where the value was evaluated. Nevertheless, the values can still be used to highlight the importance of GS in the area. The result of this research can serve as a guide in decision-making to enhance planning and management strategies, ensuring the preservation and optimization of GS and the regulating ecosystem services they offer.
Title:	**Awareness and Perceived Potential Benefits and Challenges of Agroforestry as a Sustainable Farming System in Brgy. Tala, Rizal, Laguna, Philippines**
Author:	**Crisostomo, Surinah Alelyn Guevarra**
Adviser:	**Baliton, Romnick S.**
Stream:	**Social Forestry and Agroforestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Agroforestry is the cultivation of woody perennials, agricultural crops, and/or animals in a same land unit, managed as one

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	system. The lack of awareness on the advantages of agroforestry associated with the prominence and overdependence on monoculture, unclear land status, weak enforcement of forest regulations, and inadequate coordination between sectors, has limited the adoption of agroforestry worldwide. This study aimed to determine the level of awareness of the farmers and the perceived potential benefits and challenges of adopting agroforestry as a sustainable farming system in Brgy. Tala, Rizal, Laguna, Philippines. A standardized survey questionnaire supplemented with focus group discussion was utilized to gather data Frequency. percentage, median, mean, and standard deviation were the tools used in analyzing the socio-economic condition of the farmers and their awareness on the perceived potential benefits and challenges of agroforestry. Meanwhile, in determining the significant relationship of factors affecting the adoption of agroforestry. Fisher's exact test was employed. Generally, farms adopting agroforestry are characterized by integrating fruit trees and agricultural crops. Findings revealed that only 6 (13.95%) of the respondents are able to adopt agroforestry and that income and educational attainment of the farmers are the factors influencing the awareness and adoption of agroforestry. It was found out that land status and size affect the adoption of agroforestry as most of the respondents do not have security over the land and cultivate with more or less a hectare land. These findings indicate that socioeconomic factors and security to land are pivotal in advancing the promotion of agroforestry adoption. Hence, promoting and enhancing educational and economic opportunities among farmers as well as the securing of tenurial rights, would increase the adoption of agroforestry practices and technologies. In essence, this study will serve as a baseline data in conducting future research by providing foundational information.
Title:	**Households' Willingness to Pay for Improved Water Quality of San Pedro Subwatershed**
Author:	**Cuyugan, Erika Renee Viray**
Adviser:	**Predo, Casenio D.**
Stream:	**Production and Industrial Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The United Nations' Sustainable Development Goals (SDGs) underscore the importance of water sustainability, aiming to

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	ensure access to water and sanitation for all. However, rapid population growth, urbanization, and climate change exacerbate water scarcity and quality issues. This study focuses on the San Pedro Subwatershed, a critical sub-basin of the Laguna Lake, and its role in safeguarding water quality for the community of San Pedro City. This study conducts a contingent valuation (CV) analysis in Barangay San Antonio and Barangay San Vicente to estimate households' willingness to pay (WTP) for water quality improvement derived from the San Pedro Subwatershed. The research employs single-bound dichotomous choice and payment card methods to elicit WTP values from 200 respondents. Findings reveal that most respondents are female, aged 34-49, married, with college education, employed, and have a monthly income of 10,000 pesos or less. Despite lacking association with environmental groups, all respondents acknowledge the importance of watershed management. However, awareness of its impact on water quality is limited. Among the explanatory variables, the logistic regression showed that bid amount, age, household income, being a member of an environment or conservation group, experiences of water quality problems and their water bill have a significant influence on households' WTP. Household size was the only significant variable affecting WTP in the interval regression. Over half of respondents (53%) express willingness to pay for water quality improvement. The mean WTP estimates are P245 for single-bound dichotomous choice and P186 and P179 for payment card method, respectively. Total benefits estimated are P4,993,512 and P3,785,924, P3,640,915, and P3,540,368 for single dichotomous choice, payment card method, and with uncertainty correction, respectively. Despite limited environmental group association, majority awareness of watershed importance suggests the need for educational campaigns. Mean WTP indicates community support for environmental initiatives. Addressing water quality issues is crucial for public health and underscores the necessity of watershed management.
Title:	**Estimation of Soil Loss in Pampanga River Basin: A Comparison of Integrated Valuation of Ecosystem Services and Trade Offs-Sediment Delivery Ratio (INVEST-SDR) Model and Google Earth Engine (GEE)**
Author:	**Danganan, Jovy Visey**
Adviser:	**Dida, Jan Joseph V.**
Stream:	**Environmental Forestry**
Access:	**General Public**

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Type:	**Thesis**
Abstract/Executive Summary:	The Pampanga River Basin is integral to national food security, contributing approximately one-third of the overall rice production and supporting extensive wetlands that function as critical nurseries for fisheries. Accelerating land use changes, population growth, and inadequate management practices are intensifying erosion and sedimentation rates, necessitating precise soil loss estimation and the development of models tailored to specific study sites to ensure the long-term sustainability of the basin's ecosystems and agricultural productivity. This study was crafted to generate maps for estimating soil loss in the Pampanga River Basin, employing two models: InVEST-SDR and GEE. Both models utilize the RUSLE model, incorporating additional parameters like calibration parameters and satellite images. The estimation of soil loss involved the delineation of sub-basins using the shapefile of HYDROBASIN, and zonal statistics were applied to calculate the total and mean estimated soil loss. The resulting maps were then classified using the severity classes defined by Gashaw et al. (2021). Moreover, the percentage distribution of severity classes was also computed to prioritize higher severity classification areas in the Pampanga river basin. Both models identified high severity of soil loss in sub-basin 13, which covers 11.45% of the Pampanga River Basin, indicating agreement on critical soil loss in this area. However, the models showed the greatest discrepancy in sub-basin 6. Factors like the C factor, P factor, and calibration parameters significantly impacted soil loss estimation, causing variations in the results. Google Earth Engine demonstrated versatility with its numerous functions and adaptability to additional factors. Nevertheless, the INVEST-SDR model is preferred for its reliability and accuracy, gaining prominence in recent research due to its effective use of calibration parameters despite some flexibility limitations (Danny et al, 2023; Das et al., 2023; Marques et al., 2021).
Title:	**Aboveground Carbon Stock Assessment of Taal Volcano Island, Batangas, Philippines Using Remote Sensing and Machine Learning**
Author:	**Dao, Andre Ibañez**
Adviser:	**Reyes, Tomas D., Jr.**
Stream:	**Environmental Forestry**
Access:	**General Public**

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Type:	**Thesis**
Abstract/Executive Summary:	This study utilized machine learning models to estimate the aboveground carbon stock (AGC) of Taal Volcano Island (TVI). Vegetation indices (NDVI, NDMI, EVI, RGI) were incorporated as predictor variables for three models: SLR, MLR, and RF. Model performance was assessed using R2, adjusted R2, and RMSE. SLR achieved acceptable validation R2 values; however, underfitting was observed due to its inferior performance during model development. MLR encountered multicollinearity, hindering the development of a reliable model. Conversely, RF models exhibited superior flexibility and accuracy. Hyperparameter tuning within the GEE platform optimized all RF models. The multi-variable RF model achieved a training R2 value of 0.6606, adjusted R2 value of 0.645, and RMSE of 5.612 kg/100 m2, with acceptable validation results (R2 = 0.6613, adjusted R2=0.623, RMSE = 4.166 kg/100 m2). Notably, EVI held the highest importance within the multi-variable RF model, while NDVI emerged as the most effective single predictor. The NDVI-based RF model achieved a more balanced performance compared to the multi- variable RF model. This NDVI-based model (R2 = 0.672, adjusted R2 = 0.668, RMSE 4.026 kg/100 m2 for training; R2 = 0.658, adjusted R2 = 0.649, RMSE = 5.615 kg/100 m2 for validation) was chosen to generate the final AGC map. The NDVI-based model estimated a total AGC of 68,461.28 tons for TVI in 2023, with an average AGC of 0.28 tC/ha. This study offers valuable information for stakeholders like the DENR and LGUS to guide conservation efforts within TVI. The generated map identifies areas with high ecological value and carbon storage potential. This study established a baseline for future investigations into vegetation health and carbon storage on TVI, particularly regarding the impacts of volcanic eruptions. The employed methodology provides valuable insights adaptable to academic and governmental settings, informing future research on natural resource quantification and monitoring.
Title:	**Relationship of Land Use/ Land Cover Change and Landscape Occurences in the Province of Albay, Bicol**
Author:	**Dela Rueda, Jeffer Briones**
Adviser:	**Gabriel, Marie Jessica C.**
Stream:	**Environmental Forestry**
Access:	**General Public**

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Type:	**Thesis**
Abstract/Executive Summary:	Albay's landscape, dominated by agriculture, has experienced significant shifts in forest cover, urban expansion, and other land types, affecting landslide susceptibility, which is critical for disaster risk reduction and sustainable land management. This study investigates the intricate relationship between land use/land cover (LULC) changes and landslide occurrences in Albay, Bicol, from 2010 to 2020. To analyze this relationship, a comprehensive methodology was employed, involving the collection of multi-temporal land use / land cover maps and landslide inventory data. Land cover change detection analysis identified temporal trends in land use changes. Frequency ratio analysis assessed the susceptibility of different land cover classes to landslides, while the Chi-Square Test and Kruskal-Wallis Test were used to examine the relationship between LULC/changes and landslide occurrences over time. The analysis revealed that agricultural and urban areas in Albay were consistently vulnerable to landslides. Frequency ratio analysis highlighted urban areas as increasingly prone to landslides, alongside significant risks in agricultural and forested areas. Chi-Square Test and Kruskal-Wallis Test reveals that there is significant relationship between LULC and landslide occurrences. However, the results on LULC change and landslide occurrences shows no significance. The findings suggest a need for sustainable land management strategies, particularly in agriculture and urban planning, to reduce landslide risks. Additionally, the significant relationship between LULC and landslide occurrences underscores the importance of integrated land use policies and continuous monitoring to ensure effective disaster risk reduction and sustainable land management.
Title:	**Assessment of Soil Organic Carbon from Various Land Use and Land Cover Types Within the Agno River Basin, Philippines**
Author:	**Delminguez, Elisha Cartejo**
Adviser:	**Padrones, Jenielyn T.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	This thesis investigates the intricate interplay between land use, soil management practices, and the physicochemical

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	characteristics of soil, and their collective impact on organic carbon storage. The study focuses on the Agno River Basin, examining four distinct land cover types-forest, agriculture, grassland, and built-up areas. With a total of 29 samples, this research utilized a composite sampling approach at depths of 0-20 cm (topsoil) and 20-50 cm (subsoil) and employed the undisturbed core method to determine bulk density and the Walkley-Black procedure to quantify soil organic carbon content. The findings reveal notable variations in the percentage of soil organic carbon (%SOC) across land cover types. Built-up areas exhibit lower %SOC (0.86% in topsoil and 0.11% in subsoil), whereas forested regions display higher %SOC (2.58% in topsoil and 1.74% in subsoil). The study also found that % SOC decreased with depth, wherein high soil organic carbon was observed at 0 - 20 cm, while the lowest was observed at 20- 50 cm depth. The computed soil organic carbon storage (in ton/ha) decreased in the order of forest >grassland >agriculture >built-up. Furthermore, the study establishes negative correlations between soil physicochemical properties (bulk density, particle density, pH, % silt, and % sand) and %SOC, while % clay exhibits a positive relationship. However, certain soil physical properties, such as bulk density and soil texture, display weak correlations with %SOC. This investigation contributes to a deeper understanding of the intricate relationships between soil properties and soil organic carbon dynamics, providing valuable insights for sustainable land management practices in the Agno River Basin.
Title:	**Land Cover Change Analysis and Prediction of Angat River Watershed**
Author:	**Del Rosario, Hannah Bernadette Potian**
Adviser:	**Carandang, Vida Q.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Angat River Watershed, is a significant and major contributor to the water supply of people of Bulacan and its nearby provinces and Metro Manila. The Angat Dam watershed is critical to the population of Metro Manila and the neighboring province of Bulacan. The Angat River Watershed is a critical watershed and a protected area, illegal activities and logging must not occur since it damages the environment. However, despite its

