IDENTIFICATION AND MAPPING OF WETLANDS IN THE DOUDY DRAW/ELDORADO MOUNTAIN AREA, BOULDER COUNTY, COLORADO

Submitted to:

City of Boulder
Open Space Department

By:

Donald R. D'Amico
5935 Baseline Road
Boulder, Colorado 80303

31 January 1995

TABLE OF CONTENTS

INTRODUCTION 1

STUDY AREA DESCRIPTION 1

METHODS 3

RESULTS AND DISCUSSION 5

Functions of Wetlands in the Study Area 7
Spiranthes diluvialis Survey 10
Impacts of Hydroelectric Development on Wetlands in the Study Area 11

LITERATURE CITED 13

Appendix A. Plant species of the Doudy Draw/Eldorado Mountain area wetlands 14

Appendix B. Wetland field data sheets. 17

INTRODUCTION

The purposes of this project were (1) to identify, map and evaluate the functions of wetlands on City of Boulder Open Space property in the Doudy Draw/Eldorado Mountain area of southern Boulder County and (2) to survey the study area for the occurrence of the federally threatened orchid Spiranthes diluvialis and its suitable habitat. Information from this study will be incorporated into the City's wetland database which seeks to identify all wetlands on Open Space property. This study is also necessary to fulfill the preliminary permit requirements for the Bolder Lindsay hydroelectric power project.

STUDY AREA DESCRIPTION

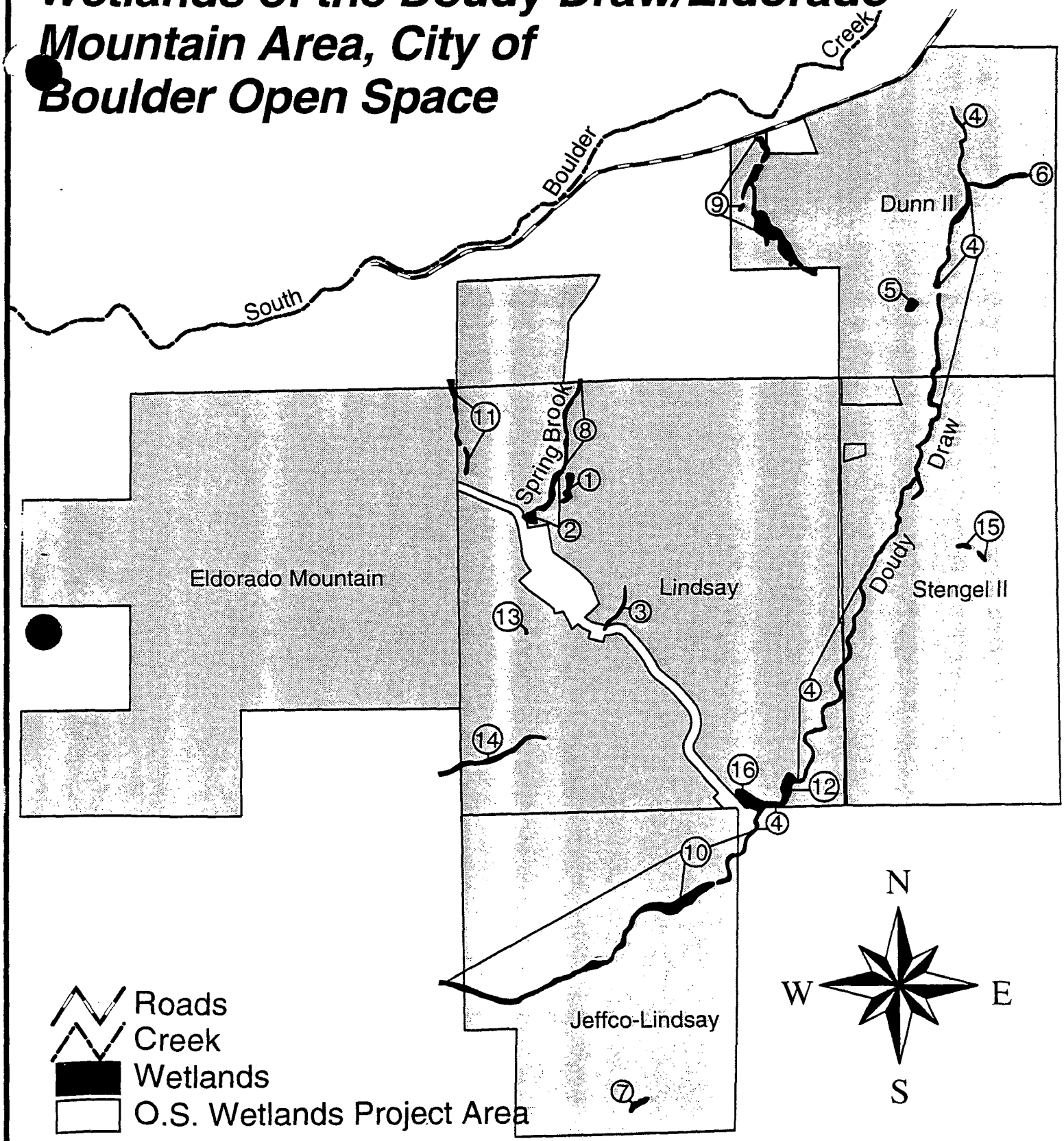
The study area encompasses a total of approximately 2,265 acres. 1,920 acres are in southern Boulder County and 345 acres are in northern Jefferson County. It includes the west halves of sections 29 and 32, section 30 south of State Highway 170 and section 31 in T1S, R70W, and most of section 36 in T1S, R71W of Boulder County. In Jefferson County, part of section 6, T2S, R70W was included (Figure 1). All property is owned by the City of Boulder Open Space Department.

