

## Phytological Study of Freshwater Wetland Ecosystem of Bajwat Area

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## PHYTOLOGICAL STUDY OF FRESHWATER WETLAND ECOSYSTEM OF BAJWAT AREA

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### ABSTRACT

Freshwater wetlands are individual ecosystems that support a variety of wildlife, vegetation and microscopic life. The type of plants that exist in these areas describe the physico-chemical characteristics of their locality and vice-versa. This study was carried out at Marala wetlands in Bajwat Game Reserve. The study found 39 species of higher plants in the areas of the wetland and its associated terrain. The total species were arranged into 5 vegetation types, named on the basis of the dominant plant species, with their own composition of the species and present in different habitat conditions. The vegetative community *Phragmites karka* constituted an association of 8 plant species; *Juncellus laevigatus* had 10, *Typha angustata* had 13, *Aeluropus lagopoides* and *Cyprus comylomeratus* had 9 species each.

**Keywords:** *Acacia nilotica*, *Aloe vera*, vegetation, freshwater, wetland

### INTRODUCTION

Various aspects of wetland plants have been previously studied. Most studies however, revolve around the trace element uptake of plants in wetland areas (Weis and Weis, 2004; Zayed et al., 1998; Zhu et al., 1999). Freshwater wetlands are individual ecosystems that support a variety of wildlife, vegetation and microscopic life. The type of plants that exist in these areas describe the physico-chemical characteristics of their locality and vice-versa. The a-biotic factors influence the type and population size of the flora existing near the wetland area (Dawson, 2003). Beecher (1942) found a correlation between physical characteristics of wetlands vegetation and aquatic birds.

*Peltandra virginica*, *Pontederia cordata*, *Nuphar lutea*, *Juncus effuses*, *Schoenoplectus pungens*, *Hibiscus moscheutos*, *Kosteletzkya virginica*, *Cephalanthus occidentalis* and *Typha*

*angustifolia* are commonly found in wetlands of Virginia (Freshwater marsh, n.d.). The vegetative cover around the river banks help keep the soil from eroding (Khan and Arshad, 2014).

This study was conducted to investigate different types of vegetation present at freshwater wetlands of Bajwat area.

### MATERIALS AND METHODS

This study was carried out at Marala wetlands in Bajwat Game Reserve from October, 2000 to September 2001. Three rivers (River Jammu Tawi, River Chenab and Manawar Tawi) were focused. River Jammu Tawi, with associated marshes, supports extensive reed beds and an abundant growth of submerged and floating vegetation, and in the first river, while going towards Bajwat. The marshy area of River Chenab in the study had aquatic and riverine

forest vegetation. The Manawar Tawi is full and riverine forest.  
of aquatic vegetation floating, submerged

## RESULTS

**Table 1. Distribution of different plant species between vegetation types identified at Bajwat area during 2000-2001 (A=Jammu Tawi, B=Chenab, C=Manawar Tawi)**

Species	VEGETATION TYPES														
	<i>Phragmites karka</i>			<i>Juncellus laeviagatus</i>			<i>Typha angustata</i>			<i>Aeluropus lagopoides</i>			<i>Cyprus conglomerates</i>		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
<i>Oryza sativa</i>	+		+	+											
<i>Panicum colonum</i>	+	+													+
<i>Cymbopogan citratus</i>	+														
<i>Launia nodicoulis</i>	+														
<i>Heleochoa schenoids</i>	+														
<i>Juncellus laevigatus</i>	+														
<i>Convolvulus arvensis</i>	+														
<i>Phragmites karka</i>				+	+	+	+								
<i>Muesthia laevis</i>				+	+	+									
<i>Cyperus conglomeratus</i>				+						+					+
<i>Alhagi mourorum</i>							+	+					+	+	
<i>Cynodon dactylon</i>		+	+	+											
<i>Triticum indicum</i>				+											
<i>Andropogan sorghum</i>			+		+					+	+				
<i>Trifolium species</i>															
<i>Typha latifolia</i>									+	+					
<i>Typha angustifolia</i>							+	+	+						
<i>Pistia stratiotes</i>						+	+								
<i>Caren aleneria</i>							+								+
<i>Cyperus difformis</i>															+
<i>Cynodon dactylon</i>							+	+							
<i>Saccharum arundinaceum</i>							+	+	+						