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	proclamation and declaration from DENR, various studies and news are still being reported. This study aims to assess land cover changes of Angat River Watershed and Predict Future Land Cover Changes. This study used satellite imagery from Landsat 8 Level 2 Tier 1 Raw Scenes Collection which offers a 30-meter multi-spectral spatial resolution from the years 2014, 2019, and 2024 to assess land cover changes. Google Earth Engine (GEE) was used for the supervised classification and accuracy assessment. It employed TerrSet 2020's Land Change Modeler (LCM) to analyze this data and projected a future scenario for 2040. Results show that there is a significant increase in forest cover expanding from 60102.63 ha in 2014 to 68453.25 ha in 2040. Water coverage also increased from 2024 to the predicted 2040 with 4524.54 ha to 5906.3 ha. Furthermore, a decreasing trend was observed with the Built-up, Agricultural land, and Barren land. It can be suggested that these land covers are transitioning or shifting to Forest Covers. The predictive model of Angat River Watershed can serve as a guide for constructing a framework, continuing reforestation efforts, and implementing policies. Adopting a comprehensive approach to watershed management and recognizing the strategic benefits of reforestation can greatly aid in the sustainable stewardship of the region's water resources.
Title:	**Vegetation Restoration Assessment of a Landslide of a Portion of Mount Makiling Forest Reserve, Laguna, Philippines**
Author:	**Dimagiba, Paulo Reyes**
Adviser:	**Bantayan, Nathaniel C.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The study seeks to assess the vegetation restoration of a landslide induced by heavy rainfall on a tropical rainforest using an RGB-based imagery. Orthorectified images through RGB-based imagery are used to classify land cover into trees, non-trees, and bare land using Object-Based Image Analysis in eCognition and manual classification through QGIS on the landslide area between Stations 16 and 17 during the years 2017, 2018, 2019 and 2024. Greenness index is assessed using RGB-based Vegetation Indices such as VARI and TGI to measure abundance of leaf coverage and plant health, and NGRDI and NExG are

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	used to classify and isolate vegetated from non-vegetated areas through time. Ground inventory is conducted to determine pioneering species and categorized into lifeforms and Family species level to determine colonization rate. Lastly, colonization and recovery rate are assessed using land cover classification generated. Non-tree species like shrubs, herbs, vines, woody perennials, grasses, rattans, and ferns and allies that dominate the landslide covering 79.5% characteristically have a rapid growth rate and are highly capable for growth and establishment especially in a tropical rainforest. Most of these belongs to shrubs and ferns (Urticaceae and Thelypteridaceae). However, tree species tend to outgrow non-tree species on tropical areas with a colonization rate of approximately 3.16% annually on the whole landslide area and a 39% cover out of all the lifeforms surveyed. Vegetation Indices computed show relatively the same values with land cover classification and ground inventory thus proving ecological succession.
Title:	**Effects of Indole-3-Butyric Acid (IBA) and Alpha Naphthalene Acetic Acid (ANAA) Concentrations on the Root Growth Performance of Maki (*Podocarpus macrophyllus* var. *maki* Siebold & Zucc.) Cuttings**
Author:	**Dizon, Benjamin Campos, III**
Adviser:	**Carandang, Vida Q.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The trend towards sustainability is leading many landscaping companies to adopt eco-friendly practices, which also attract property buyers and renters. Maki (Podocarpus macrophyllus var. maki) Siebold & Zucc., an evergreen tree from the Podocarpaccac family, is commonly utilized in landscaping for its aesthetic appeal and low maintenance This study aims to optimize the propagation of Maki through stem cuttings using two rooting hormones, Indolebutyric Acid (IBA) and Alpha Naphthalene Acetic Acid (ANAA). Application of rooting hormones on cuttings can greatly improve the development of plants' root systems. Maki cuttings were submerged in varying concentrations of IBA and ANAA within 10 minutes before it was planted. The effectiveness of these hormones on root growth performance was assessed based on parameters like root length, number of roots, rooting percentage, and survival rate. Results

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	indicated that a 1000 ppm concentration of IBA significantly enhanced root performance, showing a significant effect on root number and length, however, all treatments showed no significant difference on rooting percentage and survival rate. Generally these results showed that IBA at 1000 ppm concentration can increase root growth performance, specifically in producing roots, and increasing root length of Maki cuttings.
Title:	**Aboveground Biomass Assessment of Trees Along Public Roads in San Pedro City, Laguna, Philippines**
Author:	**Dumagpi, James Kairo Sabio**
Adviser:	**Racelis, Diomedes A.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The assessment of aboveground biomass of trees planted along public roads in San Pedro City, Laguna could enhance the capability of the local government authority to ensure sustainable urban planning and management. In particular, the presence of trees enhances the aesthetic value in urban areas and benefits both residents and visitors. Furthermore, trees are an important component of urban ecosystems in terms of providing habitat for wildlife, lowering air and noise pollution, and regulating microclimate by mitigating heat island effects. Furthermore, biomass along roadsides can serve as natural buffers by filtering air pollutants from motor vehicles and improving air quality in densely populated areas. Assessment of tree biomass will allow urban planners to identify places with insufficient trees and adopt strategies to where trees need to be planted. The study assessed the aboveground biomass of trees planted along public roads in San Pedro City, Laguna, Philippines using Brown and Lugo's (1997) allometric equation. A total of 3,306 trees were inventoried along a 48.02-km transect established along public roads in the city. Results indicate that the total aboveground biomass of trees amounted to 25,227,839.26 kg or 25,227.84 tons and is equivalent to 12,613,918.63 kg or 12,613.92 tons of carbon which accounts for 50% of total aboveground biomass. The large volume of biomass is attributable to Rain Tree (Samanea saman), Narra (Pterocarpus indicus), and Mahogany (Swietenia macrophylla). Other potential native trees were also found thriving within the area that are suitable for urban

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	streetscape but have low population within the study site thus more research is needed in this area. Overall, to maximize carbon storage, the use native and some naturalized tree species within San Pedro City is highly recommended and is imperative to be included in implementing infrastructure development plans in the city.
Title:	**Assessment of Regulating Ecosystem Services of the Urban Tree Corridor Along Rosario Avenue in San Pedro City, Laguna, Philippines Using Tree Eco**
Author:	**Enriquez, Jonathan Telebrico**
Adviser:	**Marza, Ma. Cecilia C.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The study aimed to explore the Regulating Ecosystem Service (RES) value of the Urban Tree Corridor along Rosario Avenue in San Pedro City, Laguna. Specifically, it sought to characterize the site's urban trees and estimate their RES and assign to it a PhP equivalent via a monetary valuation approach. This was achieved through the adaptation of the iTree Eco v6 software for use in the study site. The methodology utilizes tree data such as species, dbh, and total height, as well as location parameter data, weather station meteorological data, and pollution station data to estimate different types of RES. Due to gaps in data availability, substitution options and their effects on data accuracy were evaluated. The study determined that out of 103 trees across 10 species, A. saman, S. macrophylla, and T. catappa, in consistent order, were the top contributors to all types of estimated RES. The total valuation of the Urban Tree Corridor was estimated at PhP 913,460. CSt (PhP 771,000), BES (PhP 118,000 per year), and CA (PhP 16,100 per year) were the most significant RES in terms of monetary value equivalent, while OP and RV had no assigned monetary value. CSt, CSq, BES, and CA accuracy is largely affected by the benefit prices of carbon and electricity but minimally affected by substituted and insufficient data sources, while PR and AR may be less accurate accounting for substituted and insufficient data sources. By assigning a more intuitive metric to a RES estimate, in this case through a monetary equivalent, understanding of the true value of urban trees is improved and can subsequently influence positive effects on management and policy decision-making, as well as

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	environmental awareness. The insights gained from adapting the iTree Eco methodology in the context of the Philippines can be used to contribute to its development and use in many potential applications in San Pedro City, Laguna.
Title:	**Effects of Digital Elevation Model Resolution on the Morphometric Characteristics of Chico River Basin, Philippines**
Author:	**Ergina, Victor John Camara**
Adviser:	**Gabriel, Marie Jessica C,**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Effective watershed management relies on precise watershed delineations. This accuracy influences erosion control, pollution mitigation, flood prevention, and conservation efforts such as reforestation and wetland restoration. Using 90 m, 30 m, and 5 m resolutions of DEM, Chico RB was delineated. Further, the river basin was also characterized using various morphometric parameters, such as catchment area, perimeter, elevation, slope, stream order, stream length, mean stream length, bifurcation ratio, and form factor. QGIS with the Whitebox Tools plugin facilitated the watershed delineation process. Results show varying degrees of relative differences across resolutions, with seemingly minor differences in catchment area and perimeter potentially translating into significant real-world variations. While finer resolutions generally offer better accuracy, selection should align with project needs and objectives. Notably, parameters like catchment area, perimeter, relief, form factor, and compactness coefficients may be sensitive to scale, emphasizing the importance of scale considerations in analysis and decision-making. A mere 1.15% relative percent difference (RPD) between 90 m and 30 m resolutions could equate to differences of hectares in catchment area, while a 10.05% RPD between 90 m and 5 m resolutions in watershed perimeter could result in disparities measured in kilometers or hundred meters. Visual differences observed depend on map scale, highlighting the need for scale-appropriate interpretation. This study underscores the importance of selecting the appropriate DEM resolution based on project requirements, considering factors like device capabilities and processing time.

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Title:	**Growth Dynamics and Carbon Storage Potential of Selected Planted Native Species in La Mesa Watershed, Philippines**
Author:	**Espiritu, Jestelle Anne Mae Oliveres**
Adviser:	**Codilan, Analyn L.**
Stream:	**Production and Industrial Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	La Mesa Watershed (LMW) holds significant importance as one of the most vital watersheds in the Philippines. Due to its crucial role in the country's water supply and carbon sequestration, rehabilitation programs had been implemented in the area since 1999. However, more comprehensive measures for planning and implementing reforestation programs are necessary to ensure long-term effectiveness. This study aims to assess the growth dynamics and carbon storage potential of two planted native species in La Mesa Watershed: Pterocarpus indicus and Terminalia microcarpa. The growth performance of these species was characterized by determining its mean annual increment in DBH (MAID) and total height (MAIH). Moreover, their biomass estimates were determined using three allometric equations proposed by Brown (1997) and Chave et al. (2005 and 2014). Finally, their carbon sequestration potential was assessed by computing for their carbon content and carbon dioxide equivalent. Results suggest that the MAID and MAIH of Narra indicate a better growth performance and higher carbon sequestration potential than Kalumpit. Moreover, the most preferred allometric equation for estimating aboveground biomass turned out to be Equation 3 which is the formula most recently proposed by Chave et al. in total height. With this knowledge, future 2014 due to the additional parameter used carbon credit reforestation projects can be more effectively facilitated, enhancing efforts to mitigate the effects of climate change.
Title:	**Analysis of Producers' Investment Decision in the Establishment of a One-stop Shop for Non-Timber Forest Products in Banton, Romblon, Philippines**
Author:	**Fabula, Camille Fabul**
Adviser:	**Predo, Canesio D.**

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Stream:	**Production and Industrial Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	One-stop shop presents a potential solution to the need for more efficient marketing channels and infrastructure for producers to access markets. This study analyzed producers' investment decisions in the establishment of a one-stop shop for non-timber forest products in Banton, Romblon. A total of 128 producers from different barangays in Banton were interviewed face-to-face. Interval regression analysis was used for the identification of factors influencing investment decisions of the respondents. Results showed that 49 producers were satisfied with the existing type of market for NTFPS. Due to insufficient information and promotion regarding a one-stop shop, only 25 producers were familiar with the concept. Moreover, most NTFP producers had a positive attitude and perception toward a one-stop shop. Furthermore, 81 producers were willing to invest in the establishment of a one-stop shop. Additionally, high establishment cost, low income, and satisfaction with the existing market were the reasons of the respondents who were unwilling to invest. Interval regression analysis indicated that willingness to invest in the establishment of a one-stop shop increased with producers' satisfaction with income from the existing market and likelihood to support. Meanwhile, as age increased, willingness to invest decreased. Thus, to improve the market for NTFPs in Banton, the local government should initiate the dissemination of information and promotion of NTFP production through education and economic incentives.
Title:	**Impacts of Land Use Land Cover Changes in Angat River Basin on Floodline in Hagonoy, Bulacan, Philippines**
Author:	**Fajardo, Eden Joy Dela Pasion**
Adviser:	**Racelis, Diomedes A.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	This study explores the ramifications of land use and land cover changes within the Angat River Basin on flooding dynamics in Hagonoy, Bulacan. Spanning the years 2016, 2021, and

