A Natural Heritage Assessment and Inventory of State Wildlife Area Wetlands

1998-99 Pilot Study

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Executive Summary

In 1998, the Colorado Natural Heritage Program (CNHP) was contracted to conduct a pilot study of wetlands and riparian areas on several Colorado Division of Wildlife (CDOW) State Wildlife Areas (SWAs). The primary goals of this project were to refine the methodology for a comprehensive assessment of wetlands on SWAs statewide, determine the level of effort (i.e. personnel time and money) needed to perform this assessment, and to provide the groundwork for a field-verified, scientifically-based SWA wetlands database. Other important goals were to quantify the types of wetland and riparian habitats, and identify the functions and values of these habitats for each SWA. It was intended that the results of this pilot would be utilized by the CDOW Wetlands Program to evaluate in the near future the feasibility of a statewide SWA wetlands comprehensive assessment project. Such an evaluation would include an assessment of how well such a project would compete within the internal DCOW budgeting process. It would also include an assessment of funding needs, personnel needs, and equipment needs.

To achieve these goals, the CNHP conducted this pilot study on 9 SWAs with wetlands during the 1998 field season. SWAs were subjectively selected to represent a diverse range of management approaches, hydrologic regimes, elevations, and sizes. This was done to try to evaluate the applicability of methods and to estimate the level of effort needed to complete assessments throughout the Colorado SWA system.

The study focused on collecting spatially referenced information on plant communities, environmental attributes, and wetland functions and values. The study assessed vegetation and environmental attributes using National Wetlands Inventory (Cowardin et al. 1979) mapping units. The objective was to field verify mapping units generated by the NWI and collect more detailed information on species present, plant communities present, and environmental characteristics. These data are currently categorized and placed into a Geographic Information System (GIS) and spreadsheets, and will be incorporated into a wetlands database and the Natural Diversity Information System (NDIS).

The most important outcome of the pilot study was unexpected: the development of a project that subsequently was entitled “Comprehensive Statewide Wetlands Classification and Characterization” (Appendix A). This concept was conceived in the planning and design stages of the pilot study as a result of discussions between the CDOW and CNHP staff familiar with wetlands mapping, inventory, and classification. From these discussions and from the early results of the pilot study, it was concluded that the statewide effort is the first step to take and that it would, over time, provide the information targeted by the original “statewide SWA comprehensive assessment” concept, but in a more useable context. Funding was secured for the statewide project from EPA and implementation will begin in May of 1999.

Thus, the decision whether or not to proceed with the SWA wetlands comprehensive assessment project will be made in the context of the larger statewide comprehensive

effort. Nevertheless, CNHP anticipates that the results of this pilot study will further CDOW's ability to assess their efforts in a broader context to insure more effective and efficient conservation. The larger statewide effort on the other hand, will provide point data for interpretation of National Wetland Inventory (NWI) maps, CDOW riparian classification projects, or GAP signatures. It will also contribute to development of a statewide HGM (hydrogeomorphic) wetland functional assessment program by identifying potential reference wetlands, describing the range of variation of wetlands, and providing qualitative information on wetland functions that can guide future quantitative data collection for reference wetlands.

Introduction

Colorado wetlands are well known for providing habitat for wildlife, yet wetlands perform many functions beyond providing habitat for animals and plants. It is commonly known that wetlands act as natural sediment and toxicant filters, helping to protect water quality, but it is less well known that wetlands perform other important functions such as providing groundwater recharge, stabilizing stream banks, and providing protection from flood flows. A major shortcoming to our ability to protect and manage these important wetland resources is the lack of site-specific information in a comprehensive database. Without such information, management and conservation of these resources may be ineffective. For the purposes of this pilot study wetlands are defined as "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water" (Cowardin et al. 1979).

In 1998, the Colorado Natural Heritage Program (CNHP) was contracted to conduct a pilot study of wetlands and riparian areas on several Colorado Division of Wildlife (CDOW) State Wildlife Areas (SWAs). This project was initiated as an effort to begin identifying and quantifying wetland resources, functions, and values on SWAs and to develop a system for evaluating wetlands statewide. Comparison of wetlands on a statewide basis requires a system that uses data collected in a standardized way. Two systems that have been used successfully to evaluate wetlands over large areas are the Montana Wetland Field Evaluation Form (Berglund 1996) and the Hydrogeomorphic approach (HGM) (Brinson 1993). The methods used for this SWA wetland assessment were based on these two systems.

The main objectives of this project were to 1) refine the methodology for a comprehensive assessment of wetlands on SWAs statewide, 2) determine the level of effort (i.e. personnel time and money) needed to perform this assessment, 3) provide the groundwork for a field-verified, scientifically-based SWA wetlands database, 4) begin to quantify the types of wetland and riparian habitats (plant communities[1]) and identify the functions and values of these habitats for each SWA, 5) incorporate the information into a Geographic Information System (GIS) and readily accessible database.

[1] The term plant community or association as used by CNHP refers to vegetation with definite floristic composition, presenting a uniform physiognomy and growing in uniform habitat conditions.

Methods

Nine SWAs were subjectively selected to represent a diverse range of management approaches, hydrologic regimes, elevations, and sizes. This was done to evaluate the applicability of methods and to estimate the level of effort needed to complete assessments throughout the Colorado SWA system. The SWAs selected were Apishapa, Elliott, Flagler Reservoir, Lake Dorothey, Mount Evans, Queens Reservoir, Russell Lakes, Teter-Michigan Creek, Tomahawk. The study assessed vegetation and environmental attributes using National Wetland Inventory (NWI) mapping units (Cowardin et al. 1979). The objective was to field verify mapping units generated by the NWI and collect more detailed information on species present, plant communities present, and their environmental characteristics.

NWI mapping units were digitized to determine the size of each mapping unit within the SWA. Mapping units were field surveyed and detailed categorical and descriptive data were collected (see Table 1). Information recorded included abundance of plant communities, plant species present, wetland functions and values, environmental setting, and presence of sensitive species. These data are currently categorized and placed into a Geographic Information System (GIS) and spreadsheets, and will be incorporated into a wetlands database being developed. In addition, other information such as descriptions of hydrologic regimes and evidence of disturbance were assessed and are presented in narrative form for each SWA.

Abundance of Plant Communities

Within each NWI mapping unit the abundance of each different plant community was estimated and assigned a relative proportion between 1-10 (i.e., 1=10%, 10=100%). The area occupied by each plant community was then calculated by multiplying the proportion (10-100%) by the total area of the NWI mapping unit.

In some cases, where numerous mapping units containing the same plant communities were present, not every mapping unit was field verified. For example, Elliott SWA contains eleven units mapped as palustrine forested wetlands (PFOW NWI unit), all of which appear to be dominated by the same plant community. In cases such as this, where time limitations prevented field verification of every mapping unit, the abundance of each plant community was assumed to be similar to that in field verified mapping units (aerial photographs were examined for verification).

Plant Species Lists and Non-native Species

Lists of the most common plant species were compiled for each SWA during field surveys by CNHP staff. CNHP did not attempt to make exhaustive plant lists. In the initial stages of the project, the strategy was to have staff from the Denver Botanic Garden make comprehensive species lists and plant collections for each wetland type on

the SWAs. Due to time limitations, Denver Botanic Garden's staff were unable to conduct this task.

Along with habitat loss and fragmentation, invasion of non-native plant species may be one of the greatest threats to biodiversity. Numerous studies have shown that areas invaded by non-native species have reduced populations of native plant and animal species (Bedunah 1992, Melgoza et al. 1990, Belcher and Wilson 1989, Bock and Bock 1988). Documenting the relative abundance of non-native species at each SWA was an important goal of the project since these species can have a significant impact on areas managed for wildlife.