Name of Species	VEGETATION TYPES															
	<i>Phragmites karka</i>			<i>Juncellus laeviagatus</i>			<i>Typha angustata</i>			<i>Aeluropus lagopoides</i>			<i>Cyprus conglomerates</i>			
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	
<i>Saccharum munja</i>						+	+	+								
<i>Nelumbium speciosum</i>						+	+	+								
<i>Nelumbium nucifer</i>																
<i>Nymphaea lotus</i>																
<i>Dicanthium annulatum</i>										+	+	+	+	+		
<i>Cynoglossium sp.</i>	+									+		+				
<i>Heliotropium sp.</i>	+	+		+						+	+	+				
<i>Scirpus meritimus</i>	+									+						
<i>Arena sativa</i>						+				+						
<i>Seleria cereal</i>																
<i>Melilotus parriflora</i>																
<i>Euphorbia prustrata</i>														+	+	+
<i>Dicanthium annulatum</i>													+	+	+	+
<i>Alhagi maurorum</i>																+
<i>Avena sativa</i>																+
<i>Pennisetum typhoidicum</i>																+
<i>Seteria italica</i>																

**Table 2. Relative abundance of different plant species observed at Jammu Tawi during different seasons (Months)**

Season	Winter			Spring			Summer			Autumn		
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
<i>Cynodon dactylon</i>	+	+	+	++	+++	+++	+++	+++	+++	+++	+++	+++
<i>Dicanthium anmulatum</i>	-	-	-	-	+	+	+	+	+	+	+	-
<i>Acacia nilotica</i>	++	++	++	++	++	++	++	++	++	++	++	++
<i>Alhagi morurum</i>	+	+	-	-	+++	+++	+	+	++	+++	++	+++
<i>Cyprus conglomeratus</i>	+	+	-	-	+++	+++	+	+	++	+++	+++	+++
<i>Euphorbia prostrata</i>	++	++	++	++	++	++	-	-	++	++	++	++
<i>Mnesthia laevis</i>	+	+	-	-	+	+	+	+	+	+	+	+
<i>Aeluropus lagopoides</i>	+	+	+	+	+	+	+	+	+	++	+	+
<i>Heliotropium sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Phragmites karka</i>	+	+	+	+	++	++	-	++	+++	+++	+++	++
<i>Juncellus lavigatus</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Arundo donan</i>	++	-	-	++	++	++	+++	+++	+++	++	++	++
<i>Aloe vera</i>	++	++	++	++	++	++	++	++	++	++	++	++
<i>Ashpodelus tenuifolms</i>	+	-	-	-	+	+	+	-	+	+	+	+
<i>Typha angustata</i>	+	++	+++	+++	++	++	+	+	+	+	+	+
<i>Typha latifolia</i>	++	+	-	-	++	++	++	++	++	++	++	+++
<i>Typha angustifolia</i>	+	+	-	-	-	-	++	++	++	++	++	++

Season	Winter			Spring			Summer			Autumn		
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
<i>Arum macudatum</i>	+	+	-	-	+	+	-	-	+	+	+	+
<i>Arisaem helliborifolium</i>	+	+	-	-	+	+	-	-	+	+	+	+