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	projecting scenarios for 2031, the research delves into the evolving relationships between land use alterations, rainfall patterns, runoff intensities, and resultant flood risks. The investigation reveals significant transformations in land cover categories, with built- up areas expanding from 13.66% in 2016 to 16.83% in 2031. Conversely, forest cover decreases from 76.15% to 71.62%, raising concerns about the region's water absorption capacity. These shifts align with projections of heightened rainfall intensities in 2031, ranging from 24.8 mm to 60.42 mm. The correlation between land use types and runoff unveils intricate dynamics. Urbanized areas exhibit substantial runoff potential, while forests display minimal runoff, emphasizing the importance of considering land use in understanding hydrological dynamics. The sustained increase in runoff values from 95.79 mm to 215.56 mm further underscores the potential exacerbation of flood risks. In 2031, the flood risk assessment categorizes areas into low, moderate, and high susceptibility. Results indicate a substantial impact on Hagonoy, covering a significant portion of the municipality. The study underscores the interconnectedness of hydrological dynamics and flood susceptibility, urging proactive measures. Key values include the expansion of built- up areas, the reduction in forest cover, and the projected increase in rainfall and runoff intensities. The comprehensive analysis contributes valuable insights for disaster risk management, urban planning, and sustainable development. This study underscores the imperative need for integrated watershed management and land use planning to mitigate the potential adverse effects of land use changes and urbanization on flood risks in downstream areas, particularly in Hagonoy, Bulacan.
Title:	**Analysis of the Carrying Capacity of Nature-Based Activities in Pandin Lake, San Pablo, Laguna, Philippines**
Author:	**Faundo, Anne Margarett Perez**
Adviser:	**Visco, Roberto G.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The study analyzed the carrying capacity of the nature-based ecotourism activities at Pandin Lake, San Pablo City. This was done by the quantitative description of the nature-based activities

	using Boullon's Carrying Capacity Mathematical Model. It focused on carrying capacity estimates through psychological, economic, and socio- cultural considerations. Tourist visitation data were collected using questionnaire-based interviews with 100 respondents in April, May, and August 2023. Swimming and floating cottage rides are the most popular activities on the lake. Basic Carrying Capacity (BCC) resulted in 64 tourists in the floating cottage ride and 4,127 tourists for swimming per day. Potential Carrying Capacity (PCC) resulted in two portions for the weekend and weekday tour, the floating cottage ride having 256, and 320 tourists while 16,508, and 20,635 tourists for swimming per day. The limited number of floating cottages, extreme weather conditions, and crowding were the limiting factors for floating cottage rides. Meanwhile, lack of facilities, the limited number of life jackets, and accessibility, were the limiting factors for swimming activities. The computed Real Carrying Capacity (RCC) based on limiting factors were 139 and 1677 tourists for weekdays, and 174, and 1677 tourists for weekends for swimming, and floating cottage rides, respectively.
Title:	**GIS-Based community Mapping and Hazard Exposure Analysis of Mts. Palay-palay Mataas na Gulod Protected Landscape, Cavite, Philippines**
Author:	**Florece, Francis Emmanuel Gamboa**
Adviser:	**Dida, Jan Joseph V.**
Stream:	**Production and Industrial Forestry**
Access:	**Restricted**
Type:	**Thesis**
Abstract/Executive Summary:	Previous studies in Cavite have primarily focused on waste loading analysis for the Maragondon River, particularly in Barangay Sapang IV-I, Ternate, Cavite, using chemical hydrographic data and GIS (Pareja, M. C, 2015) Moreover, traditional mapping techniques have proven inadequate due to their time-consuming and costly nature, as well as their inability to capture spatial and temporal changes effectively (Verma and Garg 2019). The study developed a GIS-based hazard exposure analysis for the protected landscape, which incorporated community input through community mapping This includes the creation of a community map that integrated local knowledge and insights and constructed an exposure database from community-generated data and Gits outputs. The study provided a detailed understanding of hazard spatial distribution on the

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	landscape and communities. This methodology ensured the inclusion of local insights, which enhanced the accuracy of hazard assessments and supported informed decision-making for disaster risk reduction and sustainable land management. The GIS-based hazard exposure analysis revealed that there are no active fault lines within the protected landscape, with the nearest fault located 40 km away. Regarding erosion susceptibility, the landscape was classified into two categories areas vulnerable to slight erosion and areas with no apparent erosion Landslide exposure was categorized into three classifications: very low, low, and moderately high. Community mapping efforts identified 17 hazard occurrences within the protected landscape, including 11 landslides, 3 rock falls, 2 mudslides, and 1 ground instability event These hazards were further classified by intensity, with 9 categorized as very high intensity, 3 as high intensity, 4 as medium intensity, and I as low intensity Participants also mapped 23 exposure units, divided into urban use areas, critical point facilities, and natural resource-based production areas. The urban use areas encompassed 60.85 hectares and included 4 residential and 12 tourism classifications Critical point facilities covered 15.23 hectares, including 2 government offices, I school, and I water. Participants also mapped 23 exposure units, divided into urban use areas, critical point facilities, and natural resource-based production areas. The urban use areas encompassed 60.85 hectares and included 4 residential and 12 tourism classifications. Critical point facilities covered 15.23 hectares, including 2 government offices, 1 school, and I water supply facility. Natural resource-based production areas totaled 30.05 hectares, comprised of 2 agricultural sites and I forest area. The findings highlighted the crucial role of integrating GIS-based community mapping with participatory methods to effectively understand and mitigate hazards, emphasizing the importance of incorporating indigenous knowledge and community perspectives.
Title:	**Carbon Stock Estimation of Peatland in Tan-ag Ilaya, Lopez, Quezon, Philippines**
Author:	**Forlales, Allainess Rosette T.**
Adviser:	**Dida, Jan Joseph V.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**

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Abstract/Executive Summary:	Peatland is a type of wetland characterized by the accumulation of partially decomposed organic matter, storing large amounts of carbon over thousands of years. This ecosystem plays a crucial role in mitigating climate change by acting as a carbon sink. However, peatlands are increasingly threatened by land-use changes and human disturbances. Among the 24 identified tropical peatlands in the Philippines, one is the Tan- ag Ilaya Peatland. This study estimates the carbon stock of Tan-ag Ilaya Peatland in Lopez, Quezon to assess its potential as a carbon sink and provide baseline data for conservation efforts. Field surveys and allometric equations were used to measure carbon pools, including aboveground biomass, belowground biomass, and soil organic matter. A tree inventory recorded 22 individuals with a DBH >10 cm, resulting in an estimated aboveground biomass of 28.56 Mg/ha and belowground biomass of 50.60 Mg/ha. Soil organic matter stored the largest amount of carbon at 528.81 Mg/ha. The total carbon stock of Tan-ag Ilaya Peatland was 506 Mg C/ha, which is lower than other tropical peatlands due to differences in peat depth, vegetation, and land-use history. These findings highlight the need for conservation and sustainable management to prevent carbon loss and enhance sequestration potential. This study serves as a foundation for future research and policymaking, supporting the protection of peatlands as essential carbon reservoirs and promoting their sustainable management.
Title:	**Developing a GIS-Based Prioritization Technique of Sub-Watershed for the Management of Mount Makiling Forest Reserve, Philippines**
Author:	**Gaddi, Giovanni Sto. Tomas**
Adviser:	**Tiburan, Critino L., Jr.**
Stream:	**Environmental Forestry**
Access:	**Restricted**
Type:	**Thesis**
Abstract/Executive Summary:	This study presents the ranking of sub-watersheds within the Mount Makiling Forest Reserve (MMFR) for its sustainable management using GIS-based approaches and spatial techniques. The prioritization and ranking are mainly based on morphometric analysis, LULC change analysis, and soil loss analysis. The criteria used for prioritization include the weighted sum average for morphometric analysis, the remaining forest cover for the land use and land cover change analysis, and the

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	annual soil loss for the erosion- based analysis. Finally, the three spatial-based methods are then combined to determine the overall prioritization ranking of sub-watersheds. Based on the results of the morphometric analysis, the Tighi sub-watershed was identified as the priority due to its low compound parameter value indicating high susceptibility to erosion. In terms of LULCC analysis, the Cambantoc sub-watershed was found to be of high priority because of the low percentage of canopy cover (49%), indicating the need for rehabilitation. And lastly, according to the results of the annual soil loss analysis, the Tigbi sub-watershed still recorded the highest potential annual soil loss according to the weighted score based on annual soil loss in tons per hectare per year, which signifies the need to develop measures for abating erosion in the area. Both the Tighi and Greater Sipit sub-watersheds got consistently high ratings for the two spatial-based methods, which would necessitate the need for a comprehensive and multi-faceted sustainable management plan of the area. The study has demonstrated that using GIS and remote sensing data is effective and efficient, and that it also saves time and resources. The findings underscored the necessity for targeted sustainable management approaches in these high-priority areas to ensure the proper management and protection of MMFR.
Title:	**Prediction of Resin Yield: A Biometric Analysis of Canarium sp. in Gubat, Sorsogon**
Author:	**Gulmatico, Ellainore Mae Letada**
Adviser:	**Codilan, Analyn L.**
Stream:	**Production and Industrial Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Resin is one of the Philippine's economically significant export products, given the country's international recognition as the sole source of globally-traded resin. In the Bicol region, the municipality of Gubat, Sorsogon, is a major producer of resin from pili (Canarium ovatum Engl.) trees. Despite its potential to provide sustainable livelihood for local tappers, pili resin production has not been optimally practiced. Research gap limits farmers' understanding of the dynamics of resin production, hence its economic contribution. This study investigates the relationship between the biometric attributes of pili trees and

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	their resin yield in Gubat, Sorsogon. It aims to determine how tree height (TH) and diameter-at-breast height (DBH) influence resin production to develop a regression model for predicting resin yield based on these attributes. Field data were collected from 160 pili tree samples across three study sites: Brgy. Manapao, Brgy. Sangat, and Brgy. Union. Correlation analysis revealed that resin yield is more strongly correlated with DBH (r = 0.884) than with tree height (r = 0.393). Regression models were developed and compared, with two models identified as the most suitable for predicting resin yield. The first model: y = -0.202 -0.017*(TH) + 0.028*(DBH) indicates that shorter trees with larger diameters facilitate higher resin production, likely due to greater resource allocation for defense mechanisms and metabolic activities rather than growth. Alternatively, the -0.363+ 0.027*(DBH) may be used when tree height cannot be second model: y measured. The findings have practical implications in informing better stand management practices to optimize resource allocation and enhance sustainable resin production in Gubat, Sorsogon.
Title:	**Assessing Land Cover and Carbon Dynamics in La Mesa Watershed, Philippines**
Author:	**Gumabay, Bon Haley Rellama**
Adviser:	**Dida, Jan Joseph V.**
Stream:	**Production and Industrial Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	La Mesa Watershed is a major watershed in Metro Manila that serves as the carbon sink responsible for absorbing carbon emissions of the area and is the source of domestic water for the residents in the region. However, the degradation of La Mesa Watershed has been attributed to various anthropogenic factors such as urbanization and land use practices. In 1999, its forest land cover density had lost 75% as stated by the ABS-CBN Foundation, Inc.. The study aims to evaluate land cover dynamics in the La Mesa Watershed Reservation on utilization of remote sensing data focusing on the land cover changes. The study used Landsat satellite data from 2005, 2010, 2015, and 2020 to track land cover changes in the watershed. The TerrSet 2020's Land Change Modeler (LCM) was used to analyze the data and project a future scenario for 2030. There was a significant trend in forest land density from 1228.91 hectares to

