

**IMPACT OF *POPULUS CILIATA* FOR SOIL EROSION
CONTROL WITHIN UNION COUNCIL GHORA GALI,
TEHSIL MURREE .**



**A thesis submitted to Bahria University, Islamabad in partial fulfillment of the requirement
for the degree of M.S in Environmental Policy and Management**

MUHAMMAD UMAR QURESHI

**Department of Earth and Environmental Sciences
Bahria University, Islamabad**

2013

ABSTRACT

Populus ciliata also known as the Himalayan Poplar is being used extensively for erosion control and the re-vegetation of eroded hilly areas in the developed countries such as China, Japan, United States of America, and New Zealand. Two samples of *Populus ciliata* were uprooted to study the root distribution of each of trees for every ten cm thick layer. Evident from the excavation of both sample trees, it is found that a majority of the roots are found at depths of 50-80cm. Trees and other vegetation impart a roughness to water flow in channels, causing flow retardance, which results in reduced flow and lower flow energy for detachment and transport of the sediment. The data that was gathered revealed that the *Populus ciliata* is a stable plant species and breaks new ground on steep eroded slopes with shallow soil that was subjected the climatic movement of the area. The current study has also showed that *Populus ciliata* has roots that have the ability to grow and stretch out to shallow soils, unlike other tree species that may not have the ability to do so. *Populus ciliata* has very fast growth rates and strong spreading root systems as examined in the current study. A-type slope has a growth of tap roots which is restricted by bedrock resulting in no reinforcing strength effect at the potential shear zone boundary. However, root reinforcement is increased by the growing plant only to a depth of 70 to 80cm. In the B-type slope, the roots invade and reinforce the transitional zone, and the change of the occurrence of landslides begins to decrease as the plant becomes older. When the plant begins to age or become older after about 25 years, the root reinforcement becomes stronger than the soil shear strength and the shear stress of the rooted soil. The potential shear zone also increase for the Type B slope as the age of the plant increases between the ages of 25 to 40 years.

ACKNOWLEDGEMENTS

I am very grateful to my respected supervisor, Mr. Khubaib Abuzar, Assistant Professor of Department of E&ES, Bahria University Islamabad for his guidance, allegiance, time and making possible the completion of this research within time. Dr. Muhammad Zafar, Head of Department E&ES, Bahria University, Islamabad for his kind attention and guidance. I am also thankful to Dr. Tehseenullah Khan Bangash, Professor, Department of E&ES, Bahria University, Islamabad, and Mr. Asif Javed, Assistant Professor of Department of E&ES, Bahria University, Islamabad and my colleague Mr. Waqi-ur-Rehman for moral support.

I am also very grateful to Mr. Muhammad Javed Gill, Ex District Forest Officer, Punjab Forest Department, Murree and Mr. Asad Ali, Sub Divisional Forest Officer, Punjab Forest Department, Lower Topa, Murree for their kind supervision in completing my research work.

I am extremely thankful to my parents and my family for their unfailing encouragement, unremitting love and the prayers, which have always been a source of inspiration and guidance for me all the way, their invaluable prayers and support through the arduous process of putting together this project.

CONTENTS

ABSTRACT	ii
ACKNOWLEDGEMENTS	iii
CONTENTS	iv
FIGURES	vi
TABLES	vii

CHAPTER 1 INTRODUCTION

1.1	General	1
1.2	Botanic description of <i>Populus ciliata</i>	2
1.3	Geographical distribution	2
1.4	Elevation	5
1.5	Ecological context	5
1.6	Climate	6
1.7	Precipitation	6
1.8	Uses of <i>Populus ciliata</i>	6
1.9	Cultivation of <i>Populus ciliata</i>	7
1.10	Distribution	7
1.11	Ecology and habitat	7
1.12	Reproduction	8
1.13	Properties of wood	8
1.14	Soil erosion in Pakistan	8
1.15	Objectives	8

CHAPTER 2
METHODOLOGY

2.1	Study area	9
2.2	Study area Map	11
2.3	Root Distribution Simulation Model	12

CHAPTER 3
RESULTS AND DISCUSSIONS

Results and Discussions	17
-------------------------	----

CONCLUSIONS AND RECOMMENDATIONS

Conclusions	30
Recommendations	33
REFERENCES	35
APPENDICES	38

FIGURES

	Page
Figure 2.1. Topo Cadastral Map of Murree Tehsil.	11
Figure 2.2. Geographical map of Ghora Gali, Murree.	12
Figure 2.3 Application of Displacement fluid.	14
Figure 3.1. A Type Slope.	21
Figure 3.2. B Type Slope.	21
Figure 3.3. Changes in FS as plant ages.	22
Figure 3.4. EI distribution curves for three locations in Union Council Ghora Gali.	24
Figure 3.5. Wholeroot weightof 2 samples	29

TABLES

	Page
Table 3.1. Variables for Root Distribution Model.	17
Table 3.2. Root number ratios ($Y(i)$) under two tree sites.	18
Table 3.3. Characteristics of two slopes.	19
Table 3.4. Soil Characteristics in Ghora Ghali associated with K values.	24
Table 3.5. LS Equation Selection.	25
Table 3.6. B-Value Selection.	26

APPENDICES

	Page
Appendix 1. Young <i>Populus ciliata</i> developed from Stem cutting.	38
Appendix 2. Map showing compartments of Sub Division Ghora Gali Forests.	39
Appendix 3. Uprooting of sample tree <i>Populus ciliata</i>	40