<i>Pistia stratiotes</i>	++	++	+	+	+	+	-	-	+	+	+	+++
<i>Carex alenaria</i>	++	++	+	+	+	+	++	++	+++	+++	+++	+++
<i>Cyperus difformis</i>	+	-	-	-	++	+++	-	-	-	-	-	++
<i>Avena sativa</i>	-	++	++	++	+++	+++	-	-	-	-	-	-
<i>Itoideum vulgare</i>	+	-	-	-	-	-	++	++	++	+++	+++	++
<i>Oryza sativa</i>	+++	-	-	-	-	-	-	+++	+++	+++	+++	+++
<i>Parucum colanum</i>	++	++	-	-	++	++	++	++	+++	+++	+++	++
<i>Penisetum typhoideum</i>	++	++	+	+	++	++	++	++	+++	+++	+++	++
<i>Saccharum arundinaccum</i>	+++	-	-	-	-	-	+++	+++	+++	+++	+++	+++
<i>Setaria cereale</i>	-	++	++	++	+++	++	-	-	-	-	-	-
<i>Setaria italica</i>	-	++	++	++	+++	++	-	-	-	-	-	-
<i>Cymbopogan citratus</i>	++	++	+	+	++	++	+	-	-	+	+	++
<i>Saccharum munja</i>	++	-	-	+	++	++	+++	++	+++	+++	+	++
<i>Agave americana</i>	+	-	-	-	++	++	++	-	++	++	++	+
<i>Cannabus sativa</i>	-	-	-	-	-	-	-	++	+++	+++	++	++
<b>Season</b>	<b>Winter</b>			<b>Spring</b>			<b>Summer</b>			<b>Autumn</b>		
<b>Plant Species</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun e</b>	<b>Jul y</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>
<i>Urtica dioca</i>	+	+	-	-	+	+	+	+	+	+	+	+
<i>Euphorbia prostrata</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Euphorbia rogleana</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Euphorbia heliscolia</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Jatropha curcos</i>	+	-	-	-	+	+	+	+	+	+	-	+
<i>Croton tiglium</i>	+	+	-	-	+	+	+	+	+	+	+	+

<i>Malva salvestris</i>	+	-	-	-	+	+	+	++	++	++	++	+
<i>Achyranthus aspera</i>	++	+	+	+	++	++	++	++	++	++	++	++
<i>Amarantus viridis</i>	++	++	++	++	++	++	++		+	+++	++	++
<i>Chinopodium album</i>	++	++	++	++	++	++	-	-	-	-	-	++
<i>Chinopodium murale</i>	++	++	++	++	++	++	-	-	-	-	-	++
<i>Verbascum thaspus</i>	++	++	++	++	++	++	-	-	++	++	+++	++
<i>Withenca somifera</i>	+	+	-	-	+	+	+	+	+	+	-	+
<i>Solanum nigrum</i>	++	+	+	++	+++	+++	+++	++	++	++	++	++
<i>Solanum surattenus</i>	++	+	+	++	+++	+++	+++	++	++	++	++	++
<i>Capacium annum</i>	-	-	-	-	++	++	+++	+++	++	-	-	-
<b>Season</b>	<b>Winter</b>			<b>Spring</b>			<b>Summer</b>			<b>Autumn</b>		
<b>Plant Species</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun e</b>	<b>Jul y</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>
<i>Dalura alba</i>	++	++	++	++	++	++	-	-	++	++	++	++
<i>Convolvulus arvensis</i>	++	++	++	-	-	++	++	++	++	+++	+++	++
<i>Cardia dictiotoma</i>	+	+	+	+	++	++	+++	+++	++	+	+	+
<i>Calotropis procera</i>	++	++	++	++	++	++	++	++	++	++	++	++
<i>Taraxacum Officinale</i>	-	-	-	++	++	++	++	-	-	-	-	-
<i>Cantharus oxycantha</i>	++	+	+	+	++	++	++	++	++	++	++	++
<i>Nelumbium speciosum</i>	-	-	-	-	-	-	-	+	+++	+++	+++	++
<i>Nelumbium nucifera</i>	++	-	-	-	-	-	-	++	+++	+++	+++	+++
<i>Nelumbium lotus</i>	++	-	-	-	-	-	-	++	+++	+++	+++	+++
<i>Triticum indicum</i>	+	++	+++	+++	++	++	++	++	-	-	-	-



<i>Urtica dioica</i>	+	+	+	+	+	+	+	+	+	-	-	+
<i>Trifolium species</i>	+++	+++	+++	+++	+++	++	+	-	-	-	-	++
<i>Erianthus murya</i>	++	+	-	-	++	++	++	+++	+++	+++	+++	++
<i>Saccharum spontaneum</i>	++	+	-	-	++	++	++	+++	+++	+++	+++	++
<i>Vallisneria spiralis</i>	+	+	-	-	+	+	+	+	-	-	+	+
<i>Hydrilla verticillata</i>	++	+	-	-	+	+	+		+	+	+	++
<i>Lamina minor</i>	++	++	++	++	++	++	-	-	-	-	-	++