	2012.75 hectares. Using the InVEST Carbon Stock and Sequestration Model, the study analyzed carbon stock dynamics from 2020 to 2030. Comparing the land cover of 2020 to the projected land cover of 2030, the study found an increase in carbon stock volume due to the increased forest cover, from 1,051,396.40 Mg of carbon to 1,087,065.15 Mg. The generated future scenario of 2030 can be a foundation for practical applications for enhancing land management planning. Continuous monitoring and evaluation are essential to achieve long-term ecological and conservation objectives.
Title:	**Enhancing Microclimate Resilience: A Comprehensive Study on the Influential Role of Street Trees Along the National Highway in Pila, Laguna**
Author:	**Hombrebueno, Paolo Jerado Conopio**
Adviser:	**Gabriel, Marie Jessica C.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The research focused on how street trees affect the microclimate along Pila, Laguna's national highway, particularly in relation to current road widening and infrastructure projects. The study area included three sections with varying canopy openness: open, sparse, and dense canopies. Within each transect, 20 points were sampled to assess various parameters, including light intensity, air temperature, and relative humidity. Data collection occurred every morning, noon, and late afternoon from April to June 2023. Results indicated that areas with tree cover had cooler temperatures compared to areas with few or no trees. Significant findings include variations in light intensity across different canopy types. In the morning, sparse canopies recorded 17,206.03 lux, while at noon, it reached 50,799.57 lux. Dense canopies ranged from 17,206.03 lux to 51,890.51 lux, and open canopies showed light intensities between 48,529.56 lux and 74,637.85 lux during various times of the day. Air temperature patterns were similar, ranging from 29.08°C in the morning to 38.09°C at noon in sparse canopies, 29.08°C to 36.43°C in dense canopies, and 31.45°C to 36.72°C in open canopies. Relative humidity ranging from 54.95% at noon 80.36% in the morning in sparse canopies, 51.78% at noon and 75.53% in the morning in dense canopies, and 59.59% at noon to 81.32% in the morning in open canopies. Statistical analysis, including Kruskal-Wallis

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	tests, showed significant variations on the different parameters based on canopy openness and time of the day. This emphasizes trees' role in improving the local climate and underscores the need for green infrastructure planning for environmental balance.
Title:	**Urban Green Usage and Perception and its Effects on Users' Well-being: The Case of Ninoy Aquino Park and Wildlife Center**
Author:	**Ibay, Ma. Danella Ysabel Filart**
Adviser:	**Lo, Frechie Belle O.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Urban parks provide both environmental and socio-economic benefits, creating liveable and sustainable cities. Currently, there is a research gap in factors in urban green space management, design, and planning that influence their success in achieving park objectives. A developed urban green space in Metro Manila is the Ninoy Aquino Parks and Wildlife Center (NAPWC) in Diliman, Quezon City. This case study aims to describe NAPWC management in terms of facilities, biodiversity, and developments and to determine the relationship between urban green spaces and visitor quality of life through Key informant three dimensions (physical, emotional, and social well-being), and interviews with management staff were conducted and the transcript was coded through a modified repertory grid. Survey questionnaires relating to park usage and quality of life were administered to 100 park visitors. The results were analyzed using Pearson's correlation through JASP software. It was found that park visitors do not visit NAPWC or other green spaces often enough to garner well being benefits, with over less than 20% of visitors visiting weekly or more frequently. It was found that there was a significant positive relationship between the user's perception of urban green spaces and their well-being across all dimensions. Visitors are also most likely to garner social well-being benefits, such as feelings of connectedness and relationship satisfaction. Thus, visitors' attitudes and perceptions towards green spaces have an effect on garnering well-being benefits. The thematic analysis finds that the park was effectively able to meet its the goals of biodiversity conservation, education and information, and ecosystem services provision. The park exhibited good management strategies that may inform

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	other urban parks in developing countries. The practices and techniques employed in NAPWC may be adopted by other green spaces in the Philippines, especially its commitment to complying with expert advice by foresters, environmental management specialists, and researchers.
Title:	**Floral Inventory of Street Trees Along the Main Road of Barangay Gabriel San Pablo, Laguna, Philippines**
Author:	**Ignacio, Kristoffer Chito Dungca**
Adviser:	**Marza, Ma. Cecilia C.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Practicum Report**
Abstract/Executive Summary:	Barangay San Gabriel is one of 80 barangays in San Pablo City, Laguna. A floral inventory of street trees was conducted along the 3.5-kilometer main road of the barangay which is part of Miguel Leonor Street. A total of 50 street trees were inventoried, and these species belong to 18 genera and 11 families. Family Fabaceae was the most dominant, with 26 tree species, 15 of which are Pterocarpus indicus or Narra. Regarding endemicity, 32 are native species, and 18 are non-native species. Among the street trees present in the area, Adonidia merrillii (palm or tree-like), Pterocarpus indicus, and Nephelium lappaceum are the most vulnerable. Meanwhile, Leucaena leucocephala, Moringa oleifera, and Swietenia macrophylla are invasive species. All street trees are in good condition except for one Moringa oleifera and one Monoon longifolium species. Many street trees are unlikely to fall, but it is vital to take precautions since most trees are near residential houses and commercial spaces (<10 meters). Growth parameters like average crown diameter, tree height, trunk diameter, and tree volume are measured. The lone Acacia confuse tree was the tallest and largest in terms of DBH (diameter at breast height). At the same time, the street tree with the most number of species is Pterocarpus indicus. These healthy Narra trees and other street trees included in this floral inventory make Barangay San Gabriel one of many communities in San Pablo City that has maintained the presence of trees in an urban setting.

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Title:	**Knowledge and Perception on Carbon Sequestration of a Agroforestry Systems of Farmers in Sitio San Joseph, Antipolo Rizal, Philippines**
Author:	**Jara, Aingeala Faye Bonilla**
Adviser:	**Baliton, Romnick S.**
Stream:	**Social Forestry and Agroforestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Agroforestry presents a promising solution to enhance ecosystem services, particularly in the realm of carbon sequestration. However, despite its potential, many farmers lack knowledge and perception of carbon sequestration as one of its ecosystem services for climate change mitigation. Filling this gap, this study explores farmers' knowledge and perception about carbon sequestration as an ecosystem service of agroforestry for climate change mitigation, including factors affecting the two cognitive aspects. Recommendations were outlined for the enhancement of farmers' knowledge and perception, aiming to optimize agroforestry's potential as a sustainable nature-based solution for climate change mitigation. Thirty-one (31) farmers from Sitio San Joseph, Antipolo Rizal, participated in the focus group discussion and key informant interview Convergent parallel mixed-method analysis was employed. Qualitative and quantitative results revealed trends of similarities, discrepancies, and inconsistencies. For the knowledge category, the FGD and KII findings indicated farmers' extensive understanding on agroforestry components and their role on the environment associated with climatic conditions, which parallels the results of the survey. Meanwhile, qualitative and quantitative investigations for perception showed differing trends. The former highlighted more of farmers' awareness on climate change and the latter on their recognition of agroforestry practices' role on carbon sequestration. There is therefore a remarkably high knowledge of farmers on agroforestry components and their environmental benefits, but not necessarily carbon sequestration. Likewise, for the perception category, the study revealed substantial awareness on climate change reality but most farmers struggled to relate it directly to carbon sequestration. Key findings underscore the urgent need for targeted extension programs designed to enhance farmers' knowledge and perception on carbon sequestration as an ecosystem service of agroforestry systems for climate change

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	mitigation. With robust knowledge systems and substantial perceptions among farmers, agroforestry gains a strong foundation for optimizing its role as a climate change mitigation solution through carbon sequestration.
Title:	**Determination of Carrying Capacity of Pagsanjan Falls in Cavinti, Laguna, Philippines**
Author:	**Lapitan, Aura Vida Lapitan**
Adviser:	**Lo, Frechie Belle O.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The Pagsanjan Falls is a well-known tourist destination in Laguna, Philippines, that faces the problem of balancing environmental conservation with satisfying the needs of tourists The research assessed the carrying capacity of Pagsanjan Falls and determined what causes fluctuations in visitor numbers. The RCC (Real Carrying Capacity) values of the site were evaluated through interviews and secondary data analysis, with recommendations for sustainable tourism management strategies being made thereafter. The RCC estimates were calculated into three (3) different values according to the typhoon data for the last five years, typhoon data for the year 2023, and without considering rainfall as a limiting factor, with values of 33, 40, and 81 visitors per day. The findings indicate that tourist counts in Pagsanjan Falls exceed its RCC values, which may lead to degradation of the environment. Limiting factors such as typhoons, rainfall, high temperature, and opening hours refer to constraints that influence the visitation behavior of tourists, which affects both satisfaction levels amongst themselves and their numbers. A survey on crowding perception revealed that most visitors did not feel overly crowded. Although the results showed that visitor numbers might be within acceptable limits, the environmental impact could be still significant. Suggested actions are setting daily limits on tourists, establishing reservations, and introducing different pricings. The implication of the study is that the management authorities of Pagsanjan Falls will be more aware of the carrying capacity of the site to accommodate the visitors without leaving any adverse effects on the environment. The main emphasis the research delivers is the need for joint efforts to preserve the natural and cultural heritage

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	of Pagsanjan Falls alongside ensuring a positive visitor experience for generations to come.
Title:	**Locals' Perception and Awareness about the Importance of Panguil River Eco-Park in the Conservation of Natural Resources in Pangil, Laguna, Philippines**
Author:	**Maas, Alyssa Ashley Alejandro**
Adviser:	**Andrada, Rogelio T., II**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Nature-based tourism has a significant role and great contribution in the economic and environmental aspects of many countries such as providing better employment opportunities, increase in revenue and income for local communities and in the conservation of natural resources worldwide. However, it is often considered as a "double-edged sword" because of the positive and negative impact on the local community and natural resources. The local support and promotion for tourism and conservation of natural resources are successful through the understanding of perceptions of the importance of nature-based tourism viewed and experienced by the local community. This study serves as additional information and knowledge about the importance of Pangil River Ecopark as nature-based tourism in terms of economic and environmental aspects in local community of Barangay Natividad, Pangil Laguna Using a mixed-methods on local households, the researcher assessed the importance of the Panguil River Eco-park and their support and promotion of the conservation of natural resources in Pangil, Laguna. The researcher conducted a face-to- face survey in 251 local households. As a result, the majority of the number of respondents perceived positively, and were highly aware of the importance of the ecopark in terms of economic and environmental aspects. Due to their perceived benefits from the ecopark such as income, livelihood opportunities, and support for local markets, and viewed the positive environmental changes within the barangay caused by the ecopark hence the highest number of respondents supporting and promoting conservation of natural resources in Pangil, Laguna. On the other hand, perceived negative impacts were found such as environmental problems that is needed for necessary actions for sustainable management and improvements, relationships

	between local community and Panguil River Eco-park management and strengthening economic growth and conservation of natural resources.
Title:	**Assessment of Land Cover Change in Pagsanjan, Laguna Using Terrset Land Change Modeler**
Author:	**Melendez, Dundaele Kyle Bayer**
Adviser:	**Dida, Jan Joseph**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	In recent years, land use and land cover changes have been influenced by several factors, these changes presented major challenges in decision makers in terms of sustainable management and planning. Evaluation and prediction of land use and land cover change using spatiotemporal dans are significant for environmental monitoring and better planning and management of land use. This study investigates the land cover changes in the municipality of Pagsanjan, Laguna, over the decade from 2010 to 2020, employing remote sensing techniques and Terret software. It aims to predict how land cover will change in 2030 and 2035, taking into account population growth and its impact on urbanization patiems. It uses several drivers, such as elevation, slope, and distance from highways, to forecast changes in land cover. Terrer's Land Change Modeler Plugin is used for image categorization. It also facilitates expedited examination of alterations in land cover, enabling users to discern patterns and relationships among variables associated with such changes (Rahnama, 2021) Additionally, it possesses the capability to provide analytical insights into the net change and transitional dynamics pertaining to alterations in land cover (Arfase et al., 2003). The findings indicate notable changes in the distribution land cover, such as a reduction in the amount of vegetation and an increase in urban and agricultural regions. The built-up area and bare land are projected to increase in total land area as it has risen by 53.73% and 10.84% from 2000 to 2000. These changes are the results of land conversion, as the vegetation cover and agricultural land decreased by 32.63% and -9.84% respectively from 2020 to 2030. Insights on the past combined with these forecasts offer useful knowledge for resource management, urban development, and environmental