Elevations throughout the study area range from approximately 5,700 feet to 7,800 feet. The lower elevations support foothills grassland communities. As elevation increases, these grasslands are replaced by ponderosa pine woodland and eventually by ponderosa pine forests with douglas fir communities on moist, north facing slopes.

Several wetland types occur in the study area including shrub/forested wetlands, wet

Figure 1. Map of Doudy Draw/Eldorado Springs wetland study area with locations of wetlands described in this report.

Wetlands of the Doudy Draw/Eldorado Mountain Area, City of Boulder Open Space



Scale

0.25 0 0.25 0.5 Miles

Map produced by T. Stonich and the Open Space GIS lab, Feb. 6,1995

meadows and emergent marshes around ponds. The forested or riparian wetlands occur in drainages such as Doudy Draw and Spring Brook. The wet meadows and emergent marshes are supported by numerous natural springs and by leakage from agricultural ditches and the Boulder Diversion Canal and Pipeline.

METHODS

In general, the methods outlined in *Advanced Identification of Wetlands in the City of Boulder Comprehensive Planning Area* (Cooper 1988) were used to evaluate wetlands in the study area. Methods of locating and evaluating the wetlands specific to this study are detailed below. The purpose of the mapping is not to plot the exact wetland/upland boundary, but to identify and characterize each individual wetland and map its location.

Blueline reproductions of 1"=200' orthogonal aerial photographs were initially used to locate wetlands in the study area. However, the resolution and contrast of these photographs was inadequate for this purpose and only the open water wetlands and natural drainages that could potentially support wetlands were identifiable. As a result, all land within the study area had to be visited on foot in order to locate all wetlands.

The wetlands that were identifiable from the blueline aerial photographs were visited first. These tended to be open water ponds or wetlands with rank growth such as cattails. Following this, natural drainages were located and walked to ascertain the presence and extent of wetlands in these areas. After these wetlands were surveyed, all other land was traversed in order to ensure that no wetlands were passed over.

Upon visiting each wetland, an evaluation form supplied by the city was used in order to

document the important physical and biological features of the wetland including information on soils, hydrology and vegetation. Soils information included the occurrence of hydric soil indicators such as gleying, the presence of mottles, organic soil and hydrogen sulfide odor. Hydrologic characteristics such as the hydroperiod, duration of flooding or soil saturation, water source, maximum water depth, amount of water level fluctuation and an estimation of flow velocity (if flowing surface water) were noted. Information on the wetland vegetation included a complete list of all species present in the wetland, an estimate of the percent cover of each species and the percentage of the area that was vegetated and unvegetated.