Key: +:- Present ++:- Common +++:- Abundance

**Table 3. Relative abundance of different plant species observed at Chenab during different seasons (Months)**

Season	Winter			Spring			Summer			Autumn		
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
<i>Cynodon dactylon</i>	+	+	+	+	+++	+++	+++	+++	+++	+++	+++	++
<i>Dicanthium anmulatum</i>	+	+	-	-	+	+	+	-	-	-	-	-
<i>Acacia nilotica</i>	++	++	++	++	++	++	++	++	++	++	++	++
<i>Alhagi morurum</i>	-	-	-	-	+++	+++	-	++	++	++	++	+++
<i>Cyprus conglomeratus</i>	-	-	-	-	+++	+++	-	++	++	++	++	+++
<i>Euphorbia sp.</i>	+	+	+	-	+	+	+	+	+	+	+	+
<i>Sarpus maritimus</i>	+	+	-	-	+	+	+	+	-	-	+	+
<i>Aeluropus lagopoides</i>	+	+	-	-	+	+	+	+	+	+	+	+
<i>Heleochlo schenoids</i>	+	-	-	-	+	+	-	+	-	-	-	-
<i>Phragmites karka</i>	+	-	-	-	++	++	-	++	+++	+++	+++	++
<i>Brassica compestres</i>	++	+++	+++	+++	++	-	-	-	-	-	-	++
<i>Cynoglossium species</i>	-	++	+++	+++	++	++	-	-	+	+	++	-
<i>Typha angustata</i>	+	++	+++	+++	++	++	-	-	-	-	++	+

<i>Lounia nodicanlis</i>	+	+	-	-	+	-	-	-	-	-	+	-
<i>Ashpodelus tenuifoluis</i>	+	-	-	-	-	+	+	-	+	+	+	+
<i>Typha lotifolia</i>	++	+	-	-	++	++	++	+++	+++	++	+++	+++
<b>Season</b>	<b>Winter</b>			<b>Spring</b>			<b>Summer</b>			<b>Autumn</b>		
<b>Plant Species</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun e</b>	<b>Jul y</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>
<i>Typha angustifolia</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Carven alenaria</i>	++	++	+	+	+	+	++	++	+++	+++	+++	+++
<i>Cyperus difformis</i>	+	-	-	-	++	+++	-	++	+++	+++	+++	++
<i>Avena sativa</i>	-	++	++	++	+++	+++	-	-	-	-	-	-
<i>Arundo donan</i>	++	-	-	++	++	+++	+++	+++	+++	+++	++	++
<i>Setaria cereale</i>	-	++	++	++	++	+++	++	-	-	-	-	-
<i>Saccharum arundinaceum</i>	+++	-	-	-	-	-	+++	+++	+++	+++	+++	+++
<i>Saccharum munja</i>	++	-	-	+	++	++	++	+++	+++	+++	+++	++
<i>Cymbopogan citrates</i>	+	+	-	-	+++	++	++	-	+++	+++	+++	+
<i>Agave Americana</i>	++	-	-	++	+++	++	-	-	-	-	++	++
<i>Cannabus saliva</i>	-	-	-	-	-	-	-	++	+++	+++	+++	++
<i>Urtica dioca</i>	+	+	-	-	+	+	+	-	+	+	+	+
<i>Jatropha curcas</i>	+	-	-	-	+	-	-	+	+	+	+	-
<i>Crotum tiglium</i>	+	-	-	-	+	+	+	+	-	+	+	+
<i>Amaranthus viridis</i>	+	+	-	-	+	+	+	+	+	+	+	+
<i>Achyranthis aspera</i>	++	+	+	+	++	++	++	++	++	++	++	++