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	preservation. Thus, the conclusion highlights the necessity of constant observation and evaluation in order.
Title:	**Predicting Land Cover Change of Mount Makiling Forest Reserve, Philippines**
Author:	**Melicio, Fernando Lantican**
Adviser:	**Gabriel, Marie Jessica C.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The Mount Makiling Forest Reserve (MMFR) serves as a beacon of biodiversity and ecological value. Renowned for its diverse flora and wildlife, the MMFR has long acted as a key sanctuary for a variety of species. However, the reserve faces increasing pressures from multiple causes of change such as climate change, land conversion, forest degradation, and a growing human population. Hence, this study was conducted to understand the dynamics of land cover change and evaluate the impacts of different scenarios such as the status quo, conservation, and infrastructure development on future land cover change in the MMFR. Specifically, the study analyzed land cover changes that occurred in the area from 2010 to 2015 and explained the impacts of various drivers of change and predicted future land cover for 2025 and 2030. These land cover maps were analyzed using the Land Change Modeler of TerrSet 2020, which was also used to model the future land cover of the forest reserve. The factors used in the model include elevation, slope, distance from roads, distance from built-up, distance from agriculture which were set to static, while road and population density were set to dynamic. The model was validated using the 2020 actual land cover and statistically verified using the VALIDATE tool and VALIDATION panel of the Land Change Modeler. The sub-models used to predict land cover change were status quo, conservation, and infrastructure. These sub-models generated an accuracy rate 64% for the status quo, 83% for the conservation, and 86% for the infrastructure while also obtaining 0.76 to 0.89 kappa indices. Additionally, the status quo generated more hits compared to other sub-models. Projected land cover of the MMFR using the three sub-models revealed that built-up, forest, and agricultural areas will continue to increase until 2030.

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Title:	**Tree Biomass and Carbon Stock of a Mangrove Forest in Barangay Bucao Polillo, Quezon, Philippines**
Author:	**Mendoza, Wendell Moral**
Adviser:	**Reyes, Tomas D., Jr.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The study is about the carbon stock and tree biomass of the mangrove forest of Barangay Bucao, Polillo, Quezon. It looked into the tree richness, biomass and carbon stock of the mangrove forest. Eleven species were represented in the study wherein 345 trees were counted; Avicennia marina was the most common, followed by Bruguiera gymnorrhiza, Rhizophora mucronata and Sonneratia alba. The variety of species composition and tree sizes in the mangrove environment is a manifestation of its biodiversity which is important for ecological resilience of such mangrove ecosystem. Significant differences were found in biomass among the three canopy covers (Bare, Sparse and Dense). Dense canopy stored the most biomass especially in roots and trees having a total biomass of 66,828.15 tons. Carbon stock analysis showed that trees accounted for 23.13% of the total carbon stock while soil carbon accounted for 59.64% of the total soil carbon. Dense canopy areas was found to give highlights on the importance of dense mangrove forests in carbon sequestration. A potential carbon storage of 212,281.07 tons was found in dense areas which is the highest among the canopy covers evaluated in the study. Since dense mangrove canopies contribute a lot in carbon sequestration and biodiversity conservation, the findings emphasize the importance of maintaining and continuing conservation efforts on this type of forest. With a potential of 240,631.88 tons, the mangrove forest in Barangay Bucao has a total carbon stock of 75,326.05 tons which means these ecosystems are critical in promoting ecological health and reducing climate change impacts.
Title:	**Willingness to Pay of Households for Reliable Water Supply in Pangil, Laguna, Philippines**
Author:	**Micosa, Irish Jaece Panganiban**
Adviser:	**Predo, Casenio D.**

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Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Pangil covers most of the total area of the micro-watershed located in the 4th District of Laguna with 52.86% or 2,861.40 hectares. Patches of cleared land or kaingin are located alongside cultivated areas, brush, and shrublands within the watershed. Moreover, past logging activities are also evident in the area as well as charcoal production which signifies the varying level of degradation in the watershed. On top of that, the growing population in Pangil is also a factor contributing to the unreliable water supply in the municipality. Contingent Valuation Method was used in this study to estimate the willingness to pay of households for a reliable water supply and the survey questionnaire was distributed to the 255 household heads residing in Barangay Balian, Sulib, and Isla. Results showed that the key factors that influence the WTP are bid level, education, income, employment, household size, water shortage in the last six months, water supply as a serious problem in the area, and affected livelihood. The mean WTP is Php 117 and Php 100 based on the results of logistic and interval regression, respectively. These suggest that this is the amount the households are willing to pay for reliable water supply in Pangil, Laguna.
Title:	**Vulnerability to Climate Change and Adaptation Strategies of Agricultural Farmers in Selected Barangays of Bulan, Sorsogon**
Author:	**Mohametano, Ave Christine Guañizo**
Adviser:	**Visco, Roberto G.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Climate change in the Philippines has been more evident in recent years, resulting in more frequent and severe weather events that have caused substantial harm to agriculture sector. In Bicol, the province of Sorsogon is prone to climate-related risks such as typhoons, because of its geographical position. Vulnerability assessment offers a critical perspective on

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	Bulaneno farmers' distinctive exposure and risks amidst a shifting climate. This study identifies the socioeconomic, environmental, and institutional factors that make farming communities vulnerable to climate-related shocks allows for targeted efforts to strengthen resilience and improve livelihood security. Household survey and interviews were conducted to 121 farmer respondents across five (5) study sites: Brgy. Beguin, Brgy. G. Del Pilar, Brgy. N. Roque, Brgy. San Juan Bag-o, and Brgy. San Ramon. The study uses a mixed-methods approach, combining quantitative household surveys to measure socioeconomic vulnerability and exposure to climate hazards with qualitative interviews to gain deeper insights into household experiences and coping mechanisms in Bulan, Sorsogon. After computing the overall vulnerability index, all five selected barangays fall under the moderate vulnerability category. Moreover, based on the regression model analysis it was determined that factors such as education, household size, and technology significantly influence farmers' susceptibility to climate-related risk while factors such age, income, house area, and farm area did not have a significant influence. It was also revealed that most adaptation strategies of farmer respondents are directed on typhoon, flooding, and flashflood occurrences since these are what they commonly experienced.
Title:	**Urbanization and Land Surface Temperature of the Kalaklan River Watershed, Philippines: A 30-year temporal and Correlation Analysis Using Google Earth Engine**
Author:	**Montañer, Jared Simon Ocampo**
Adviser:	**Dida, Jan Joseph V.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The dynamic interplay of urbanization and its environmental impact has become a focal point for global concern. Numerous studies have been conducted associating urbanization and land surface temperature (LST), which is a crucial indicator in various geosciences. The Kalaklan River Watershed envelops the Subic Bay Freeport, which has undergone a significant growth in urbanization in recent years. Hence, it is crucial to determine the trends and correlation between the urbanization and LST of the watershed. Urbanization was quantified using the normalized difference built-up index (NDBI) and normalized difference

	vegetation index (NDVI). A temporal and correlation analysis was conducted for the years 1993, 1995, 1997, 1999, 2001, 2003, 2005, 2011, 2013, 2015, 2017, 2019, 2021, and 2023. Landsat level 2 imagery underwent processing using Google Earth Engine (GEE) in order to generate NDBI, NDVI, and LST datasets. Generated datasets were then analyzed using Pearson's correlation coefficient (r). Results from NDBI data, in conjunction with a strong positive correlation between maximum NDBI with moderately strong positive correlations between mean and maximum NDVI and and time (0.91), indicate an increase in urbanization over 30 years. NDVI data, along time (-0.74 and r=0.50 respectively), indicate growth in vegetation cover and density as well. Results from LST data indicate a slight increase in mean LST over 30 years. Correlation analysis resulted in a strong positive correlation for NDBI and LST, a strong negative correlation for NDVI and LST, and a strong negative correlation for NDBI and urbanization and vegetation cover in the watershed only caused a minimal increase in NDVI. Thus, NDBI and NDVI are both associated with LST. The increase in both LST from 1993 to 2023.
Title:	**Attitude and Perceptions of the Youth on Forest Conservation, Degradation, and Deforestation in Rodriguez, Rizal, Philippines**
Author:	**Morada, Caressa Mae Loma**
Adviser:	**Gabriel, Marie Jessica C.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Despite ongoing conservation efforts, the Philippine forests are still threatened by forest degradation and deforestation due to various human activities and natural disasters. The study focuses on the youth of Rodriguez, Rizal where they play pivotal roles in helping in the conservation and preservation of the rich forests of Southern Sierra Madre Mountain Range. The research employed a mixed-methods approach to determine the youth respondents' attitudes and perceptions toward conservation, degradation, and deforestation, utilizing survey research to gather data on demographic profiles, awareness, attitudes, and participation of youth aged 15 to 24. Findings reveal a high level of active participation (84.88%) among the youth in environmental

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	conservation initiatives, indicating positive outcomes. However, challenges such as awareness gaps, unsustainable practices, and governance issues persist. The study recommends targeted awareness campaigns, skill-building programs, strengthened governance mechanisms, sustainable development initiatives, collaborative partnerships, educational workshops, and a monitoring and evaluation system. By addressing these challenges and building on positive findings, the study aims to inform evidence-based strategies and interventions for impactful contributions to forest conservation and environmental sustainability in Rodriguez, Rizal.
Title:	**Terrain Impacts of the Normalized Difference Vegetation Index (INDVI) in General Nakar, Quezon, Philippines Using Time-Series Landsat Satellite Imagery**
Author:	**Ola, James Clierick Acula**
Adviser:	**Gabriel, Marie Jessica C.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	This study examines how terrain characteristics influence the Normalized Difference Vegetation Index (NDVI) using Landsat satellite images from 2003 to 2024. Temporal analysis using the Mann-Kendall Test revealed a moderate positive correlation between time and vegetation cover, but it was not statistically significant, suggesting the trend might be incidental. Sen's slope analysis indicated a slight positive trend in NDVI values, indicating minimal change in vegetation density over time. This contrasts with other studies reporting declines in forests and increases in brushland, likely due to climate and land cover changes. The study extensively analyzed terrain parameters-slope, elevation, and aspects from Digital Elevation Model (DEM) imagery of General Nakar- to understand their impact on vegetation density. It found a strong correlation between NDVI and terrain features, with areas of moderately steep slopes, moderate elevation, and east or west-facing aspects showing higher NDVI values and denser vegetation. These results emphasize the significant influence of terrain on NDVI through ecological factors, essential for accurate vegetation monitoring. Furthermore, the study compared Global Ordinary Least Squares (OLS) and Local Geographically Weighted Regression (GWR) models to analyze the NDVI-terrain

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	relationship. Both models indicated statistically significant correlations, but the Local GWR model generally provided a better fit with higher R2 values, highlighting spatial heterogeneity. The Global OLS model, with lower AIC values, suggested a simpler, more robust approach assuming uniformity. Spatial regression coefficients varied widely, with elevation showing stronger correlations in higher zones, emphasizing its role in vegetation variability. These findings highlight the importance of localized modeling in environmental studies to capture spatial variations essential for accurate predictions and effective management strategies.
Title:	**Assessment of Vegetation Succession and Soil Properties in Landslide-Affected Areas in Mankayan, Benguet**
Author:	**Oyales, Stephen Kent Javier**
Adviser:	**Padrones, Jenielyn T.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The occurrence of landslides is triggered by natural and anthropogenic factors that change the soil properties and vegetation cover of a certain area. Secondary succession, which naturally regenerated plants in the landslide regions, results from these disruptions. Consequently, the amount of vegetation cover grows over time. Additionally, vegetation provides services such as enhancement of the qualities of the soil, which could lessen the risk of landslides. This study looked into the temporal analysis of the areas impacted by landslides in three locations in Mankayan, Benguet, between 2019 and 2023. The undisturbed core method, hydrometer method, and potentiometric method were used to examine the pH, bulk density, and texture of the soil, respectively. Edaphic factors in the sites include acidic soil from 2.47 to 5.37 with loamy sand, sand, and sandy loam soil texture type, all are within the acceptable range for the growth and development of plants. The variations in vegetation density during four years were calculated using the normalized difference vegetation index, which showed an increase in the density of vegetation. The findings indicated that Faccinium sp. was the most abundant species in the Palasaan-Suyoc landslide area, and they thrive in acidic soil. The Copcopit study site with a recent slope failure, has a density of 47 species. Study sites in Copcopit and Taneg with previous landslide occurrences