Non-native species were documented from each mapping unit using the following categories: a) none noted, b) present in less than 10% of mapping unit, c) present in 10-25% of mapping unit, d) present in more than 25% of the mapping unit. The most abundant non-native species in each of the field verified mapping units were listed. These species lists are being incorporated into the wetlands database for each SWA.

At the initial stages of the project the objective was to document those non-native species considered noxious weeds by the State of Colorado. Because many weeds not considered noxious can still substantially impact natural systems, CNHP felt it would be valuable to note the most problematic non-native species at each site, regardless of whether a species is considered noxious or not.

Interviews with Land Managers

Many of the local District Wildlife Managers have detailed knowledge about the SWAs that they manage therefore contacting them was considered an important part of the information collection. Phone interviews were conducted with SWAs managers familiar with each SWA. Interview forms were developed with the following questions:

1) What is the history of the site: date acquired, dates of impoundment, etc., previous owners and their land uses (such as grazing, timber harvest, etc.), other?

2) What are the main management objectives or goals and associated activities at the site?

3) Have previous biological inventories been conducted at the site? Parties involved? Objectives?

4) Is there an existing management plan? When was it completed? Where is it located?

5) Are there any known species of special concern?

6) What is the source of the water for the site? Are diversions or water augmentation used at the site? Have they been in the past?

7) Have seeding or other revegetation efforts ever been conducted at the site? When? What species were used?

8) Have animal species been introduced at the site (e.g. non-native fishes)? Which species?

9) What are the current uses of the site (consumptive or otherwise likely to affect wetlands and biodiversity)?

10) Other comments

Wetland Function and Values

Wetlands perform many functions beyond simply providing habitat for plants and animals. It is commonly known that wetlands act as natural filters, helping to protect water quality, but it is less well known that wetlands perform other important functions. Adamus et al. (1991) list the following functions performed by wetlands:

- Ground water recharge--the replenishing of below ground aquifers.
- Ground water discharge--the movement of ground water to the surface e.g., springs.
- Floodflow alteration--the temporary storage of potential flood waters.
- Sediment stabilization--the protection of stream banks and lake shores from erosion.
- Sediment/toxicant retention--the removal of suspended soil particles from the water, along with toxic substances that may be attached to these particles.
- Nutrient removal/transformation--the removal of excess nutrients from the water, in particular nitrogen and phosphorous.
- Production export--supply organic material (dead leaves, etc.) to the base of the food chain.
- Aquatic diversity/abundance--wetlands support fisheries.
- Wildlife diversity/abundance--wetlands provide habitat for wildlife.

Adamus and Stockwell (1983) include two items they call “values” which also provide benefits to society:

- Recreation--wetlands provide areas for fishing, birdwatching, etc.
- Uniqueness/heritage value--wetlands support rare and unique plants, animals, and plant communities.

“Values” are subject to societal perceptions, whereas “functions” are all biological or physical processes and manifestations of processes which occur in wetlands, regardless of the value placed on them by society (National Research Council 1995). The actual value attached to any given function or value listed above depends on the needs and perceptions of society.

CNHP utilized a function and value assessment based on the Montana Wetland Field Evaluation Form prepared by Morrison-Maierle Environmental Corporation (Berglund 1996). This technique is designed to provide rapid, economical, and repeatable wetland evaluation results. This form minimizes subjectivity and variability between evaluators, provides a means of assigning wetlands overall ratings, and incorporates some of the principles of the hydrogeomorphic (HGM) assessment method. It also classifies each wetland using the Cowardin et al. (1979) classification system. It is important to note that this method is intended to evaluate wetland functions and values, and is not to be used to delineate jurisdictional wetland boundaries (Berglund 1996).

The following functions and values are evaluated using the Montana Wetland Field Evaluation Form:

- Habitat for federally listed, proposed, or candidate threatened or endangered plants or animals
- Habitat for plants, animals, and natural plant communities rated S1, S2, or S3 by CNHP
- General wildlife habitat
- General fish habitat
- Flood attenuation and storage
- Sediment/nutrient/toxicant retention and removal
- Sediment/shoreline stabilization
- Production export/food chain support
- Groundwater discharge/recharge
- Uniqueness
- Recreation/education potential
- Dynamic surface water storage

Table 1. Variables Evaluated for SWA Wetlands.

HYDROLOGY	**Description**	**Variable Type**
Hydrologic Regime	Denotes flooding period. In increasing order, intermittent< temporarily < seasonal < semipermanent	Categorical
Water Source/HGM Class	Hydrogeomorphic Class(es) present (riverine, depressional, lacustrine, etc.)	Categorical
SOILS		
Presence/Distribution of Organic Soils	Denotes presence and extent of sapric, histic or hemic soils at the complex	Presence/ absence
Presence/Distribution of Fens	Denotes presence of groundwater supported wetlands with peat accumulations exceeding 0.3 m (16")	Presence/ absence
Presence/Distribution of Saline Soils	Denotes presence and extent of visibly saline or alkaline soils	Presence/ absence
WETLAND FUNCTIONS AND VALUES		
Habitat for S1,S2, and S3 Ranked Species	Habitat for species which are tracked by the Colorado Natural Heritage Program	Categorical
General Wildlife Habitat	Habitat for native wildlife (i.e. presence of water, food, and cover)	Categorical
General Fish Habitat	Habitat for native fishes (i.e. water of high quality with presence of habitat for native fish species)	Categorical
Flood Attenuation and Storage	Ability of wetlands at the site to detain moving water through storage or resistance by vegetation	Categorical
Dynamic Surface Water Storage	Potential of wetland to intercept flow from local precipitation, surface flow, or groundwater flow	Categorical
Sediment/ Toxicant Retention	Ability of the wetland to retain or remove sediments and toxicants	Categorical
Sediment/Shoreline Stabilization	Ability of the wetland to dissipate flow or wave erosion	Categorical
Groundwater Discharge/Recharge	Assesses potential of the wetland for groundwater recharge or discharge	Categorical
Uniqueness	Assesses uniqueness of the wetland within the larger watershed basin	Categorical
Recreation Potential	The potential for the wetland to support recreational activities	Categorical
Production/Export/Food Chain Support	Assesses the ability of the wetland to generate and export food/nutrients for living organisms	
LANDSCAPE CONTEXT		
Type of Surrounding Land Uses	Describes the type of surrounding land use(s)	Descriptive
Type of Surrounding Land Ownership	Describes the type of surrounding land ownership	Descriptive
Connectivity with Other Natural Areas	Describes the proximity to other areas managed for natural resources	Descriptive
Position of Wetland in Relation to Sediment, Toxicant, or Nutrient inputs	Describes the proximity to sources of sediments, toxicants, or nutrients (such as agricultural fields, municipal or road drainage, etc.)	Descriptive

The methodology assigns each of the functions and values ratings of "low", "moderate", or "high", and scores each on a scale of .1 (lowest) to 1 (highest) "functional points." The scoring scale for each function and value is similar to that of HGM (see description below).

Functional points are summed on the form and expressed as a percentage of the possible total. This percentage is then used in conjunction with other criteria to provide an overall wetland ranking into one of four categories. Category I is the highest overall ranking a wetland can receive, Category IV the lowest. Functional points are also multiplied by the total acreage in the assessment area to determine the total "functional units" for a given site.

Habitat for Federally Listed, Proposed, Candidate Threatened or Endangered Plants or Animals and CNHP's Significant Plants, Animals, and Natural Plant Communities

This field assesses the wetland's ability to support habitat for federally threatened or endangered and/or state rare plants, animals, and natural plant communities (see Appendix B for CNHP methodology). The habitat is assessed based on known or suspected occurrence.