Season	Winter			Spring			Summer			Autumn		
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
<i>Clunopodium album</i>	++	++	++	++	++	+	-	-	-	-	-	++
<i>Chenopodium murale</i>	++	++	++	++	++	+	-	-	-	-	-	++
<i>Verbascum thaspus</i>	+	+	+	+	++	++	++	++	-	-	+	+
<i>Solanum sp.</i>	++	+	+	++	+++	+++	++	+++	++	++	++	++
<i>Datura alba</i>	++	++	++	++	++	++	-	-	-	-	-	++
<i>Calotropis procera</i>	++	++	++	++	++	++	++	+++	+++	+++	+++	++
<i>Taraxacum officinale</i>	-	-	-	+++ +	++	++	-	-	-	-	-	-
<i>Cichorium intibus</i>	+	+	-	-	+	+	+	+	-	-	+	+
<i>Nelumbium speciosum</i>	-	-	-	-	-	-	-	+	+++	+++	+++	++
<i>Nelumbium species</i>	++	+++	+++	+++	+++	++	+	-	-	-	-	++
<i>Trifolium species</i>	++	+++	+++	+++	+++	++	+	-	-	-	-	++
<i>Oryza saliva</i>	+	-	-	-	-	-	-	++	+++	+++	+++	++
<i>Andropogon sorghum</i>	+	+	-	+	+	+	-	-	-	+	+	+
<i>Pistia stratiotus</i>	+++	++	+	+	+	+	-	+	++	++	+++	+++
<i>Triticum indicum</i>	+	++	++	+++	++	++	++	+	-	-	-	
<i>Juncellus larvigalus</i>	+	+	+	+	+	+	+	+	+	+	+	+

Key: +:- Present ++:- Common +++:- Abundance

**Table 4. Relative abundance of different plant species observed at Manawar Tawi during different seasons (Months)**

Season Plant Species	Winter			Spring			Summer			Autumn		
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
<i>Alhagi maurorum</i>	-	-	-	-	+++	+++	-	-	++	+++	+++	+++
<i>Cyprus conglomerates</i>	-	-	-	-	+++	+++	-	-	++	+++	+++	+++
<i>Mnasthia laevis</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Acacia nilotica</i>	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++
<i>Juncellus lavegatus</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Cynodon dactylon</i>	+	+	+	++	+++	+++	+++	+++	+++	+++	+++	+++
<i>Trianthea crystalina</i>	-	+	-	-	+	+	+	+	+	-	+	-
<i>Heliotropium sp.</i>	-	-	-	-	+	+	+	-	-	-	+	-
<i>Heliotropium sp.</i>	-	-	-	-	+	+	+	-	-	-	+	-
<i>Heliachloa schenoides</i>	+	-	-	-	++	++	-	++	+++	+++	+++	++
<i>Phragmites karka</i>	++	+++	++	+++	+	-	-	-	-	-	+	++
<i>Brassica campestris</i>	-	++	+++	+++	++	++	-	-	-	-	++	-
<i>Cynoglossium sp.</i>	-	++	+++	+++	++	++	-	-	-	-	++	-
<i>Typha angustata</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Aeluropus lagopoides</i>	+	+	+	+	+	+	+	+	+	+	+	+
<i>Dicanthium annulatum</i>	-	+	-	-	+	+	+	+	+	+	+	-
<i>Trianthea monogyna</i>	-	-	-	-	-	-	-	++	+++	+++	++	++
<i>Zizyphus mauritiana</i>	+	+	-	-	+	+	+	+	+	+	+	+
<i>Antrogrophis panoculata</i>	++	++	++	++	++	++	++	++	+	+	++	++