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	exhibited an increase in species richness and density. The principal component analysis presents the positive correlation of bulk density to vegetation as compared to soil pH. The vegetation and soil properties have significant relation in landslide-affected areas in terms of bulk density, species density, and Shannon Diversity.
Title:	**Agroforestry Farming System Design in Barangay Taneg, Mankayan, Benguet, Philippines**
Author:	**Pagaduan, Michael Allan Abadan**
Adviser:	**Baliton, Romnick S.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Practicum Report**
Abstract/Executive Summary:	Agroforestry farming combines agriculture, pasturage, and woody perennials in the same area to improve the farming system by maximizing the positive interaction between components. The practicum was conducted in Baranggay Guinaoang, Mankayan, Benguet. The study aims to identify and characterize the different components and farming practices in the area, and create an agroforestry farm design that can be used as a model for the promotion of agroforestry in the area. The study will provide a baseline information on the potential of incorporating agroforestry practices in the farming system of the area. Agroforestry interventions, along with annual, and perennial plants were recommended for the farm. Species were recommended based on climatic, edaphic, and soil characteristics of the area. For the annual crops, corn, celery, onion, sayote, carrots, lettuce, and snow pea were recommended. For the annual plants, coffee, orange, ipil-ipil, and alnus were selected. Windbreaks composed of alnus will be established around the farm. The ipil-ipil will serve as live trellis and also as a source of nitrogen for the soil. Orange was selected as a mean to protect the terraces from erosion. According to Mr. Bao-idang, on average he earns about 70,000Php to 80,000Php per harvest or about 140,000Php to 160,000Php annually. With the implementation of the Agroforest farm plan, the productivity in terms of revenue and profit of the farm is projected to increase, with a projected annual revenue of 171,425Php during the first year, 204,125Php for the second up to the fourth year, and

	559,260Php for the fifth till the tenth year when coffee and orange becomes productive.
Title:	**Assessment of Operations and Management of Bataan Natural Park Using the Ecotourism Tracking Tool**
Author:	**Parbo, Jonathan Angeles**
Adviser:	**Lo, Frechie Belle O.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The Bataan Natural Park (BNP) is a protected area that ventures the possibilities of ecotourism through implementing various activities and facilities. The primary objective of this study is to assess the operations and management of BNP, identify the rooms for improvement, and recommend ways to improve such aspects. Hence, this study utilizes the Ecotourism Tracking Tool that is formulated by the Department of Environment and Natural Resources - Ecosystems Research and Development Bureau. Specifically, the management and operation criteria were adapted together with its 11 sub parameters in conducting the assessment of this aspect in the protected area. The researcher identified six key informants originating from the different sectors that are directly involved in the management and operation of the site. Consequently, most of them are from the Protected Area Management Office while the other is from the people's organization, which are also members of the Protected Area Management Board. Consequently, BNP received an overall average weighted rating of 8.89%, which is classified under moderate certification for the effectiveness of operations and management. The four sub parameters which require the most improvements are the staff complement, staff training, protection systems, and the information, education, and communication campaigns. Furthermore, several recommendations are suggested for each sub-parameter, specifically to increase the budgeting and recalibrate the staffing pattern of the BNP, among others. Thus, these strategies may help in enhancing the existing operations and management of BNP to protect the biodiversity, preserve its environment, and conserve its natural resources through utilizing ecotourism endeavors.

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Title:	**The Tourist Recreational Value of Sampaloc Lake, San Pablo City, Laguna Philippines**
Author:	**Pascua, Alliana Marie Edizor**
Adviser:	**Carandang, Vida Q.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Sampaloc Lake, situated in San Pablo City, Laguna, Philippines, is a popular recreational destination offering a range of activities such as sightseeing, walking, jogging, biking, picnicking, and more. Despite its popularity, the lake's recreational potential remains underdeveloped. This study aims to determine the recreational value of Sampaloc Lake using the individual travel-cost method (ITCM), a method that considers the expenses and socio-economic characteristics of individual visitors to the site. The Poisson regression model and zero-truncated negative binomial regression model were utilized to analyze the data. The goodness-of-fit test and comparison of AIC and BIC revealed that the zero- truncated negative binomial regression model was the best-fit model for the data. Using the zero-truncated negative binomial regression model, the recreational value of Sampaloc Lake was determined. The annual recreational value of Sampaloc Lake with and without the opportunity cost of time is at Php 1,597,835,602 and Php 5,169,442,748, respectively. If improvements are made on the site, the result revealed that the annual recreational value with and without the opportunity cost is at Php 4,275,321,629 and Php 8,842,178,605, respectively.
Title:	**Initial Investigation on the Effects on Weeding in the Abandoned Rubber Plantation at CNFR, UPLB**
Author:	**Petil, Esven Angelu**
Adviser:	**Marza, Ma. Cecilia C.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**

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Abstract/Executive Summary:	Weeding, much like other practices, is essential for forest and plantation management. However, the impacts of weeding and subsequent slash treatment on carbon dynamics and soil properties remain to be underexplored. To understand the effects of weeding and the utilization of the slashed materials as mulch, an initial investigation in the abandoned rubber plantation within the College of Forestry and Natural Resources, University of the Philippines Los Baños was conducted accordingly. The area was selected since it was neglected for almost 10 years with only a few human interactions, thus leaving the site occupied by other vegetation aside from the intended tree crop, Para Rubber (Hevea brasiliensis). The soil sampling was conducted in two different periods, at the start of the weeding application in October 2023 and at the end of the weeding application in January 2024. In each sampling, a total of 24 undisturbed core samples and 12 disturbed samples are collected from the depths of 0-20 cm and 20-50 cm; half of which are from the weeding and the other are from the no-weeding plot. In the end, it was revealed that the application of weeding did not have a significant effect on the soil organic carbon in the area. Soil moisture content increased during the study but was not statistically significant. Soil bulk density also increased with weeding activity but was not statistically significant. However, it was noted that such results might have been affected by factors such as climatic conditions, and the duration and intensity of the conducted weeding. Following these regards, it is recommended for future research to consider the other factors that were not explored during the study.
Title:	**Mapping of Potential Groundwater Recharge Sites in Mt. Isarog Natural Park, Camarines Sur, Philippines**
Author:	**Pongpong, Alayne Maria Clara Peñano**
Adviser:	**Tiburan, Cristino L., Jr.**
Stream:	**Environmental Forestry**
Access:	**Restricted**
Type:	**Thesis**
Abstract/Executive Summary:	Groundwater is a vital natural resource widely utilized in different fields like agriculture, domestic, food industry, manufacturing, and other industrial applications, among many others. This study primarily investigates groundwater recharge potential in Mt. Isarog Natural Park by analyzing eight (8) thematic layers namely slope, elevation, land cover, soil texture,

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	drainage density, rainfall, depth to groundwater, and electrical conductivity. These factors were evaluated by selected experts to determine their relative weights in the model using the Analytical Hierarchy Process (AHP), one of the multi- criteria decision approaches. The AHP analysis prioritized factors influencing groundwater recharge, highlighting rainfall as the most influential followed by land cover and soil texture, while electrical conductivity ranked the least significant. The generated groundwater recharge map revealed that most of the areas within Mt. Isarog Natural Park exhibited a high potential for groundwater recharge. This is mainly attributed to favorable conditions such as high soil permeability and adequate rainfall. Municipalities within the area of the natural park with moderate potential are Calabanga, Naga, Pili, and Ocampo while Goa and Tigaon have notable areas with high potential. Additionally, most areas with low groundwater recharge potential are in the flat terrains of Naga City which is within the 5-km radius of the natural park. These areas are characterized by a high level of industrialization which significantly affects the area's groundwater recharge capacity. The results of the study suggest that the integration of GIS into groundwater mapping is crucial for stakeholders and policymakers, as it assists in visualizing potential groundwater recharge sites in the area that may require appropriate intervention in the future.
Title:	**Assessing Physical Properties in Various Land Use/Land Cover Classifications in Rain Induced Landslide Sites in Sagnay, Camarines Sur and Tiwi, Albay Philippines**
Author:	**Quedilig, Allyzza Veronica Plata**
Adviser:	**Padrones, Jenielyn T.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The assessment of soil physical properties in landslide-prone areas is essential in the science-based management of land use/land cover (LULC) for the identification of suitable areas for development and for corrective measures related to landslide mitigation. The study investigates the relationships between soil physical properties of rain-induced landslide sites, their correlations, and differences in the context of LULC. This study focuses on sites within Sagñay, Camarines Sur and Tiwi, Albay wherein the occurrences of landslides were triggered by Tropical

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	Depression Usman in 2018. The study site has 3 identified LULC categories: grassland, brushland, and built-up areas. This study employed a random sampling approach and standard measurements for soil physical characteristics was carried out. Results revealed variations in soil physical properties between different LULC. Brushland recorded the highest values for bulk density, plastic limit, and sticky limit. Meanwhile, built-up recorded the lowest bulk density, plastic limit, and liquid limit, and the highest porosity. The dominant soil textural class among the samples is sandy clay loam. The correlation of soil physical properties revealed significant positive correlation between % silt and liquid limit, % clay and Plasticity Index, and % silt and plastic limit. On the other hand, there is a strong negative correlation between % silt and Plasticity Index. Moreover, the study identified that there is a significant difference between PL and PI among the different LULC classification in the rain-induced landslide sites in Sagñay and Tiwi. However, the other soil physical properties such as densities, porosity, and textural composition did not exhibit significant differences among the LULC classifications. This study provides additional information on the relationships between and among soil physical properties in the context of LULC.
Title:	**Aboveground Biomass Estimation of Canarem Lake Bird Sanctuary in Victoria, Tarlac, Philippines**
Author:	**Quijano, Kyle Joseph Gozum**
Adviser:	**Dida, Jan Joseph V.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The Canarem Lake Bird Sanctuary in Victoria, Tarlac is a 116-hectare wetland that gives refuge to endemic and exotic avian birds throughout the year. Aside from providing shelter, the trees and other vegetation in the area aid in carbon sequestration and store carbon in their biomass acting as carbon sinks. However, threats from human activities such as land conversion and development pose a threat to the bird sanctuary. To aid in the creation of responsive policies and strategic management plans for the area, a proper understanding of the site and the vegetation is needed. Aboveground biomass (ABG) estimation using allometric equations and remote sensing was

