



TABLE OF CONTENTS

Summary	xiii
CHAPTER 1	1
GENERAL INTRODUCTION.....	1
1.1 Introduction	2
1.2 References	6
CHAPTER 2	9
GENERAL BACKGROUND.....	9
2.1 Species rarity	10
2.1.1 What does rarity mean?	10
2.1.2 Importance of rare species	11
2.1.3 Rarity and extinction risk	13
2.2 Philippine forests and forest biodiversity.....	15
2.2.1 Forest biodiversity	15
2.2.2 Change in forest cover.....	16
2.3 Forest remnants	19
2.4 Reforestation in the Philippines	20
2.4.1 Native species in reforestation.....	21
2.5 Sampling rare species.....	22
2.5.1 Adaptive cluster sampling	24
2.5.2 Systematic sampling.....	25
2.5.3 Snowball sampling	26
2.6 References	28
CHAPTER 3	37
MATERIALS AND METHODS.....	37
3.1 Overall research process	38
3.2 Ecological survey	38
3.2.1 The study sites	38
3.2.1a Forests over limestone	39
3.2.1b Forests in non-limestone substrates.....	43
3.2.2 The study species.....	45
3.2.3 Field data collection and data analysis	46
3.3 Nursery study	50



3.3.1 Selection of study sites and data collection	50
3.4 References	51
CHAPTER 4.....	53
THE ABUNDANCE OF RARE TREE SPECIES IN REMNANT FORESTS ACROSS THE VISAYAS, PHILIPPINES	53
4.1 Abstract.....	54
4.2 Introduction	55
4.3 Materials and methods.....	57
4.3.1 The Visayas region	57
4.3.2 Study sites	58
4.3.3 The focal study tree species	61
4.3.4 Assessment of focal species and forest tree inventory.....	62
4.3.5 Soil sampling and analysis.....	64
4.3.6 Data analysis	64
4.4 Results	65
4.4.1 General stand and site characteristics	65
4.4.2 Occurrence and density of focal tree species.....	66
4.4.3 Associations among species and sites.....	67
4.4.4 Environmental factors influencing density of focal tree species	71
4.5 Discussion.....	72
4.5.1 Ecological status of the focal species.....	72
4.5.2 Species associations	74
4.5.3 The influence of soil nutrients and basal area on tree species density.....	75
4.5.4 Unexplained environmental factors influencing density of species	76
4.5.5 Management considerations.....	76
4.6 References	78
CHAPTER 5.....	87
RARE TREE SPECIES IN NURSERIES ACROSS THE VISAYAS, PHILIPPINES .	87
5.1 Abstract.....	88
5.2 Introduction	89
5.3 Materials and Methods	92
5.3.1 The Visayas region	92
5.3.2 Selection of respondents and background information of study sites.....	93
5.3.3 Data gathering	94
5.3.4 Data analysis	94
5.4 Results and Discussion	98
5.4.1 Overview of nurseries in the study sites	98



5.4.2 Positive trend in growing native tree species in nurseries.....	100
5.4.3 The focal tree species	104
5.4.4 Factors affecting the production of focal species	104
5.4.6 Rarity of focal species in forests and nurseries and its implication for reforestation.....	108
5.4.7 Challenges in producing the focal species for biodiversity conservation ...	110
5.5 Concluding Remarks.....	111
5.6 References	113
CHAPTER 6	119
PRACTICAL STEPS AND KNOWLEDGE REQUIREMENTS FOR THE CONSERVATION OF RARE TREE SPECIES	119
6.1 Practical steps in the conservation of rare tree species in the Visayas.....	120
6. 1.1 Full-protection of near-natural remnant forests.....	120
6.1.2 Wildlings	121
6.1.3 Seeds.....	122
6.1.4 Nurseries.....	123
6.1.5 Plantations	124
6.2 Knowledge to be acquired for a scientifically sound conservation.....	128
6.2.1 Assessment of rare species	128
6.2.2 Better climatic information needed	128
6.2.3 Impact of wildling harvest.....	129
6.2.4 How to collect seeds, and make them viable.....	130
6.2.5 Technical things about nurseries	130
6.2.6 Silvicultural strategies	131
6.3 References	133
CHAPTER 7	136
SYNTHESIS	136
7.1 The rare tree species in remnant forests	137
7.2 Rare tree species in nurseries	140
7.3 Rare tree species in nurseries and in remnant forests	141
7.4 Management and conservation measures for rare tree species and remnant forests	142
7.5 Constraints and opportunities for future research	144
7.6 Concluding remarks	147
7.7 References	148
SUPPORTING DOCUMENTS	151