Season	Winter			Spring			Summer			Autumn		
	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct
<i>Aloevera sp.</i>	++	++	++	++	++	++	++	++	++	++	++	++
<i>Asphodelus tenuifolius</i>	+	+	-	-	++	++	-	-	++	++	++	+
<i>Commilina benghalensis</i>	+	+	-	-	+	+	+	-	+	+	+	+
<i>Tradescantia virginia</i>	++	+	-	-	++	++	++	++	++	++	++	+++
<i>Typha latifolia</i>	+	+	-	-	++	++	++	++	++	++	++	+
<i>Arum maculatum</i>	+	+	-	-	++	++	+	-	+	++	++	+
<i>Arisaem helliborifolium</i>	++	++	+	+	+	+	-	+	++	++	+++	+++
<i>Psitia stratiotes</i>	++	++	+	+	+	+	++	++	+++	+++	+++	+++
<i>Caren alenaria</i>	+	-	-	-	++	+++	-	++	+++	+++	+++	++
<i>Cyperus difformis</i>	-	++	++	++	+++	+++	-	-	-	-	-	-
<i>Aicena sativa</i>	++	-	-	++	++	++	+++	+++	+++	++	++	++
<i>Arundo donax</i>	+	-	-	-	-	-	++	++	+++	+++	+++	++
<i>Iordeum vulgare</i>	+++	-	-	-	-	-	-	+++	+++	+++	+++	+++
<i>Oryza saliva</i>	-	-	-	-	-	-	-	++	+++	+++	-	-
<i>Panicum colonum</i>	-	-	-	-	-	-	-	++	+++	+++	+++	-
<i>Pennisetum typhoideum</i>	+++	-	-	-	-	-	+++	+++	+++	+++	+++	+++
<i>Saccharum arundinaceum</i>	-	++	++	++	+++	++	-	-	-	-	-	-
<i>Setaria ceareale</i>	-	++	++	++	+++	++	-	-	-	-	-	-
<i>Setaria italica</i>	++	-	-	+	++	++	+++	++	+++	+++	-	++
<i>Saccharum munja</i>	-	-	-	-	-	-	-	++	+++	+++	++	++
<i>Cannabus sativa</i>	-	-	-	-	-	+	+	+	+	+	++	+
<i>Urtica dioca</i>	+	+	+	+	+	+	+	+	+	+	+	+

Season	Winter			Spring			Summer			Autumn		
	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct
<i>Euphorbia sp.</i>	++	++	++	++	++	++	++	++	++	++	++	++
<i>Jatropha curcos</i> <i>helinobia</i>	+	-	-	-	+	++	++	-	+	+	+	+
<i>Crotam tiglium</i>	+	+	+	+	-	+	+	-	-	+	+	+
<i>Zizyphus nummularia</i>	-	-	-	-	-	-	-	++	++	+++	+++	++
<i>Picinus communis</i>	++	++	++	++	++	++	++	-	-	-	-	-
<i>Achyranthus aspera</i>	++	+	+	+	++	++	++	++	++	++	++	++
<i>Amarantus viridis</i>	++	++	++	++	++	++	+	-	+	+++	+++	++
<i>Viten negundo</i>	+	-	-	++	++	++	+	-	-	-	-	++
<i>Verbascum thaspus</i>	-	++	++	++	++	+++	+++	++	-	-	-	-
<i>Solanum sp.</i>	++	+	+	++	+++	+++	++	+++	++	++	++	++
<i>Capacium annum</i>	-	-	-	-	++	++	+++	+++	++	-	-	-
<i>Datura alba</i>	++	++	++	++	++	++	-	-	++	++	++	++
<i>Cardia dictiotona</i>	+	+	+	+	++	++	+++	+++	++	+	+	+
<i>Calotropis procera</i>	++	++	++	++	++	++	++	+++	+++	+++	++	++
<i>Taranacum officinale</i>	-	-	-	++	++	++	++	-	-	-	-	-
<i>Cichorium intibus</i>	+	-	-	+	+	+	-	-	+	+	+	+
<i>Canthanus oxycantha</i>	++	++	-	-	++	++	-	-	+	+	++	+
<i>Nelumbium speciosum</i>	-	-	-	-	-	-	-	+	+++	+++	+++	++
<i>Nelumbium nucifera</i>	++	-	-	-	-	-	-	++	+++	+++	+++	+++
<i>Nelumbium lotus</i>	++	-	-	-	-	-	-	++	+++	+++	+++	+++
<i>Cardia obliqua</i>	+	+	-	-	+	+	+	+	+	+	+	+

Key: +:- Present ++:- Common +++:- Abundance

## DISCUSSION

The results suggest that a total of 39 species of higher plants were present in the areas of the wetland and its associated terrain. The total species can be arranged into 5 vegetation types, named on the basis of the dominant plant species, with their own composition of the species and present in different habitat conditions.