The following functions were evaluated for each wetland: Groundwater recharge and discharge, flood storage, shoreline anchoring, sediment trapping, short term and long term nutrient retention, within basin and downstream foodchain support, fish habitat, wildlife habitat and passive recreation. A detailed discussion of each function can be found in *Advanced Identification of Wetlands in the City of Boulder Comprehensive Planning Area* and will not be covered here.

Each function was rated on two different scales. The first scale is based on how well the wetland performs a particular function and ranges from 1 (does not perform this function) to 5 (performs this function to a very high degree). The second rating is the confidence in the first rating and ranges from "a" (low confidence) to "c" (high confidence).

This study also included surveying wetlands with suitable habitat for the presence of the federally threatened orchid, *Spiranthes diluvialis*. Guidelines discussed in the "*Interim Survey Requirements for Spiranthes diluvialis*" (USFWS 1992) were used to determine which wetlands contained suitable habitat. When a wetland with suitable hydrology and plant species that are

known to associate with Spiranthes was located, the wetland was sectioned into linear grids and intensively searched for the orchid. The width of each grid varied according to the size and density of associate vegetation and were a maximum of 2m wide. Although no individuals were found during the study, wetlands with habitat that could potentially support this species were noted.

Each wetland was assigned a number, a photograph was taken from several perspectives if possible and the physical limits of each wetland were drawn on the corresponding blueline aerial photograph. Information collected from each wetland was compiled into computer files in a structure compatible with the City's wetland database. Field investigations were conducted between July and September, 1994.

Finally, the potential impacts of the proposed Boulder Lindsay hydroelectric project on each wetland was evaluated. This discussion included an estimation of the direct and indirect impacts on hydrology, vegetation and functions of the wetland as well as the area that will be impacted.

RESULTS AND DISCUSSION

Sixteen wetlands were identified and mapped in the study area. The origin and principle water source as well as an estimation of the acreage of each wetland is given in Table 1.

The Boulder Diversion Canal exerts an important influence on many of the wetlands in the study area. Of the 11 wetlands that lie down gradient of the canal, at least seven are partly or wholly influenced hydrologically by leaks from the canal or its pipeline. These are represented by an urban/industrial origin in Table 1.

Numerous joints in the above ground pipeline leak and contribute to natural flows in Doudy Draw and lower Spring Brook year round. Additional underground leakage occurs in several places along the canal and influences the hydrology of several other wetlands. Interestingly, three of these wetlands are streams with water flowing for most of the year that would likely be seasonal in nature if not for the contributions from the canal. Thus, should repairs or alterations to this artificial water source ever occur, it could impact a number of wetlands in the study area.

Table 1. Origin, water source and acreage of wetlands in the study area. A = Agricultural, N = Natural, U = Urban/Industrial (from Boulder Diversion Canal), G = Ground water, D = Ditch, C = Creek, P = Pond

Wetland #	Origin	Source	Acreage
1	N+A	G+P	0.537
2	U	D	1.119
3	U	D	0.335
4	N+U	C+D	6.901
5	A	P	0.336
6	A	D	0.687
7	N+A	G+P	0.312
8	N+U	C+D	0.762
9	N	G	4.288
10	N	C	5.550
11	N+U	C+D	0.856
12	A+U	P+D	0.863
13	N	G	0.036
14	N	C	1.187
15	N	G (and/or precip)	0.243
16	U	D	1.053

Of the 5 wetlands that have an agricultural origin, 4 of these (wetlands 1, 5, 7 and 12) are the result of ponds being dug presumably for livestock watering. Wetlands 1 and 7 have springs

immediately up gradient that were dammed to impound water. Ten of the wetlands have natural origins and occur either along streamcourses or as a result of a high water table expressing itself at the ground surface. Wetland 15 may also be influenced by snowmelt from large snowdrifts that form on the mesa top where this wetland occurs.