General Wildlife and Fish Habitat

Habitat includes those physical and chemical factors which affect the metabolism, attachment, and predator avoidance of the adult or larval forms of fish, and the food and cover needs of wildlife in the place where they reside. Wetland characteristics indicating good fish habitat include: deep, open, non-acidic water, no barriers to migration, well-mixed (high oxygen content) water, and highly vegetated. Wetland characteristics indicating good wildlife habitat are: edge ratio, islands, high plant diversity, and a sinuous and irregular basin. This field assesses general wildlife and fish habitat potential of the wetland based on known or suspected use by wildlife and fish, and habitat diversity.

Flood Attenuation and Storage

Wetlands are excellent in their ability to store or delay flood waters that occur from peak flow, gradually recharging the adjacent groundwater table. Indictors of flood storage include: debris along streambank and in vegetation, low gradient, formation of sand and gravel bars, high density of small and large depressions, and dense vegetation. This field assesses the capability of the wetland to detain moving water from in-channel flow or overbank flow for a short duration when the flow is outside of its channel.

Sediment/Nutrient/Toxicant Retention and Removal

Sediment and toxicant trapping is the process by which suspended solids and chemical contaminants are retained and deposited within the wetland. Deposition of sediments can ultimately lead to removal of toxicants through burial, chemical break down, or temporary assimilation into plant tissues (Boto and Patrick 1979). Most vegetated wetlands are excellent sediment traps, at least in the short term. Wetland characteristics

indicating this function include: dense vegetation, deposits of mud or organic matter, low gradient, and location next to beaver dams or human-made detention ponds/lakes.

Nutrient retention is the storing of nutrients within the sediment or vegetation. Inorganic nutrients are transformed into the organic form, resulting in the transformation and subsequent removal of one nutrient (e.g., nitrogen) as a gas. Nutrient removal/ transformation involves trapping of nutrients before they reach deep water, are carried downstream, or are transported to underlying aquifers. Particular attention is focused on processes involving nitrogen and phosphorus, as these nutrients are usually of greatest importance to wetland systems (Kadlec and Kadlec 1979). Nutrient storage in wetlands may be for long-term (greater than 5 years) for example peatlands or short-term (30 days to 5 years) as in riverine wetlands. A densely vegetated cattail or bulrush community would be an example of a wetland that performs this function for the short-term. A wetland that would not perform this function would be sparsely vegetated and located on a steep slope.

Some indicators of nutrient retention include: high sediment trapping, organic matter accumulation, presence of free-floating, emergent, and submerged vegetation, and permanently or semi-permanently flooded areas. This field assesses the ability of the wetland to retain sediments and retain and remove nutrients and toxicants.

Sediment/Shoreline Stabilization

Shoreline anchoring is the stabilization of soil at the water's edge by roots and other plant parts. The vegetation dissipates the energy caused by fluctuations of water and prevents streambank erosion. The presence of woody vegetation and sedges in the understory are the best indicator of good shoreline anchoring. This field assesses the wetland's ability to dissipate flow or wave energy, reducing erosion.

Production Export/Food Chain Support

Production export refers to the flushing of relatively large amounts of organic material (carbon) from the wetland downstream. Production export emphasizes the production of organic foods within the wetland and the utilization of the exported production by fish and aquatic invertebrates. Food chain support is the direct or indirect use of nutrients, in any form, of animals inhabiting aquatic environments. Indicators of wetlands that perform downstream food chain support are: an outlet, seasonally flooded, overhanging vegetation, and dense and diverse vegetation. Wetlands that perform food chain support functions do not have stagnant water and contain productive vegetation.

Groundwater Discharge/Recharge

Ground water recharge occurs when the water level in a wetland is higher than the water table of its surroundings resulting in the movement (usually downward) of surface water (e.g., flood water retention). Ground water discharge results when the groundwater level of a wetland is lower than the water table of its surroundings, resulting in the movement (usually laterally or upward) of surface water (e.g., springs, seeps). Neither of these functions is exclusionary for a wetland can perform both functions simultaneously.

Ground water movement can greatly influence some wetlands, whereas in others it may have minimal effect (Carter and Novitzki 1988).

Both groundwater discharge and recharge are difficult to estimate without intensive data collection. Wetland characteristics that may indicate groundwater recharge are: porous underlying strata, irregularly shaped wetland, dense vegetation, and presence of a constricted outlet. Indicators of groundwater discharge are: a dam upstream and wet slopes with no obvious source.

Uniqueness
This value expresses the general uniqueness of the wetland in terms of relative abundance of similar sites occurring in the same watershed, with similar size, condition, landscape context, and replacement potential.

Recreation/Education Potential
Active recreation refers to recreational activities which are water-dependent. This includes the following activities: swimming, boating, canoeing, and kayaking. Passive recreation refers to the use of wetlands for aesthetic enjoyment e.g., nature study, picnicking, open space, or research.

Dynamic Surface Water Storage
Dynamic surface water storage refers to the potential of the wetland to capture water from precipitation, upland surface (sheetflow), or subsurface (groundwater flow) flow. Wetlands are subjected to surface inflows of several types. Sheetflow is nonchannelized flow that usually occurs during and immediately following rainfall or a spring thaw. Wetlands can also receive surface inflow from seasonal or episodic pulses of flood flow from adjacent streams and rivers that may otherwise not be connected hydrologically with the wetlands (Mitsch and Gosselink 1993). This function refers to wetlands that are not subject to flooding or are flooded by in-channel or overbank flow (see Flood Storage and Attenuation).

Hydrogeomorphic (HGM) Approach to Wetland Function Assessment

Few people argue about the value of wetlands for water quality maintenance, flood regulation, and wildlife habitat, but when wetlands occur on private land their regulation for public good provokes controversy. In an effort to provide a more consistent and logical basis for regulatory decisions about wetlands, a new approach to assessing wetland functions – the *hydrogeomorphic* approach is being developed. In Colorado, the hydrogeomorphic, or HGM, approach to wetland function assessment is being developed by the Colorado Geological Survey, with help from the U.S. Army Corps of Engineers, other government agencies, academic institutions, the Colorado Natural Heritage Program, and representatives from private consulting firms (Colorado Geologic Society et al. 1998).

This approach is based on a classification of wetlands according to their hydrology (water source and direction of flow) and geomorphology (landscape position and shape of the

wetland) called “hydrogeomorphic” classification (Brinson 1993). There are four hydrogeomorphic classes present in Colorado: riverine, slope, depression, and mineral soil flats (Table 2). Within a geographic region, HGM wetland classes are further subdivided into subclasses. A subclass includes all those wetlands that have essentially the same characteristics and perform the same functions.

Using the HGM method, wetland functions are evaluated only with respect to other wetlands in the same subclass, because different subclasses often perform very different functions. For example, a montane kettle pond may provide habitat for rare plant communities never found on a large river, but it has little flood control value. While on the other hand, the wetlands along a major river perform important flood control functions.

One of the fundamental goals of the HGM approach is to create a system whereby every wetland is evaluated according to the same standard. In the past wetland function assessments typically were on a site by site basis, with little ability to compare functions or assessments between sites. The HGM approach allows for consistency first through the use of a widely applicable classification, then through the use of *reference wetlands*. Reference wetlands are chosen to encompass the known variation of a subclass of wetlands. A subset of the reference wetlands is a *reference standard*, wetlands that correspond to the highest level of functioning of the ecosystem across a suite of functions (Brinson and Rheinhardt 1996).