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	conducted to determine the total ABG stored in the area. Tree inventory revealed a total of 478 individual trees which belong to fourteen species and can be divided into seven families, with Leucaena leucocephala as the most frequent species followed by Samanea saman. Oryza sativa L. was the only crop planted and Bambusa vulgaris and Bambusa blumeana are the bamboo species present. Depending on the allometric equation used, the total ABG of the area was 882.47 tonnes (Brown) and 934.52 tonnes (Chave). Trees belonging to higher diameter classes (>60 cm) showed higher estimated ABG values as compared to lower classes. The ABG values for annual crops and bamboo were just rough estimates, hence, future biomass studies in Canarem Lake Bird Sanctuary should utilize more accurate methods in quantifying the ABG of other vegetation. Regardless, protection and conservation of important areas such as the Canarem Lake Bird Sanctuary should be prioritized for its role as an essential habitat for wildlife and as a carbon sink in addressing climate change.
Title:	**Assessment of Landslide Events in Mt. Makiling Forest Reserve, Philippines Using Random Forest (RF) and Support Vector Machine (SVM) Models in Google Earth Engine**
Author:	**Quilloy, Jheilon Lunaria**
Adviser:	**Reyes, Tomas D., Jr.**
Stream:	**Production and Industrial Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	In the Philippines, predicting and delineating landslide events are frequently utilized in management planning. Still, few studies used Google Earth Engine (GEE) as the primary platform for evaluating areas susceptible to landslides in the country. The study aims to delineate landslide prone areas of Mt. Makiling through Google Earth Engine using Random Forest (RF) and Support Vector Machine (SVM) learning algorithms. Approximately 108 total landslides and non-landslide areas were acquired from Project LIGTAS and generated using ArcGIS Pro. Sentinel-2 satellite images were used to generate indices imported to GEE and combined with different thematic layers. Following the variable importance chart results, distance to roads was the most important, while distance to rivers was the least important factor for predicting landslide occurrence. Confusion matrix findings revealed that the RF model had a training and

	testing accuracy of 98.17% and 81.82%, respectively. Alternatively, the SVM model accuracy is lower, only attaining 88.16% and 78.13% for training and testing, respectively. Similarly, the ROC-AUC values of RF also attained higher results when compared to the SVM model, so its Kappa Hat statistic value reached above 60%. Landslide susceptibility maps were generated using LSI, aggregation techniques, and reclassification to five (5) distinct classes. Results revealed that the RF model predicted a significantly larger portion of MMFR as highly susceptible (very high) to landslide events than the SVM model (24.12% > 22.37%). However, both maps produced considerable results, attaining accuracy above 75% and generally displaying similar landslide location patterns. The generated map can be used to identify, assess, and evaluate the different landslide-prone areas within Mt. Makiling. Furthermore, results can be used to evaluate the potential of using Google Earth Engine to create landslide inventory maps and aid in managing landslide-prone areas in the Philippines.
Title:	**Climate Change Adaptation Strategies of Upland Farmers in Barangay San Cristobal, San Pablo City, Laguna, Philippines**
Author:	**Rioferio, John Patrick Bigoy**
Adviser:	**Baliton, Romnick S.**
Stream:	**Social Forestry and Agroforestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Climate change is currently considered as one of the most challenging global issues because of its negative effects on human lives. This shows that adaptation strategies are necessary especially for farmers to lessen the impacts of climate change. While there are studies exploring the climate change adaptation strategies of farmers, there are less studies that considered the factors affecting the farmers' decision when adapting to climate change. This study examined farmers' perceptions, attitudes, and understanding towards climate change, as well as their adaptation strategies, barriers to adaptation, and the socioeconomic factors influencing the adoption of adaptation strategies. The findings of this study revealed that most of the farmers are well aware of climate change and its adverse effects. Farmers perceive climate change to affect farm production, lead to unpredictable rainfall patterns, and an increase in the temperature. Furthermore, it was found that even the

	socioeconomic status of farmers is not significant to influence their decision in adapting to climate change, it can still be considered by the local government and other organizations when making policies and measures to lessen impact of the adverse effects of climate change to the farmers of Barangay San Cristobal.
Title:	**Ecological Trail Assessment at the Makiling Botanic Gardens in Los Banos, Laguna Philippines**
Author:	**Remo, John Angeles Meneses**
Adviser:	**Andrada, Rogelio T., II**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The MBG ecotrail, established in 2013, offers a serene environment rich in native, endemic, and exotic plants. The trail's biodiversity not only enhances visitors' appreciation for nature's beauty but also fosters a sense of responsibility towards conservation. The study assessed the current condition of MBG's scotrail, profiled its users, compared the trail to standard characteristics of an ecotrail, and identified measures for improvement. The researcher utilized a qualitative approach through the use of ecotrail mapping, literature review, and Key Informant Interviews, to understand user preferences, needs, and experiences. Insights gained from the firsthand experiences of users were used to identify improvement measures for the ecotrail. Most visitors are adults aged 16 to 45 years, with more males than females. The most common activities include hiking, bird watching, and nature photography. Despite its positive impact, the trail has room for improvement, such as slippery sections due to moss, obstructions like dead branches, and insufficient signage. Key Informant Interviews were conducted with 20 respondents, including trail visitors, ENTs, and personnel of MBG. The feedback gathered suggests improvements in safety measures, signage visibility, and maintenance These strategies aim to enhance the trail's safety and service to its users while preserving natural habitats and ensuring the trail remains a sustainable recreational resource.
Title:	**Assessment of the Ecotourism Management and Activities in Bicol Natural Park Using the Ecotourism Tracking Tool**

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Author:	**Saños, Tefanny Franzes Matandang**
Adviser:	**Andrada, Rogelio T., II**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Bicol Natural Park (BNP) is a protected area legislated under Republic Act No. 11038 otherwise known as the Expanded National Protected Area Systems (ENIPAS) Act of 2018 that has ecotourism activities within. It is being promoted as one of the ecotourism destinations in the locality with a keen emphasis on providing sustainable livelihood for the community through the management of Ilog-Bahi Resort, Mother Tree, Bitukang Manok, and campsites. To add to the very few studies on ecotourism management in the area, this study assessed the management and activities of selected sites at BNP using the Ecotourism Tracking Tool (ETT) developed by the Department of Environment and Natural Resources - Ecosystems Research and Development Bureau (DENR-ERDB). The results revealed that the BNP earned a rating of 74.9% based on eight parameters: (a) policies, (b) operations management, (c) socio-cultural, (d), ecotourism products and services, (e) economic benefits, (f) financing/enterprise building, (g) bioecological, and (h) facilities. The overall score indicates that BNP has a fair ecotourism adherence. This means that various parameters need improvement, including conducting a carrying capacity study and formulating visitor management strategies in partnership with the local community.
Title:	**Temporal Analysis of NDVI, NDBI, and LST in Quinali Watershed, Albay, Bicol, Philippines**
Author:	**Sarza, Ryan Andre**
Adviser:	**Gabriel, Marie Jessica C.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The Quinali A Watershed (QAW) has multiple environmental and socio-economic functions. However, different activities in

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	the watershed, such as deforestation and urban expansion, made it unsustainable over the years due to the worsened impact of climate change. Hence, this study was conducted to analyze the relationship between vegetation and built-up areas with land surface temperatures using the Normalized Difference Vegetation Index (NDVI), Normalized Difference Built-up Index (NDBI), and Land Surface Temperature (LST) in Google Earth Engine (GEE), enabling an efficient way for processing satellite imagery. Landsat satellite images were acquired during the dry season, particularly from March to May 1993, 1998, 2003, 2008, 2013, 2018, and 2023. Several pre-processing techniques, such as scale factor and cloud masking, were applied to enhance the images before further analysis. Mann-Kendall and Pettit's tests were utilized to determine and validate the changes and trends of the mean values for each parameter used. The study revealed an increasing trend of 0.032 units annually in NDVI and LST and a decreasing trend in NDBI (-0.003 units), with a significant fluctuation in 1998 and 2008. While only the NDVI trend was statistically significant, the original NDBI approach was not a suitable parameter for extracting built-up areas, and the LST was due to the high variability of the data. A significant climatic event impacted the abrupt shift in NDVI and NDBI in 2008 and LST in 1993. Correlation analysis revealed a moderate to strong negative correlation between NDVI and NDBI, a weak to moderate negative correlation between NDVI and LST, and a moderate positive correlation between NDBI and LST, indicating intricate relations between vegetation, urbanization, and temperature. This study highlights the importance of continuous monitoring and understanding of environmental dynamics to support sustainable development, making it an input in helping watershed managers of QAW manage the area sustainably.
Title:	**Comparative Analysis of Agrobiodiversity in Agroforestry Farming Systems: A Case Study of Barangay Baanan, Magdalena, and Barangay Patimbao, Sta. Cruz, Laguna, Philippines**
Author:	**Sastrillo, Princess Joy Marie V.**
Adviser:	**Visco, Roberto G.**
Stream:	**Social Forestry and Agroforestry**
Access:	**General Public**
Type:	**Thesis**

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Abstract/Executive Summary:	Agroforestry is a well-known integrated land use in the Philippines which contributes to improving the livelihood of the farmers while sustaining soil health, water quality, nutrient-cycling, and most specially agrobiodiversity of the agroforestry systems. This study assessed the agrobiodiversity of agroforestry systems in Barangay Baanan, Magdalena and Barangay Patimbao, Sta. Cruz, Laguna, Philippines. It was found out that there are two similar agroforestry systems within the study sites which are the Fruit-tree Based and Vegetable-based Agroforestry System. Coconut (104.74%) and Lanzones (85.89%) are the most important species in Fruit-tree Based Agroforestry System in Baanan while Coconut (117.97%) and Banana (51.61%) were dominant in Patimbao. In terms of Vegetable-based Agroforestry System, Lanzones (179%) and Coconut (33.77%) were the most important species in Baanan while Banana (205.54%) and Coconut (23.25%) were important species in Patimbao. The diversity index of Fruit-tree Based Agroforestry Systems in Baanan and Patimbao are 2.49 and 2.386, respectively indicating that Baanan is more diverse than Patimbao. Both indexes are characterized as having low diversity. Meanwhile, the Vegetable-based Agroforestry Systems in Baanan and Patimbao have a diversity index of 2.201 and 2.085, respectively. Both types of the agroforestry systems in the study sites are characterized as having low diversity. The evenness index of Fruit-tree Based Agroforestry Systems in Baanan and Patimbao are both 0.52 while the evenness index of Vegetable- based Agroforestry Systems had 0.48 and 0.42, respectively. The results of evenness index of both agroforestry systems of Baanan and Patimbao indicates moderate evenness.
Title:	**Analysis of Landuse/Landcover Change Using High-resoluition Satellite Imagery in Candoni, Negros Occidental, Philippines**
Author:	**Segui, Renz Delos Santos**
Adviser:	**Bantayan, Nathaniel C.**
Stream:	**Production and Industrial Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	This study analyzed land use and land cover (LULC) changes in Candoni, Negros Occidental, between 2020 and 2024, which employed high-resolution PlanetScope satellite imagery. PlanetScope achieved a classification accuracy exceeding 90%,

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	providing reliable data for analysis. The findings revealed a notable decline in grassland area, decreasing from 48.32% in 2020 to 44.59% in 2024. Similarly, tree cover exhibited a decrease, dropping from 35.75% to 33.80% during the same period. Conversely, cropland and developed areas demonstrated an increase. Cropland expanded from 15.09% to 19.29%, while developed areas witnessed a rise from 0.46% to 0.94%. Effective natural resource management hinges on identifying areas suitable for specific purposes. This study integrated physical factors including proximity to rivers, roads, and urban areas, slope, and existing land cover to assess land suitability. The analysis identified 3,249.87 hectares (11.41%) as highly suitable for afforestation initiatives. Moderately suitable areas comprised 21,349.50 hectares (72.53%), while 4,818 hectares (16.06%) were deemed unsuitable. Notably, suitable areas tended to be located near rivers and roads, with gentle slopes (0-15% gradient) and a distance exceeding 3 kilometers from any urban areas.
Title:	**Effects of Land Use and Land Cover Changes on Water Quality in Iloilo Batiano Watershed, Iloilo, Philippines**
Author:	**Sorolla, Hanz Lawrenz Endrada**
Adviser:	**Arizapa, Jayson L.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	In Iloilo City, rapid urbanization has led to substantial changes in land use and cover over the past decade. These changes would also influence river dynamics as well as water quantity and quality. Hence, this study explored the effects of changes in land use and land cover and its impacts on water quality of Iloilo-Batiano River Watershed. Seven water quality parameters from 6 different monitoring stations of DENR-EMB were analyzed. All stations for the years 2011- 2023 revealed fluctuations in DO and BOD levels with a significant decrease in TSS level in varying degree among stations. The pH levels also decreased, while temperature varies from one station to another but have generally decreasing trend. The total color units fluctuate in the studied timeframe and a substantial decline in fecal coliform counts was also observed. Random Forest algorithm was implemented in Google earth engine to generate land cover maps of 2011, 2017 and 2022. Notable increase in

	agricultural areas (14.46%) and built-up areas (6.4%) was observed from 2011 to 2022, whilst a decline in forest (1.97%), grass and other wooded vegetations (4.28%), and bare areas (13%). The watershed was divided into two sub-catchments: upper and lower, to better understand the effects of land cover change to water quality. In both catchments, Built-up and agricultural areas was found out to be positively correlated to DO and BOD levels. On the other hand, the decline in TSS is found to have positive correlation to the decline in bare areas. Interestingly, fecal coliform appeared to have weak correlation with any land cover class on all 6 stations. These findings highlight the complexities of land cover's influence on water quality.
Title:	**Soil Physical Properties and its Association to Slope Instability in Landslide Areas along Bicol 30 Highway in Sagñay, Camarines Sur**
Author:	**Taguiang, Joshua Padilla**
Adviser:	**Padores, Jennielyn T.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	This study focuses on the soil physical properties in landslide areas along the Bicol 630 Highway in Sagñay, Camarines Sur that may contribute to slope instability. Sampling was conducted in February, 2024 with Project LIGTAS serving as a map guide while visual observation in the field were methods used to identify landslide sites. Samples were categorized depending on the occurrences of landslides, with four out of the seventeen sites having no landslide occurrences. Physical properties examined were soil color and texture, bulk density, particle density, porosity, and Atterberg limits. The Factor of Safety (FOS) was computed based on the physical properties of soil and topographic attributes of the slopes. Hydrometer, undisturbed core, and approximation methods were used to determine the texture, bulk density and particle density, respectively. Sticky and plastic limit tests and the Casagrande apparatus for liquid limit determination were used for Atterberg limits determination. Most of the samples are sandy clay loam with bulk and particle densities ranging from 0.82 to 1.20 Mg/m3 and 2.23 to 4.01 Mg/m3, respectively. The Atterberg limits such as plastic, sticky,