***Phragmites karka*:** The vegetative community constituted an association of 8 plant species. The community was dominated by *P. karka* which was widely present. The dominant species was associated with 7 other species i.e., *Oryzativa sp.*, *Panicum colonum*, *Cymbopogan citratus*, *Launia nodicoulis*, *Heleochloa schenoids*, *Tuncellus laevigatus* and *Convolvulus arvensis*. The community was present in the shallow water pond area associated with the main river system, and was widely distributed along the main river system.

***Juncellus laevigatus*:** The vegetative type represents in association of 10 different plant species were dominated by *J. laevigatus*. Nine other plant species i.e., *Phragmites karka*, *Mnethia laevis*, *Cyprus conglomeratus*, *Alhagi mourorum*, *Cynodon dactylon*, *Triticum indicum*, *Andropogan sorghum*, *Panicum colonum* and *Trifolium sp.* were associated with the dominant species. The vegetative community was present in very shallow waters of the river system and were closely associated with the *Phragmiatous karka* vegetative type.

***Typha angustata*:** This vegetative community, apart from the dominant species i.e., *T. angustata*; was represented by 12 more species viz., *Typha lotifolia*, *Typha amgustofolia*, *Pistia stiatotes*, *Caren alenuria*, *Cypercy difformis*, *Cynodon dactylon*, *Saccharum alundinaceum*, *Pharagmites karka*, *Saccharum munja*, *Nelumbium speciosum*, *Nelumbium nucefer*

and *Nymphaea lotus*. This vegetative community was present in the comparatively deeper waters and constituted the 1<sup>st</sup> line after the running water.

***Aeluropus lagopoides*:** This community constituted a vegetative association of 9 plant species, where *Aeluropus lagopoides* dominated. The dominant species was associated by 8 other plant species, i.e., *Dicanthium annulatum*, *Heliotropium sp.*, *Cynoglossium sp.*, *Scirpus meritimus*, *Arena sativa*, *Seterai cereal*, *Trifolium sp.*, and *Melilotus parriflora* which appear in different densities in different tracks. The vegetation type was mainly present in the areas associated with the wetland system with high moisture conditions.

***Cyprus comylomeratus*:** The vegetative type was an association between 9 different species where *Cyprus comylomeratus* played a dominant role. The dominant species was associated with 8 more plant species, i.e., *Euphorbia prostrata*, *Cynodon dachylon*, *Dicanthium annulatum*, *Alhagi maurorum*, *Avena satira*, *Pennisetum byphadicum*, *Seteria italica* and *S. cereal*. This vegetative type was present in the open terrestrial tracks where the moisture contents is comparatively low and was widely present in the open areas associated with the main wetland system.

Walker (1968), Jahn and Moyle (1964) and Whitman (1976) attributed decreased habitat heterogeneity, caused by disruption of natural ecological processes, resulting in domination by tall robust hydrophytes, such as, *Scripus caren*, *Typha salin* and *Pharagmites sp.*

Linde et al. (1979) reported that *Typha sp.* is well adapted to form monotypes. *Typha* seeds germinate under a wide range of water depths (Weller, 1975) and tolerate a wide range of soil types (Dean, 1933). *Typha sp.* occurs late in the

growing season. This plant is competitive advantage over other species is probably enhanced (Davis and Van der Valk, 1978).

Dannell and Sjoberg (1979) reported that various emergent species may decompose at different rates as the result of differences in species composition of macro-invertebrate populations which may remove some of the decompose organisms that could act to maintain or increase vegetative heterogeneity.

## CONCLUSION

The study found 39 species of higher plants in the areas of the wetland and its associated terrain. The total species were arranged into 5 vegetation types, named on the basis of the dominant plant species, with their own composition of the species and present in different habitat conditions. The vegetative community *Phragmites karka* constituted an association of 8 plant species; *Juncellus laevigatus* had 10, *Typha angustata* had 13, *Aeluropus lagopoides* and *Cyprus comylomeratus* had 9 species each.