The hydrogeomorphic approach to wetland function assessment assumes that highest, sustainable functional capacity is achieved in wetland ecosystems and landscapes that have not been subject to long-term anthropogenic disturbance. Under these conditions, the structural components and physical, chemical, and biological processes in the wetland and surrounding landscape reach the dynamic equilibrium necessary to achieve highest, sustainable functional capacity (Smith et al. 1995). In general reference standards, against which all other wetlands in a subclass will be compared, meet this condition.

Table 2. Hydrogeomorphic wetland classes in Colorado (Cooper 1998 as cited in Colorado Geological Survey et al. 1998).

Class	Geomorphic setting	Water Source	Water Movement	Subclass	Examples
Riverine	In riparian areas along rivers and streams	Overbank flow from channel	One-directional and horizontal (downstream)	R1-steep gradient, low order streams	Herbaceous plants community in subalpine
				R2-moderate gradient, low to middle order	Willow shrublands along a montane creek
				R3-middle elevation, moderate gradient along small/mid-order stream	Yampa River
				R4-low elevation canyons or plateaus	Yampa River in Dinosaur N.M.
				R5-low elev. floodplains	Arikaree River in eastern CO
Slope	At the base of slopes, e.g., along the base of the foothills; also, places where porous bedrock overlying a non-porous bedrock intercepts the ground surface.	Groundwater	One-directional, horizontal (to the surface from groundwater)	S1-alpine and subalpine fens on non-calcareous substrates.	Big Meadows in R.M. N.P.
				S2-subalpine and montane fens on calcareous substrates	High Creek fen
				S3-wet meadows at middle elev.	Irrigated/ natural meadows
				S4-low elev. meadows	Sedge meadow in eastern CO
Depressional	In depressions cause by glacial action (in the mountains) and oxbow ponds within floodplains. Lake, reservoir, and pond margins are also included.	Shallow ground water	Generally two-directional, vertical: flowing into and out of the wetland in the bottom and sides of the depression	D1-mid to high elevation basins with peat soils or lake fringe without peat	Kettle ponds
				D2-low elevation basins that are permanently or semi-permanently flooded	Reservoir or lake margins
				D3-low elevation basin with seasonal flooding	Mishak Lakes in SLV
				D4-low elevation basins that are temp. flooded	Abandoned beaver ponds
				D-5-low elevation basins that are temporarily flooded	Playa lakes
Mineral Soil Flat	Topographically flat wetland	Precipitation	Two directional	F1-low elevation with seasonal high water table	Southern side of Antero Reservoir

Discussion and Recommendations

Use of NWI Maps and CDOW Riparian Classification/Maps

NWI mapping for Colorado was mainly done with black and white photos from the 1970s and color-infrared photos from the 1980s. Changes in water management (levels) and natural plant succession can result in drastic changes in the plant communities over a relatively short time resulting in outdated and inaccurate maps. For example, water levels at Queens SWA are much higher than when the NWI maps were completed for the area. One NWI mapping unit described as being temporarily/intermittently flooded in 1975 was completely flooded in 1998. Wetland boundaries were often used as reference points for estimating abundance of the different plant communities. If these boundaries had significantly changed, the accuracy of determining abundance of plant communites was reduced. This was the case at Queens and Flagler Reservoir SWAs, and to a lesser extent at Elliott SWA. However, the NWI mapping units at the other SWAs were still relatively accurate.

Field survey of wetland mapping units is necessary to determine both species composition and condition (especially abundance of non-native species). NWI mapping units often contain very different vegetation types such as shrublands and herbaceus vegetation. These vegetation types often have very different function and values. The mapping units used for DOW's Riparian Classification/Mapping project are delineated by experienced staff using current aerial photographs. This greatly increases the level of accuracy and avoids combining very different vegetation types. These mapping units could be used to more accurately determine the abundance of different plant communities. Field survey is still needed to determine species composition and condition, especially in riparian areas and wetlands where diversity is high. For example, within DOW's Willow/Riparian Shrub mapping unit there are numerous willow plant communities, often with very different functions and values.

Two main factors limited the accuracy of determining plant community abundance. Plant communities recorded as occurring in 10% of the mapping unit could in fact dominate anywhere between 1-10% of the area. Also , the accuracy of estimating the relative proportion (1-10 or 10-100%) was felt to be limited to plus or minus one value. For example, a plant community recorded as dominating 30% of the mapping unit could probably dominate anywhere from 20-40% of the mapping unit. To achieve greater accuracy would require the use of a Global Positioning System (GPS) and physically walking the boundary of each plant community. This would greatly increase the amount of field and office time needed for evaluation.

Species Lists and Non-native Species

In the initial stages of the project the strategy was to have staff from the Denver Botanic Garden (DBG) make comprehensive species lists and plant collections for each wetland

type (NWI mapping units) on the SWAs. Due to time limitations, the DBG staff were unable to conduct this task. DBG staff estimated the resources needed for completing exhaustive species lists. Doing this at each SWA would require much more time and effort than available for this project.

Limited information is available in the literature to determine at what level the invasion of non-native species becomes significant. Those species that occur throughout an area in minor quantities may not have as great an impact on native plant and animal communities as those that are present in a small part of an area, but are heavily dominant. Therefore, CNHP felt that along with documenting presence within a mapping unit, documenting the abundance in relation to the abundance of native species would be valuable. CNHP recommends that future inventories use estimates of both. This would add valuable management information without significantly adding to the time necessary for field survey. Specific methods to assess relative abundance should be investigated. Using relatively broad canopy cover classes would be fairly quick and accurate.

Function and Values Assessment

Standardizing the data fields is critical to being able to compare wetlands across the state, especially using GIS. The wetland function and value assessment and HGM methods are useful for statewide comparison. The use of categorical data (suitable for database and GIS use) often does not provide detailed information useful for site-specific management. The desire to provide local managers with more information resulted in the preparation of the written reports for each SWA. Descriptive text fields used in the reports for each SWA could be linked to GIS polygons.

Interviews with Local Land Managers

In order to get the more detailed background information interviewing the manager(s) familiar with each SWA was considered an important step. Phone interviews were done, in most cases after the field season. This proved to be difficult for several reasons: we were unsure of who the main contact was, contacting many managers is difficult (especially once hunting season has started), and often the managers did not have on hand all the information we were trying to collect.

We felt that personal interviews would have provided greater detail and would recommend this in the future. This would have the benefit of increasing local participation in the project but would also increase the demands on the managers schedule, add to increased coordination with scheduling, and possible increase travel time. Another possible option would be to further develop the questionnaire and a cover letter describing the level of information needed and mailing it to the appropriate manager(s). This would possibly allow more than one individual to contribute information but would also increase time demands on DOW personnel. Visiting regional offices may be necessary to view the Master Management Plans.

General Comments

In general, the amount of time needed for field inventory and associated office work varied in proportion to the size of the SWA and wetlands, and the number of NWI mapping units at the SWA. Large, complex wetland systems like those at Elliott and Russell Lakes SWAs required 3-5 days of fieldwork, and a proportionally greater amount of time for data compilation and digitizing. Smaller, less variable wetland systems like those at Flagler Reservoir and Mount Evans SWAs generally required only 1-2 day of fieldwork and travel time.

Text Report Format for SWAs

Location: Location and access points.

Legal Description: Township, Range and sections in which the SWA occurs.

General Description: Includes information on the size of the SWA (taken from DOW information brochures or from digitized boundaries), elevation range, major upland plant communities present, major wetland types present, general environmental setting, current management and landuse, adjacent landuse, and proximity to other lands managed primarily for natural resources.