Functions of Wetlands in the Study Area

Several functions are performed to a high degree by many of the wetlands in the study area (Table 2). These functions include ground water recharge, food chain support and wildlife habitat.

Ground water recharge is the movement of surface water into the ground water system. Wetlands that perform this function typically have a dam occurring in the waterway and a constricted outlet that allows surface water to permeate into the underlying strata. This situation occurs in wetlands 1, 5, 7 and 12. Wetlands that have surface water inflow exceeding surface water outflow also perform this function well. The streams that occur in the study area have no significant surface water outflow, that is, they stop flowing at some point in the drainage and the surface water is assumed to be recharging the ground water system.

In many cases, leakages from Boulder Diversion Canal also appear to be contributing to ground water recharge. Much of this water flows into the various wetlands but does not flow out. Although a portion of this water evaporates and is evapotranspired from plants in the wetlands, some is assumed to become ground water.

Food chain support is another function performed by many of the wetlands in the study area. Wetlands that are isolated from others or occur outside of drainages such as wetlands 1 and

7 have high within basin food chain support but contribute little to downstream food chain support. Because many of the riparian wetlands are connected by drainage patterns and water flow, they contribute nutrients and support food chains beyond their immediate basin. Most of the wetlands that provide downstream food chain support also perform this function well within their own basin.

Table 2. Wetlands in the study area performing functions to a high or very high degree.

Function	Wetland number
Ground water recharge	1, 2, 3, 4, 5, 7, 9, 10, 11, 12, 14, 15
Ground water discharge	1, 6, 7, 9, 10, 11, 14
Flood storage	3, 4, 14
Shoreline anchoring	4, 8, 9, 12
Sediment trapping	5, 9, 11, 12
Nutrient retention-Long term	9, 11, 12, 16
Nutrient retention-Short term	5, 9, 11, 12, 14, 16
Food chain support-Downstream	2, 4, 8, 9, 10, 11, 12, 14
Food chain support-Within basin	1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 14
Fish habitat	12
Wildlife habitat	1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 14, 16
Passive recreation	4, 11, 12

Most of the wetlands in the study area provide wildlife habitat to a high or very high degree. This is likely due to several factors including the high primary productivity in wetlands that provide food and cover for organisms, a persistent water supply, isolation from urban and industrial development and connectivity between individual wetlands. The wetlands that did not provide wildlife habitat to a high degree either had a seasonal water supply (wetlands 5 and 6) or were small and isolated from other wetlands (wetlands 13 and 15).

Five wetlands performed 7 or more functions to a high or very high degree (Table 3). Of

these, 3 were streams with flowing surface water for most of the year (wetlands 4, 11, 14), one was a large wet meadow with a pond (wetland 9) and one was a pond with a surrounding emergent marsh (wetland 12). These wetlands all had several physical features in common including surface water for most of the year, large size and a large edge to area ratio. (Note - wetland 12 is located within the drainage of wetland 4 and is therefore considered "large" and to have a high edge to area ratio).

Wetland #	# of functions performed to a high or very high degree (n=12)
1	4
2	4
3	4
4	7
5	3
6	1
7	4
8	4
9	9
10	5
11	8
12	10
13	1
14	7
15	1
16	2

It is important to note that the functional evaluation technique used in this study is not based on the collection and analysis of quantitative data. Individual functions are ascribed to wetlands based on qualitative and observational data and the experience of the investigator.

However, each wetland was evaluated using the same methodology and therefore comparisons between wetlands in this study and wetlands in the Boulder Valley that have been evaluated using the same techniques are valid. In order to fully understand and identify the functions of these and other wetlands, more detailed and quantitative data must be collected and analyzed.

Spiranthes diluvialis Survey

Ute ladies'-tresses orchid (*Spiranthes diluvialis*) grows in seasonally moist soils and wet meadows below 6,500 feet elevation in Colorado and occurs in several locations in Boulder and Jefferson Counties. It prefers partially shaded open glades or meadows and pastures with full sunlight. Several wetlands in the study area provide suitable habitat and most of these contain plant species that are commonly associated with the orchid. Wetlands 2, 4, 6, 8, 9 and 14 have habitat that could potentially support *Spiranthes diluvialis* and were surveyed for the orchid.