## REFERENCES

Anderson MG (1978). Distribution and production of Sago pondweed (*Potamogeton pectinatus*) on a northern prairie marsh. *Ecology*, 59:154-160.

Beecher WJ (1942). Nesting birds and the vegetative substrate. Chicago Ornithological Society. Chicago.

Bennett LJ (1938). The blue-winged teal, its ecology and management. Collegiate Press, Ames, Iowa: 144 pp.

Buttery BR, Lambret JM (1965). Competition between glyceria manuria and phragmites communis in the region of Surlingham Board. 1. The competition mechanisms. *J. Ecol.*, 53:163-181.

Dannell K, Sjoberg K (1979). Decomposition of *carex* and Equisetum in a northern Swedish lake: dry weight loss and colonization by macro-invertebrates. *J Ecol.*, 67: 191-200.

Dawson TP, Berry PM, Kampa E (2003). Climate change impacts on freshwater wetland habitats. *J Nat Conserv.*, 11(1): 25-30.

Davis CB, Van der Valk AG (1978). Litter decomposition in prairie glacial marches. In: R.E. Good, D.F., Whigham, and R.L. Simpson, (eds.) *Freshwater Wetlands*. Academic Press, New York: 99-1300.

Dean BE (1933). Effect of soil type and aeration upon root system of certain aquatic plants. *Plant Physiol.*, 8: 202-222.

Freshwater Marsh (n.d.). Freshwater Marsh. Center for Coastal Resource Management. Retrieved from: [https://www.vims.edu/ccrm/outreach/teaching\\_marsh/native\\_plants/freshwater/index.php](https://www.vims.edu/ccrm/outreach/teaching_marsh/native_plants/freshwater/index.php)

Hammond MC (1961). Habitat improvement studies at lower improvement studies at Lower Souris National Wildlife Refuge-past, present and proposed. U.S. Fish. Wildl. Serv.: 8pp.

Jahn LR, Moyle JB (1964). Plants on parade. In J P Lundska, ed. *Waterfowl Tomorrow*. US Department of the Interior, Washington DC: pp. 293-304.

Khan AA, Arshad S (2014). Wetlands of Pakistan: distribution, degradation and management. *Pakistan Geogr Rev.*, 69 (1): 28-45.

Linde AF, Janisch T, Smith D (1979). Cattail: the significance of its growth, phenology and carbohydrate storage to its control and management. *Wisc. Dep. Nat. Resour. Tech. Bull.*, 94: 27 pp.



- Spence DHN, Chrystal J (1970). Photosynthesis and zonation of freshwater macrophytes. I. Depth distribution and shade tolerance. *New Phytol.*, 69: 205-215.
- Walker BH (1968). Ecology of herbaceous wetland vegetation in the aspen grove and grassland regions, a Saskatchewan. Ph.D. thesis Univ. Saskatchewan, Saskatoon.
- Weis JS, Weis P (2004). Metal uptake, transport and release by wetland plants: implications for phytoremediation and restoration. *Environ Int.*, 30 (5): 685-700.
- Weller MW (1975). Studies of cattail relation to management for marsh wildlife. *Iowa State J. Res.*, 49: 383-412.
- Whitman WR (1976). Artificial wetlands for waterfowl. In: M. Smart (eds.) *Internat. Conf. Conservation Wetlands Waterfowl*, IWRB, Slimbridge, England: 334-336 pp.
- Word E (1942). Phragmites management. *Trans. N. Am. Wildl. Conf.*, 7:294-298.
- Zayed A, Gowthaman S, Terry N (1998). Phytoaccumulation of Trace Elements by Wetland Plants: I. Duckweed. *J Environ Qual.*, 27(3): 715-721.
- Zhu YL, Zayed AM, Qian JH, Souza Md, Terry N (1999). Phytoaccumulation of Trace Elements by Wetland Plants: II. Water Hyacinth. *J Environ Qual.*, 28 (1): 339-344.