Imperiled Species and/or Natural Heritage Elements at the SWA: Includes a table listing any species or plant communities tracked by the Colorado Natural Heritage Program documented at the SWA. CNHP imperilment ranks, state and federal status, and quality (element occurrence) ranks are provided. This table is not included if no tracked species or plant communities have been documented at the SWA. See the Appendix B for rank definitions.

Wetland description: A narrative description of the wetlands is provided. Included are descriptions of the plant communities dominating the wetlands and environmental conditions. Names of plant communities documented at the SWA are listed in a table. Note that not every example of a plant community at a site meets the criteria for tracking in the CNHP databases. In general, most rare or imperiled communities and high quality examples of common communities are tracked. Therefore all plant communities listed in this table may not be included in the list of Natural Heritage elements at the site.

Hydrology: A description of the hydrologic regime is provided. Sources of the water, whether they are natural or managed, and the presence of unusual hydrologic features such as fens or seeps are noted.

Natural and Anthropogenic Disturbances: The presence of water diversions, non-native species, or results of other disturbance are described.

Management Comments: Factors important in maintaining wetlands (such as hydrologic regimes), plant and animal communities, or other natural resources are discussed.

Other Information: Additional pertinent information provided by the local SWA managers, availability of management plans, and availability of information from other biological inventories is noted. In most cases these data have not been compiled but are listed here to show what is available.

Map of National Wetlands Inventory Types (based on Cowardin et al. 1979).

Mapping Units (based on Cowardin et al. 1979): The relative abundance of each plant community within the mapping unit presented above is documented. The abundance of non-native species within each mapping unit and the most common species are described.

Functions and Values of NWI Wetland Types: A table is presented which rates the functions and values of the wetland complex. These ratings are based on methods developed in Montana, which are being adapted for use in Colorado. For detailed explanations of the methods refer to the descriptions of the Montana Wetland Field Evaluation Form and Instructions (Berglund 1996) and hydrogeomorphic approach (HGM).

Aerial Photograph: Aerial photographs used in evaluations for the SWA, which are located in-house at CNHP are listed, along with the type of photograph (B&W or color infrared), flight-line numbers, and dates taken.

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Appendix A

COMPREHENSIVE STATEWIDE WETLANDS CHARACTERIZATION AND CLASSIFICATION

PROJECT SUMMARY

The Colorado Department of Natural Resources (CDNR), through its Division of Wildlife Wetlands Program proposes to partner with the Colorado Natural Heritage Program (CNHP) to coordinate the planning and designing of a Comprehensive Statewide Wetlands Classification and Characterization effort. Such an endeavor is a key component of the on-going effort to define a Statewide Wetlands Strategy model for Colorado. The proposed project will accomplish the following goals: 1) collect existing and new data for a Comprehensive Statewide Wetlands Characterization and Classification Database and Mapping Product; 2) characterize Colorado's wetlands by assessing the full range of wetland types, and wetland plant communities by assessing their functions and; 3) classify the wetlands of Colorado and; 4) coordinate with other related projects e.g., the CDOW Riparian Mapping Project and the CNHP Statewide Riparian Classification. To accomplish these overall goals, CDNR proposes to continue its Statewide Strategy effort and collaborate with CNHP on a planning effort to: (1) conduct field sampling to develop a wetland classification within a watershed, (2) identify reference sites and describe the ecological significance of wetland plant communities, and (3) rank and prioritize each wetland plant community in terms of imperilment and biodiversity significance.

Furthermore, CDNR proposes the study be implemented in several steps:

1. locating representative wetlands within a watershed by stratifying the watershed by elevation.
2. using aerial photos and coordination/communication with federal, state, and local agencies to identify all the wetlands within that stratification;
3. contacting private landowners as necessary to explain our purpose and request permission to access sites on private land; stressing cooperation and providing education on the benefits of wetlands;
4. conducting field inventories to characterize the wetland and to assess functions and values; and
5. preparing a planning document and action plan that will guide the subsequent effort of a Comprehensive Statewide Wetlands Characterization and Classification.

To date, the U.S. Environmental Protection Agency (EPA) pursuant to section 104 (b)(3) of the Clean Water Act has funded several projects to map, characterize and classify wetland and riparian habitats in Colorado to improve the management of Colorado wetland resources. One of those projects, the Statewide Wetlands Strategy, is a

collaborative venture among the CDNR, U.S. EPA, the Colorado Division of Wildlife (CDOW), and the San Luis Valley community that will provide a strategy for wetlands protection and to ensure the quality of life for Coloradoans. This proposal, as part of the Statewide Wetlands Strategy, will build on the information gained from previously funded wetland and riparian projects. The result will be a concise, useful, management and planning tool to be used as a comprehensive wetlands protection strategy.

Appendix B

The Colorado Natural Heritage Program

To place this document in context, it is useful to understand the history and functions of the Colorado Natural Heritage Program (CNHP). CNHP is the state's primary comprehensive biological diversity data center, gathering information and field observations to help develop statewide conservation priorities. After operating in Colorado for 14 years, the Program was relocated from the State Division of Parks and Outdoor Recreation to the University of Colorado Museum in 1992, and more recently to the College of Natural Resources at Colorado State University.

The multi-disciplinary team of scientists and information managers gathers comprehensive information on rare, threatened, and endangered species and significant plant communities of Colorado. Life history, status, and locational data are incorporated into a continually updated data system. Sources include published and unpublished literature, museum and herbaria labels, and field surveys conducted by knowledgeable naturalists, experts, agency personnel, and our own staff of botanists, ecologists, and zoologists. Information management staff carefully plot the data on 1:24,000 scale USGS maps and enter it into the Biological and Conservation Data System. The Element Occurrence database can be accessed from a variety of angles, including taxonomic group, global and state rarity rank, federal and state legal status, source, observation date, county, quadrangle map, watershed, management area, township, range, and section, precision, and conservation unit.

CNHP is part of an international network of conservation data centers that use the Biological and Conservation Data System developed by The Nature Conservancy. CNHP has effective relationships with several state and federal agencies, including the Colorado Natural Areas Program, Colorado Department of Natural Resources and the Colorado Division of Wildlife, the U.S. Environmental Protection Agency, and the U.S. Forest Service. Numerous local governments and private entities also work closely with CNHP. Use of the data by many different individuals and organizations, including Great Outdoors! Colorado, encourages a proactive approach to development and conservation thereby reducing the potential for conflict. Information collected by the Natural Heritage Programs around the globe provides a means to protect species before the need for legal endangerment status arises.

Concentrating on site-specific data for each element of natural diversity allows us to evaluate the significance of each location to the conservation of Colorado's, and indeed the nation's, natural biological diversity. By using species imperilment ranks and quality ratings for each location, priorities can be established for the protection of the most sensitive or imperiled sites. A continually updated locational database and priority-setting system such as that maintained by CNHP provides an effective, proactive land-planning tool.

Natural Heritage Ranking System

Information is gathered by CNHP on Colorado's plants, animals, and natural communities. Each of these species and natural communities is considered an **element of natural diversity**, or simply an **element**. Each element is assigned a rank that indicates its relative degree of imperilment on a five-point scale (i.e., 1 = extremely rare/imperiled, 5 = abundant/secure). The primary criterion for ranking elements is the number of occurrences (i.e., the number of known distinct localities or populations). This factor is weighted more heavily because an element found in one place is more imperiled than something found in twenty-one places. Other important factors are: size of the geographic range, number of individuals, trends in both population and distribution, identifiable threats, and number of already protected occurrences.