Although no individuals of this species were found in any of the wetlands in the study area, it should not be assumed that it does not exist in these wetlands. The species is very difficult to locate unless it is flowering. Adding to this difficulty is the fact that flowering time is known to vary seasonally and the species may not flower every year.

Several individuals of the orchid were located in previous years in wetland 6 (Nina Williams, pers. comm.) and it likely still exists there. Its absence during this survey is probably a function of the previously mentioned phenological sensitivities of the species as well as the stress of a dry summer.

Impacts of Hydroelectric Development on Wetlands in the Study Area

The proposed Boulder Lindsay hydroelectric project is a pumped storage project that will include two storage reservoirs. The lower reservoir will be located in upper Doudy Draw, store 2,000 acre feet of water and cover 35 surface acres of land. The upper reservoir will be upstream in Bull Gulch and will be slightly smaller. This project will impact wetlands 4, 10 and 12 either directly or indirectly.

The impact of dams on the hydrology of streams and rivers is well documented (Johnson et al. 1976, Johnson and Brophy 1982, Rood and Mahoney 1990). Regulated streams typically have altered flood frequency distributions, lower peak flows and mean flows and reduced natural channel dynamics. Wetland 4 will likely be altered by a reduction in average water flows and have fewer and less severe flooding events that contribute to the dynamic nature of the system. Sediments that are normally carried downstream providing nutrients for down stream food chains and deposited for cottonwood and willow seedbeds will be deposited behind the dams. Removal of sediments may also contribute to channel erosion and downcutting of the banks in certain areas.

These hydrologic impacts will also alter the vegetation of wetland 4. Plant communities of streams are closely linked with periodic flooding and associated channel dynamics and are often degraded by regulation by dams. The species diversity of this plant community will possibly be reduced over time and invasive, non-native species will likely increase.

Wetland 10 will be inundated by the lower reservoir and will no longer exist. As a result, all the functions it currently performs will be lost. It will likely be replaced by a fringe wetland around the reservoir of unknown size, community type or function.

Wetland 12 will be impacted in a similar fashion as wetland 4. The floods and seasonal high flows that provide sediment and nutrients to this wetland will be reduced by the dam upstream. Additionally, the amount of water that is currently delivered to the wetland will likely be less and could change the hydrologic regime from a permanently flooded to a seasonally flooded nature. These changes will reduce its ability to retain nutrients and provide food chain support and fish habitat.

LITERATURE CITED

Cooper, D. J. 1988. Advanced Identification of Wetlands in the City of Boulder Comprehensive Planning Area. U.S. Environmental Protection Agency. Unpublished Report. 52pp.

Johnson, W.C., R.L. Burgess and W.R. Keammerer. 1976. Forest overstory vegetation and environment on the Missouri River floodplain in North Dakota. Ecological Monographs 46:59-84.

Johnson, W.C., and J.A. Brophy. 1982. Altered hydrology of the Missouri River and its effects on floodplain forest ecosystems. Virginia Water Resources Research Center Bulletin 139. Virginia Polytechnic and State University, Blacksburg.

Rood, S.B., and J.M. Mahoney. 1990. Collapse of riparian forests downstream from dams in western prairies: probable causes and prospects for mitigation. Environmental management 14:451-464.

USFWS. 1992. Interim Survey Requirements for Spiranthes diluvialis. Unpublished Report. 9pp.

Weber, W.A. 1990. Colorado flora: eastern slope. University press of Colorado. Niwot, CO.

Appendix A. Plant species of the Doudy Draw/Eldorado Mountain area wetlands. U.S. Fish and Wildlife Service region 5 (Central Plains) and national wetland indicator category for each species are also listed (NL= not listed). Nomenclature follows Weber (1990).