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	and liquid limits range from 13.44% to 41.69%, 26.56% to 36.19%, and 26.56% to 56.68% respectively. 11 out of the 17 samples have a factor of safety that is less than one indicating unstable slopes for these samples. Correlation analysis of these properties between sites with landslides and without showed insignificant values thus, the areas that currently do not show evidence of slope failure could also be susceptible to landslides, especially during the rainy season.
Title:	**Assessing Growth, Biomass, and Carbon Storage Potential of Planted Native in La Mesa Watershed**
Author:	**Tamondong, Elmar Bon Gonzales**
Adviser:	**Codilan, Analyn L.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The mean annual increment, biomass, and carbon storage potential of two native planted tree species, Vitex parviflora (Molave) and Parkla rimorkana (Kupang), in La Mesa Watershed were measured and estimated. The study involved field data collection to measure tree diameter at breast height (DBH) and total height (TH), use of allometric equations for aboveground biomass estimation, carbon stock, and potential carbon sequestration. While the research provides valuable insights into the ecological contributions of these native species, it also acknowledges limitations related to the use of allometric equations and non-destructive methods for biomass, carbon stock, carbon sequestration, and mean annual increment estimation. This study analyzes the growth dynamics and carbon sequestration potential of Vitex parviflora and Parkia timoriana to understand ecosystem services while supporting decision-making for environmental conservation in La Mesa Watershed as well as sustainable land management practices used elsewhere. Native species such as Parkia timoriana and Filter parviflora can be used for plantation and restoration activities because of their desirable characteristics. Kupang, being a leguminous tree can grow fast, adapts well in its environment and matures within a few decades while Finex parviflora can thrive in harsh conditions. Kupang exhibits bigger DBH resulting to higher biomass. Higher biomass means higher carbon storage and sequestration potential which translates to higher contribution to climate change mitigation.

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Title:	**Valuing Recreational Benefits in Coron, Palawan: An Analysis Using Individual Travel Cost Method**
Author:	**Tan, Princess Marywilliams Gonzales**
Adviser:	**Codilan, Analyn L.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The Travel Cost Method, particularly the Individual Travel Cost Method, is crucial for valuing ecosystem services. This study focuses on Coron Town, aiming to describe visitor profiles, estimate travel costs, develop a demand curve, and propose a management plan. The methodology involved face-to-face interviews with 220 respondents in Coron Town to assess visitors' spending willingness and intent to return, considering travel costs and site value. Distance influenced visit frequency due to higher travel expenses. The demand curve was based on visits from different distances and costs, indicating revisitation likelihood. Island hopping was a key activity, with Coron as the main destination. Income disparities between local and foreign participants led to separate analyses, revealing foreign visitors spent 50.7% more at Php 29,000 compared to local respondents at Php 19,243. Factors like distance traveled, pre-trip expenses, and activities influenced spending. Customer satisfaction was generally high, with cost being a primary concern. Gender differences showed females more likely to return despite increased expenses. Accommodation costs were significant for locals, while transportation was the highest expense for foreigners. The Poisson regression model results indicate the overall recreational benefits for local respondents were Php 9.01 B, while those for foreign respondents were Php 5.45 B. These high valuations demonstrate that both groups value the area, which has a significant impact on resource management. Recommendations include adjusting entry fees, enhancing facilities, and enforcing environmental regulations, as well as promoting recreational opportunities while ensuring long-term resource sustainability.
Title:	**Optimizing Satellite Spectral data Accuracy in Landslide Areas: A Validation Approach Using Handheld Spectrometry in Mankayan, Benguet**
Author:	**Tolentino, JM Emmanuel V.**

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Adviser:	**Reyes, Tomas D., Jr.**
Stream:	**Production and Industrial Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	This study investigated the efficiency of a handheld spectrometer in capturing spectral signatures for the validation of satellite spectral data in landslide-prone areas, as demonstrated in the case of Mankayan, Benguet. The handheld spectrometer's ability to discern distinct spectral profiles was instrumental for aligning ground truth data with expected spectral responses in satellite imagery. This alignment was crucial for refining the accuracy of satellite spectral data, especially in heterogeneous terrains. The deployment of the handheld spectrometer across three study sites effectively characterized diverse media and vegetation, providing valuable insights for natural materials analysis and vegetation differentiation. Categorized data, processed through specialized software, highlighted the significance of trees and low-lying vegetation in the study. Reflectance data analysis revealed distinct trends in vegetation, rock, and soil, emphasizing the spectrometer's capacity to capture spectral signatures ranging from 400 nm to 1050 nm. Furthermore, the study delved into the impact of moisture content on spectral data, uncovering differences between on-site and oven-dried reflectance values. Comparative analysis with Landsat 8 reflectance data underscored nuanced trends, indicating the need for careful interpretation considering the handheld spectrometer's capture limitations. The handheld spectrometer emerged as a robust tool for spectral data capture, offering valuable insights for natural media and vegetation analysis in landslide-prone areas. The study not only contributed to refining the accuracy of satellite spectral data but also emphasized the need for nuanced considerations, such as moisture content, in interpreting spectral data. The findings enhanced our understanding of spectral dynamics in challenging landscapes, affirming the handheld spectrometer's potential as a valuable asset in geological studies and satellite data validation.
Title:	**Carbon Stock of Fruit-tree Based Agroforestry Systems in Liliw and Magdalena, Laguna, Philippines**
Author:	**Urriquia, Lorenzo Antonio Agbulos**
Adviser:	**Baliton, Romnick S.**

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Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Carbon dioxide causes intense global warming and climate change. Poverty in the country has resulted from environmental degradation to the agricultural sector's unproductivity. Agroforestry system technology has the capability of these concerns by supporting environmental conservation while sufficing economic needs. The aim of this study is to determine the carbon stock of fruit-tree based agroforestry systems with distinct components and practices in Liliw, Laguna and Magdalena Laguna. The study measured the different carbon pools of fruit tree-based agroforestry systems, namely: aboveground biomass, herbaceous vegetation, litter, and soil organic carbon. The species components observed in the fruit tree-based agroforestry systems are forest trees, fruit trees, palm, and agricultural crops. The findings indicate that the mean total carbon storage in Magdalena is 119.74 tons/ha and 95.65 tons/ha in Liliw. In turn, soil organic carbon (247.31 tons/ha in Liliw and 428.67 tons/ha in Magdalena) stores the highest carbon storage when collectively aggregated among all farms in the carbon pool. Agroforestry systems in the two municipalities proved to store sufficient carbon stock having larger values as shown by values obtained and scientific articles which can serve as a basis for future research. The results of this study could contribute to the body of science, specifically, in terms of measuring carbon footprints to attain carbon cycle balance and in adopting agroforestry as an effective mitigation practice.
Title:	**Lichen Diversity Pattern Across Multiple Sites in the Mount Makiling Forest Reserve, Laguna, Philippines**
Author:	**Valderrama, Kylie Jewel**
Adviser:	**Tinio, Crusty E.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Lichens, often overlooked and underestimated, are crucial components of ecosystem biodiversity and serve as reliable bioindicators of ecosystem health. This study aimed to identify

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	lichen species, determine their frequency, richness, and assess their distribution and diversity pattern across different substrates and sites within the secondary climax growth forest, Mount Makiling Forest Reserve (MMFR). Five (5) sampling sites within the Cambantoc, and Molawin-Dampalit watersheds of MMFR were selected and surveyed using the transect and plot methods, where each site was divided into three 5x5 meter plots along 100 meter belt transects. Lichens were photo-documented and identified up to the genus level through morphological identification, using secondary resources and image comparisons. An incidence matrix was used to analyze lichen distribution across substrates and sites, Shannon-Wiener's diversity index assessed lichen diversity, and Principal Component Analysis (PCA) visualized lichen patterns across sites. A total of 28 lichen species, representing 14 families, were identified. Dominant species included Cryptothecia sp. (with 13 occurrences), Lepraria sp. (12 occurrences), Pertusaria sp. and Phlyctis argena (both with 11 occurrences), with Graphidaceae, Ramalinaceae, and Lecideaceae being the most represented families. Crustose lichens were the most prevalent growth form, likely due to factors such as low altitudinal gradients in the sampled sites, the presence of preferred microhabitats or substrates, and their longevity. Agroforestry areas demonstrated the highest diversity, with a Shannon diversity index of 2.538787. This study identified significant variations in lichen diversity across different sites within MMFR, with distinct patterns influenced by microhabitat types and substrate characteristics. Sites with specific substrate types and favorable environmental conditions showed higher species richness and diversity. These findings highlight the need to conserve diverse microhabitats within MMFR to support unique lichen communities.
Title:	**Estimation and Validation of Carbon Stock and Sequestration of Palico Watershed in Batangas, Philippines Using InVEST**
Author:	**Villavicencio, Tim Humphrey Solano**
Adviser:	**Dida, Jan Joseph V.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**

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Abstract/Executive Summary:	Carbon storage and sequestration are critical indicators of ecosystem functionality, influencing climate regulation and terrestrial ecosystem productivity. This study investigated land cover changes in the Palico Watershed, Batangas, Philippines, from 2014 to 2024, estimating carbon stock and assessing the social value of sequestered carbon using the InVEST Carbon model. In this model, the inputs included the land cover map from remotely-sensed images and the carbon pool values for various identified land cover types. Primary field data was collected for selected carbon pool values, while secondary data was used for the remaining values. In 2014, agriculture dominated the watershed, covering 41.31% of the area. By 2024, forests became the primary land cover, comprising 33.20% of the watershed. The net change analysis showed significant increases in forest, shrub/grassland, built-up, and water areas by 3.45%, 20.85%, 2.22%, and 0.12%, respectively, while areas of agriculture and open/barren lands declined. The total carbon stock in the watershed was estimated at 1,028,650.45 Mg in 2014, rising to 1,140,465.44 Mg in 2024, resulting in a net sequestration of 111,814.99 Mg. Forests were the primary contributors to carbon storage. The increase in carbon stocks was primarily due to the conversion of low-carbon or non-carbon land covers to forests. The InVEST model estimated the social value of the sequestered carbon at PHP 1,199,037,981.92, using the latest Social Cost of Carbon (SCC) at a 2% discount rate. The study's findings highlight the significant impact of land cover conversion on carbon storage, emphasizing the crucial role of forests in climate change mitigation. Generated carbon stock maps can guide land use planning and decision-making, helping local government units and agencies monitor watershed status, identify deforestation hotspots, and implement climate mitigation efforts.