Element rarity ranks are assigned both in terms of the element's degree of imperilment within Colorado (its State or S-rank) and the element's imperilment over its entire range (its Global or G-rank). Taken together, these two ranks give an instant picture of the degree of imperilment of an element. CNHP actively collects, maps, and electronically processes specific occurrence information for elements considered extremely imperiled to imperiled (S1 - S3). Those with a ranking of S3S4 are "watchlisted," meaning that specific occurrence data are collected and periodically analyzed to determine whether more active tracking is warranted. Watchlisted species are noted in the lists by an asterisk (*) next to the species name.

This single rank system works readily for all species except those that are migratory. Those animals that migrate may spend only a portion of their life cycles within the state. In these cases, it is necessary to distinguish between breeding, non-breeding, and resident species. As noted in Table 4, ranks followed by a "B" (i.e., S1B) indicate that the rank applies only to the status of breeding occurrences. Similarly, ranks followed by an "N" (i.e., S4N) refer to non-breeding status, typically during migration and winter. Elements without this notation are believed to be year-round residents within the state.

Table 1. Definition of Colorado Natural Heritage Imperilment Ranks

Global imperilment ranks are based on the range-wide status of a species. State rarity ranks are based on the status of a species in an individual state. State and Global ranks are denoted, respectively, with an "S" or a "G" followed by a character. **These ranks should not be interpreted as legal designations.**	
G/S1	Critically imperiled globally/state because of rarity (five or fewer occurrences in the world/state; or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction.
G/S2	Imperiled globally/state because of rarity (six to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range.
G/S3	Vulnerable through its range or found locally in a restricted range (21 to 100 occurrences).
G/S4	Apparently secure globally/state, though it might be quite rare in parts of its range, especially at the periphery.
G/S5	Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
GX	Presumed extinct.
G#?	Indicates uncertainty about an assigned global rank.
G/SU	Unable to assign rank due to lack of available information.
GQ	Indicates uncertainty about taxonomic status.
G/SH	Historically known, but not verified for an extended period.
G#T#	Trinomial rank (T) is used for subspecies or varieties. These taxa are ranked on the same criteria as G1-G5.
S#B	Refers to the breeding season imperilment of elements that are not permanent residents.
S#N	Refers to the non-breeding season imperilment of elements that are not permanent residents. Where no consistent location can be discerned for migrants or non-breeding populations, a rank of SZN is used
SZ	Migrant whose occurrences are too irregular, transitory, and/or dispersed to be reliably identified, mapped, and protected.
SA	Accidental in the state.
SR	Reported to occur in the state, but unverified.
S?	Unranked. Some evidence that species may be imperiled, but awaiting formal rarity ranking.
Note: Where two numbers appear in a state or global rank (e.g., S2S3), the actual rank of the element falls between the two numbers.	

Element Occurrence Ranks

Actual locations of elements, whether they be single organisms, populations, or plant communities, are referred to as element occurrences. The element occurrence is considered the most fundamental unit of conservation interest and is at the heart of the Natural Heritage Methodology. In order to prioritize element occurrences for a given species, an element occurrence rank (EO-Rank) is assigned according to the estimated viability or probability of persistence (whenever sufficient information is available). This ranking system is designed to indicate which occurrences are the healthiest and ecologically the most viable, thus focusing conservation efforts where they will be most successful. The EO-Rank is based on three factors:

1. **Size** – a quantitative measure of the area and/or abundance of an occurrence such as area of occupancy, population abundance, population density, or population fluctuation.

2. **Condition** – an integrated measure of the quality of biotic and abiotic factors, structures, and processes within the occurrence, and the degree to which they affect the continued existence of the occurrence. Components may include reproduction and health, development/maturity for communities, ecological processes, species composition and structure, and abiotic physical or chemical factors.

3. **Landscape Context** – an integrated measure of the quality of biotic and abiotic factors, and processes surrounding the occurrence, and the degree to which they affect the continued existence of the occurrence. Components may include landscape structure and extent, genetic connectivity, and condition of the surrounding landscape.

Each of these factors is rated on a scale of A through D, with A representing an excellent grade and D representing a poor grade. These grades are then averaged to determine an appropriate EO-Rank for the occurrence. If there is insufficient information available to rank an element occurrence, an EO-Rank is not assigned. Possible EO-Ranks and their appropriate definitions are as follows:

A Excellent estimated viability.
B Good estimated viability.
C Fair estimated viability.
D Poor estimated viability.
E Verified extant, but viability has not been assessed.
H Historically known, but not verified for an extended period of time.

A Natural Heritage Assessment and Inventory of Wetlands at Apishapa State Wildlife Area

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May 1999

Location: The Apishapa State Wildlife Area (SWA) is located about 30 miles east of Walsenburg, CO. The site can be accessed from the north from county roads off of Highway 10, and from the south from county roads off of Highway 350.

Legal Description: T27S R61W, all or parts of sections 11, 14, 17, 19, 20, 21, 22, 28, 29, 30,31, 32, 33; T27S R62W, part of section 25: T28S R61W, all or parts of sections 5, 6, 7, 8, 17, 18; T28S R62W, part of section 12.

General Description: The Apishapa SWA encompasses about 7935 acres of rolling to level shortgrass prairie with piñon-juniper (*Pinus edulis-Juniperus monosperma*) woodlands on ridges and the edges of mesas. A few ponderosa pine (*Pinus ponderosa*) trees occur on the uplands. Elevation ranges from about 5600 on the plains above the river to approximately 5000 feet at the Apishapa River bottom. The Apishapa River and several other smaller streams have cut deep canyons (up to 300 feet) into the surrounding plains.

The wetlands and riparian areas are confined to the narrow canyon bottoms and a few stock ponds on the SWA. The valley bottoms are narrow and slopes to the upland mesas and plains are very steep. The riparian corridor experiences significant flooding events as witnessed by the scouring and deposition of sediment and flood debris well above the level of the river channel.

Petroglyphs in the area illustrate the presence of bighorn sheep, which have been re-introduced by the Division of Wildlife (J. Aragon – pers. comm.). Aerial fertilizing has been used to improve bighorn sheep forage. Livestock grazing was the historic use on the SWA. Livestock currently graze the area and are rotated so that an area is grazed every other year. A neighboring rancher is allowed to run livestock on the property in return for allowing hunting access on adjacent private lands. Guzzlers for small game have been installed. A watering system was installed for a bison ranching operation, but bison were never re-introduced on the site (J. Aragon – pers. comm.). The area is managed mainly for large and small game hunting.

Imperiled Species and/or Natural Communities Known from the SWA: No records of species or plant communites monitored by the Colorado Natural Heritage Program or the Division of Wildlife have been documented on the SWA. Swift fox, wintering Ferruginous hawks, and nesting Golden eagles are known to occur in the area (J. Aragon – pers. comm.).

Wetland description: Due to the steep canyon slopes wetlands are confined to the immediate area adjacent to the stream channel. Small terraces above the Apishapa River channel support stands of saltcedar (*Tamarix ramosissima*) with sand dropseed (*Sporobolus cryptandrus*), Canada wildrye (*Elymus canadensis*), and alkali muhly (*Muhlenbergia asperifolia*). Slightly lower terraces support stands of coyote willow (*Salix exigua*), often with little vegetation in the understory as a result of recent flood scouring. Infrequent patches of cattail (*Typha latifolia*) and threesquare bulrush (*Scirpus pungens*) occur below the coyote willow on more saturated soils.

A few small stock ponds on the uplands support some wetland species but generally lack extensive wetland vegetation. Several of these stock ponds have stands of salt cedar growing along the edges.

The stream in Jones Lake Canyon supports similar vegetation to the Apishapa River channel. The exception is the area immediately above the confluence with the Apishapa River. Here there is less saltcedar and more coyote willow, and generally more wetland vegetation.