Scientific Name	Common Name	Region 5	National
Acanthoxanthium spinosum	Spiny cocklebur	FACU	FACU,FAC+
Acer glabrum	Rocky Mountain maple	FAC	FACU,FAC
Agrostis gigantea	Bentgrass, black	NI	FAC?
Agrostis stolonifera	Bentgrass, spreading	FAC+	FAC+,FACW
Alisma plantago-aquatica	Water plantain, broadleaf	OBL	OBL
Alnus incana ssp. tenuifolia	Thin-leaf alder	NL	NL
Alopecurus aequalis	Short awn foxtail	OBL	OBL
Ambrosia psilostachya	Ragweed	FAC	FACU-,FAC
Amorpha fruticosa	False Indigo-bush	OBL	FAC,OBL
Arctium minus	Burdock	NL	NL
Batrachium circinatum ssp. subrigidum	Water crowfoot	OBL	OBL
Beckmannia syzigachne	Sloughgrass, American	OBL	OBL
Betula fontinalis	River birch	OBL	FACW,OBL
Bidens cernua	Beggar-ticks, nodding	OBL	FACW+,OBL
Bidens comosa	Beggar-ticks	FACW	FACW
Bidens frondosa	Beggar-ticks, devil's	FACW	FACW,FACW+
Cardamine cordifolia	Bitter-cress	OBL	OBL
Carduus nutans	Musk thistle	NL	NL
Carex lanuginosa	Sedge, wooly	OBL	OBL
Carex microptera	Sedge	NL	NL
Carex nebrascensis	Sedge, Nebraska	OBL	OBL
Carex praegracilis	Sedge, clustered field	FACW	FACW-,FACW+
Carex scoparia	Sedge, pointed broom	FACW	FACW
Carex stipata	Sedge, stalk grain	OBL	OBL
Ceratophyllum demersum	Hornwort, common	OBL	OBL
Chenopodium glaucum	Goosefoot, oakleaf	FACW	FAC,FACW
Cirsium arvense	Canada thistle	FACU	FACU-,FAC
Crataegus macracantha	Hawthorn	NL	NL
Critesion jubatum	Foxtail barley	FACW	FAC,FACW
Dactylis glomerata	Orchard grass	FACU	FACU,FACU+
Digitalis purpurea	Foxglove	NL	NL
Distichlis spicata	Saltgrass,inland	NI	FAC+,FACW
Echinochloa crusgalli	Barnyard grass	FACW	FACU,FACW

[illegible]ocharis palustris	Spikerush,creeping	OBL	OBL
Eleocharis parvula	Spikerush,small	OBL	OBL
Elymus canadensis	Wild rye, Canada	FACU	FACU,FAC+
Epilobium ciliatum	Willow-herb, hairy	OBL	FACU,OBL
Festuca pratensis	Meadow fescue	FAC	FACU-,FAC
Glyceria striata	Fowl mannagrass	OBL	OBL
Glycyrrhiza lepidota	Licorice, American	FACU	UPL,FAC+
Halerpestes cymbalaria ssp. saximontana	Alkali crowfoot	OBL	OBL
Iris missouriensis	Rocky Mountain iris	OBL	FACW-,OBL
Juncus acuminatus	Rush, taper-tip	OBL	OBL
Juncus balticus	Rush, baltic	OBL	FACW,OBL
Juncus bufonius ssp. occidentalis	Rush, toad	OBL	FACW,OBL
Juncus interior	Rush, inland	FAC	FACU,FACW
Juncus longistylis	Rush, long-style	FACW	FACW,FACW+
Juncus nodosus	Rush, knotted	OBL	OBL
Juncus saximontanus	Rush	NL	NL
Juncus tenuis	Rush, slender	FAC	FAC-,FACW
Juncus torreyi	Rush, torrey's	FACW	FACW,FACW+
Lophopyrum elongatum	Wheatgrass, slender	FACU	FACU,FAC
[illegible]pus americanus	Bugleweed, American	OBL	OBL
Melilotus alba	Sweetclover, white	FACU	FACU-,FACU+
Mentha arvensis	Fieldmint	FACW	FAC,FACW
Mentha spicata	Spearmint	OBL	FACW,OBL
Monarda fistulosa	Horsemint	FACU-	UPL,FAC+
Mimulus glabratus	Monkeyflower	OBL	OBL
Myosotis scorpioides	Forget-me-not	FACW	UPL,FACW
Myriophyllum spicatum	Water-milfoil, eurasian	OBL	OBL
Negundo aceroides	Box-elder	FAC	FAC,FACW
Padus virginiana ssp. melanocarpa	Chokecherry	FACU	FACU-,FAC
Pascopyrum smithii	Wheatgrass, western	FACU	UPL,FAC-
Persicaria punctatum	Smartweed, dotted	OBL	FACW,OBL
Persicaria maculata	Lady's thumb	OBL	FAC,OBL
Persicaria lapathifolium	Willow-weed	OBL	FAC,OBL
Persicaria hydropiper	Smartweed, marshpepper	OBL	FACW,OBL
Physocarpus monogynus	Ninebark	FAC	UPL,FAC
Plantago major	Plantain, common	FAC	FACU,FACW
Poa pratensis	Bluegrass, Kentucky	FACU	FACU,FAC-
[illegible]mpressa	Bluegrass, Canada	FACU	FACU-,FAC