The wetland and riparian plant communities present on the SWA are thought to be common on the eastern plains of Colorado. Similar habitat occurs on many streams in southeast Colorado and would be expected to support similar plant communites.

Table 2. Wetland and Riparian Plant Communities known from the SWA

Scientific Name	Common Name
Salix exigua/mesic graminoid	Coyote willow
Typha latifolia	Cattail
Scirpus pungens	Threesquare bulrush
Scirpus acutus	Hardstem bulrush

Note that not every example of a plant community at a site meets the criteria for tracking in the CNHP databases. In general, most rare communities and high quality examples of common communities are tracked.

Hydrology: The hydrology of the Apishapa River has been altered by irrigation diversions upstream of the SWA, especially near Interstate 25. This alteration probably lowers base flows in the summer. Localized precipitation events can still result in flash floods that scour the stream banks and reshape the streambed and banks. The geomorphology of the stream channels on the SWA is highly variable. The channels alternate from wide (10-20 feet) and shallow, to narrow and deep (at least 3-4 feet) in pools. On the stream in Jones Lake Canyon, not far above the confluence with the Apishapa River, a small dam created by muskrats or beaver has impounded the stream.

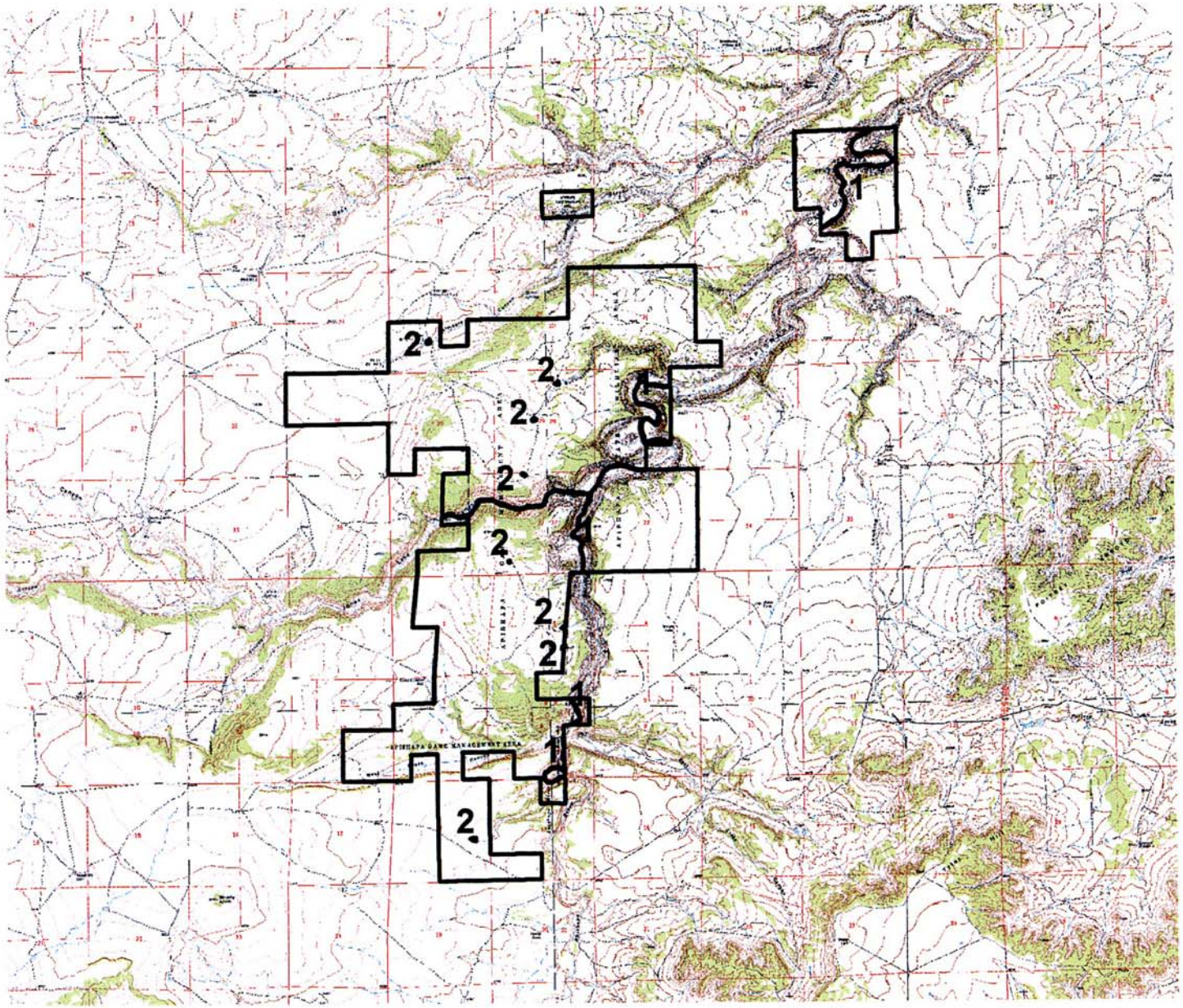
Anthropogenic Disturbances: Many non-native species are present around the streams and stock ponds on the SWA. The most common are salt cedar, Russian thistle (*Salsola* sp.), white sweetclover (*Melilotus alba*), Canada thistle (*Cirsium arvense*), and Japanese brome (*Bromus japonicus*). Russian thistle has completely taken over on the terraces above the streams at the confluence of Jones Lake Canyon and the Apishapa River.

Management Comments: Along with habitat loss and fragmentation, invasion of non-native plant species may be one of the greatest threats to biodiversity. Numerous studies have shown that areas invaded by non-native species have reduced populations of native plant and animal species (Bedunah 1992, Melgoza et al. 1990, Belcher and Wilson 1989, Bock and Bock 1988).

In areas where the water table is higher coyote willow appears to be able to out-compete the salt cedar. Beaver or muskrat dams may help raise the water table enough to allow native species to replace the salt cedar in some areas.

Other Information: A management plan has been prepared for the SWA and is available in the DOW office in Pueblo. The Colorado Bird Observatory surveyed the area approximately 2-3 years ago. Aerial photographs are available in house at CNHP (NAPP color-infrared, photos 1028-101, 1028-102, 1028-191, 1028-192, 1028-193, July 2, 1988).

Figure 1: National Wetlands Inventory Mapping Units at Apishapa SWA



Apishapa SWA and NWI Wetlands

NWI Mapping Units
1 - R4SBW
2 - PFLW

See the tables following this figure for text descriptions of NWI mapping units.

N
W E
S

1 0 1 2 3 4 5 6 7 Miles

Plant Communities and Abundant Non-native Species Present in NWI Mapping Units

The following calculations are based on the NWI mapping units presented in Figure 1.