Polygonum aviculare	Knotweed, prostrate	FACW	UPL,FACW
Polypogon monspeliensis	Rabbit-foot grass	OBL	FACW,OBL
Populus deltoides ssp. monilifera	Cottonwood, plains	FAC	FAC,FACW
Populus angustifolia	Cottonwood, narrow-leaf	FACW	FAC,FACW
Potamogeton nodosus	Pondweed, long-leaf	OBL	OBL
Potamogeton pectinatus	Pondweed, sago	OBL	OBL
Potamogeton pusillus	Pondweed, small	OBL	OBL
Potamogeton foliosus	Pondweed, leafy	OBL	OBL
Prunella vulgaris	Heal-all	FAC	FACU,FACW
Prunus americana	Wild plum	NL	NL
Puccinellia distans	Weeping alkali grass	OBL	FACW,OBL
Ranunculus sceleratus	Buttercup, celery-leaf	OBL	OBL
Ribes cereum	Currant, white squaw	NI	FACU?
Rorippa palustris	Yellow-cress, bog	OBL	FAC,OBL
Rosa woodsii	Woods rose	FACU	UPL,FAC-
Rudbeckia ampla	Coneflower	FAC	FACU,FACW+
Rumex aquaticus ssp.occidentalis	Western dock	OBL	OBL
Rumex crispus	Curly dock	FACW	FACU,FACW
Sagittaria latifolia	Arrowhead, broad-leaf	OBL	OBL
Salix amygdaloides	Willow, peach-leaf	FACW	FACW
Salix bebbiana	Willow, Bebb	FACW	FAC,FACW+
Salix exigua	Willow, sandbar	OBL	FACW,OBL
Salix fragilis	Willow, crack	FAC	FAC,FAC+
Schoenoplectus lacustris ssp. creber	Bulrush, soft-stem	OBL	OBL
Schoenoplectus pungens	Bulrush, three-square	OBL	FACW+,OBL
Scirpus microcarpus	Bulrush, small-fruit	OBL	OBL
Spartina pectinata	Prairie cordgrass	FACW	FACW,OBL
Sporobolus airoides	Alkali sacaton	FAC	FAC-,FAC+
Thalictrum fendleri	Meadow-rue	NL	NL
Trifolium pratense	Red clover	FACU	FACU-,FAC
Typha angustifolia	Cattail, narrow-leaf	OBL	OBL
Typha latifolia	Cattail, broad-leaf	OBL	OBL
Verbena hastata	Blue vervain	FACW	FAC,FACW+
Veronica anagallis-aquatica	Speedwell,water	OBL	OBL
Veronica catenata	Speedwell, pink water	OBL	OBL

Appendix B. Wetland field data sheets.

INFORMATION HAS BEEN ENTERED INTO WETLANDS DATABASE

MDG 1/21/97