Mapping Unit 1 - Riverine, intermittent, streambed, intermittently flooded, temporary (R4SBW).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Coyote willow/mesic graminoid (*Salix exigua*/mesic graminoid)	30%	12
Saltcedar (*Tamarix ramosissima*)	30%	12
Mixed mesic grasslands	20%	8
Open water with mixed cattail (*Typha latifolia*) , hardstem bulrush (*Scirpus acutus*), threesquare bulrush (*Scirpus pungens*)	10%	4
Exposed streambed	10%	4
Non-native Species Abundance & Most Common Species	>25%	
Saltcedar (*Tamarix ramosissima*)		
Canada thistle (*Cirsium arvense*)		
Japanese brome (*Bromus japonicus*)		
Salsola (*Salsola* sp.)		
White sweetclover (*Melilotus alba*)		

Mapping Unit 2 - Palustrine, flat, intermittently flooded, temporary (PFLW).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Saltcedar (*Tamarix ramosissima*)	Variable between 0-20	4
Upland species or bare ground	80-100%	
Non-native Species Abundance & Most Common Species	>25%	
Saltcedar (*Tamarix ramosissima*)		
Russian thistle (*Salsola* sp.)		
Japanese brome (*Bromus japonicus*)		
White sweetclover (*Melilotus alba*)		

Functions and Values of NWI Wetland Types

NWI type – R4SBW

HYDROLOGY	
Hydrologic Regime	Intermittent – temporary
Water Source/HGM Class	Apishapa River/Riverine
SOILS	
Presence/Distribution of Organic Soils	None
Fens	None
Presence/Distribution of Saline Soils	None
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	None
General Wildlife Habitat	Moderate – deer, bighorn sheep, small game
General Fish Habitat	Low
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	Low
Sediment/Shoreline Stabilization	Low
Groundwater Discharge/Recharge	Low
Uniqueness	Low
Recreation Potential	Moderate – hiking, hunting
Production/Export/Food chain support	Low
LANDSCAPE CONTEXT	
Type of surrounding land uses	Native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources

NWI type - PFLW

HYDROLOGY	
Hydrologic Regime	Intermittently flooded – temporary
Water Source/HGM Class	Apishapa River/Depressional
SOILS	
Presence/Distribution of Organic Soils	None
Fens	None
Presence/Distribution of Saline Soils	None
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	None
General Wildlife Habitat	Moderate – deer, bighorn sheep, small game
General Fish Habitat	Low
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	Low
Sediment/Shoreline Stabilization	Low
Groundwater Discharge/Recharge	Low
Uniqueness	Low
Recreation Potential	Moderate – hiking, hunting
Production/Export/Food chain support	Low
LANDSCAPE CONTEXT	
Type of surrounding land uses	Native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources

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Melgoza, G., R.S. Nowak, and R.J. Tausch. 1990. Soil water exploitation after fire: competition between *Bromus tectorum* and two native species. Oecologia 83:7-13.

A Natural Heritage Assessment and Inventory of Wetlands at Elliott State Wildlife Area

Prepared for*:*
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May 1999

Location: The Elliott State Wildlife Area (SWA) is located about 8 miles northeast of Brush, Colorado immediately southwest of the Morgan County-Washington County line. The site can be accessed on both sides of the South Platte River from County Roads off of Highway 6.

Legal Description: T5N R55W, all or parts of sections 12, 13, 23, 24, 25, 35, and 36.

General Description: The Elliott SWA encompasses approximately 2100 acres including several miles of the floodplain of the South Platte River. Elevations range from 4090 feet at the downstream end of the SWA to about 4140 feet at the upstream end. Mature cottonwood stands dominate the vegetation near the main channel. Parts of the floodplain further from the river are used to grow crops or hay for livestock, or have been historically and this is no exception at the SWA. A large part of the floodplain west of the river has been planted to non-native hay grasses. Apparently this meadow was tilled and replanted after a flood event scoured the surface. Several irrigation diversions run through the SWA. About 1-2 miles from the river stabilized sand dunes rise above the floodplain of the river. These sand dunes support native shrub communites dominated by sandsage (*Artemisia filifolia*).

The topography on the SWA is relatively flat although some depressions occur on the floodplain, several of which are filled with water and support wetland communities. Some of these wetlands may be enhanced by water from irrigation diversions on the SWA or nearby private property. Management focuses on providing habitat for waterfowl. Some food plots have been planted in the past for small game. Hunting is a popular activity at the SWA.

The SWA occurs in a large valley. Landscape processes are primarily erosional with some alluvial deposition at places along the river and along some overflow channels. The topography is mostly level with some small swales, depressions, and overflow channels. The stream channel gradient is very low. Hydric soils are present adjacent to the river in small patches and around the swales, depressions, and overflow channels. Hydric soils are also present near irrigation diversions.

Imperiled Species and/or Natural Communities Known from the SWA: A good condition example of a globally imperiled cottonwood plant community (*Populus deltoides-Salix amygdaloides*/*Spartina pectinata*) was documented at the site. This community covers much of the floodplain. Sections 25 and 35 are in good conditions, however much of the rest of the area is degraded by invasion of non-native species. A river otter (*Lutra canadensis*) was sighted at the SWA in the fall of 1998 (B. Miles – pers. comm.).

Table 3. Imperiled Species and/or Natural Communities Known from the SWA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	*EO Rank
Populus deltoides-(Salix amygdaloides)/ Spartina pectinata	Plains cottonwood-(peach-leaved willow)/prairie cordgrass riparian woodland	G2	S1	--	--	B
Populus deltoides/ Symphoricarpos occidentalis	Plains cottonwood/ western snowberry riparian woodland	G2G3	S2	--	--	D

Wetland description: Overflow channels, old oxbows, and other topographic and edaphic variation creates habitat for a diverse mixture of wetlands and riparian plant communities. Large cottonwood forests or woodlands dominate the floodplain adjacent to the river channel. Many of these stands are old and show evidence of decadence such as dead branches or tops. Areas further from the channel are often dominated by hay meadows planted with non-native species. Within these meadows there are often slightly wetter sloughs or depressions which support native wetland plant communities dominated by cattails (*Typha* spp.), bulrushes (*Scirpus pungens* and *Scirpus acutus*), sedges (*Carex* spp.), and prairie cordgrass (*Spartina pectinata*). Within the cottonwood stands there are areas with wet depressions, sloughs, or overflow channels which also support a variety of wetland plant communites, including coyote willow (*Salix exigua*) stands and cattail and bulrush marshes. Small patches of wetland vegetation (cattails and bulrushes) exist along the river channel but these are probably destroyed from year to year as they are scoured or buried by deposited sediment.

CNHP has quantitatively sampled and described many of the riparian vegetation types along the South Platte River (Kittel et al. 1998). These wetland types occur on other State Wildlife Areas. The cottonwood plant communities continue east to the confluence with the North Platte River, and possibly beyond. The small wetlands dominated by coyote willow, bulrushes, cattails, and sedges are relatively common throughout the eastern plains of Colorado.

Table 4. Wetland and Riparian Plant Communities known from the SWA

Scientific Name	Common Name
Populus deltoides-(*Salix amygdaloides*)/*Spartina pectinata*	Plains cottonwood-(peach-leaf willow)/prairie cordgrass
Populus deltoides/*Symphoricarpos occidentalis*	Plains cottonwood/snowberry
Salix exigua/mesic graminoid	Coyote willow
Spartina pectinata	Prairie cordgrass
Typha latifolia	Cattail
Scirpus acutus	Hardstem bulrush
Scirpus pungens	Threesquare bulrush
Scirpus maritimus	Saltmarsh bulrush

Note that not every example of a plant community at a site meets the criteria for tracking in the CNHP databases. In general, most rare communities and high quality examples of common communities are tracked. Therefore all communities listed in this table may not be included in the list of Natural Heritage elements at the site (Table 1).

Hydrology: Human settlement and the associated activities have altered the hydrology of the South Platte River. The changes in the hydrology of the South Platte River have allowed cottonwood forests to develop to the extent that they currently are along the river. Flooding events are necessary for cottonwoods to regenerate and these events are partially limited by human activities. This results in only small patches of regeneration of cottonwoods and other riparian vegetation. Historically, a wide, shallow, braided channel characterized the South Platte River. High spring flows from snowmelt in the headwaters often scoured out newly colonized vegetation. In many years the late summer flow would be minimal, dropping the water table below the rooting zone of many newly established plants.

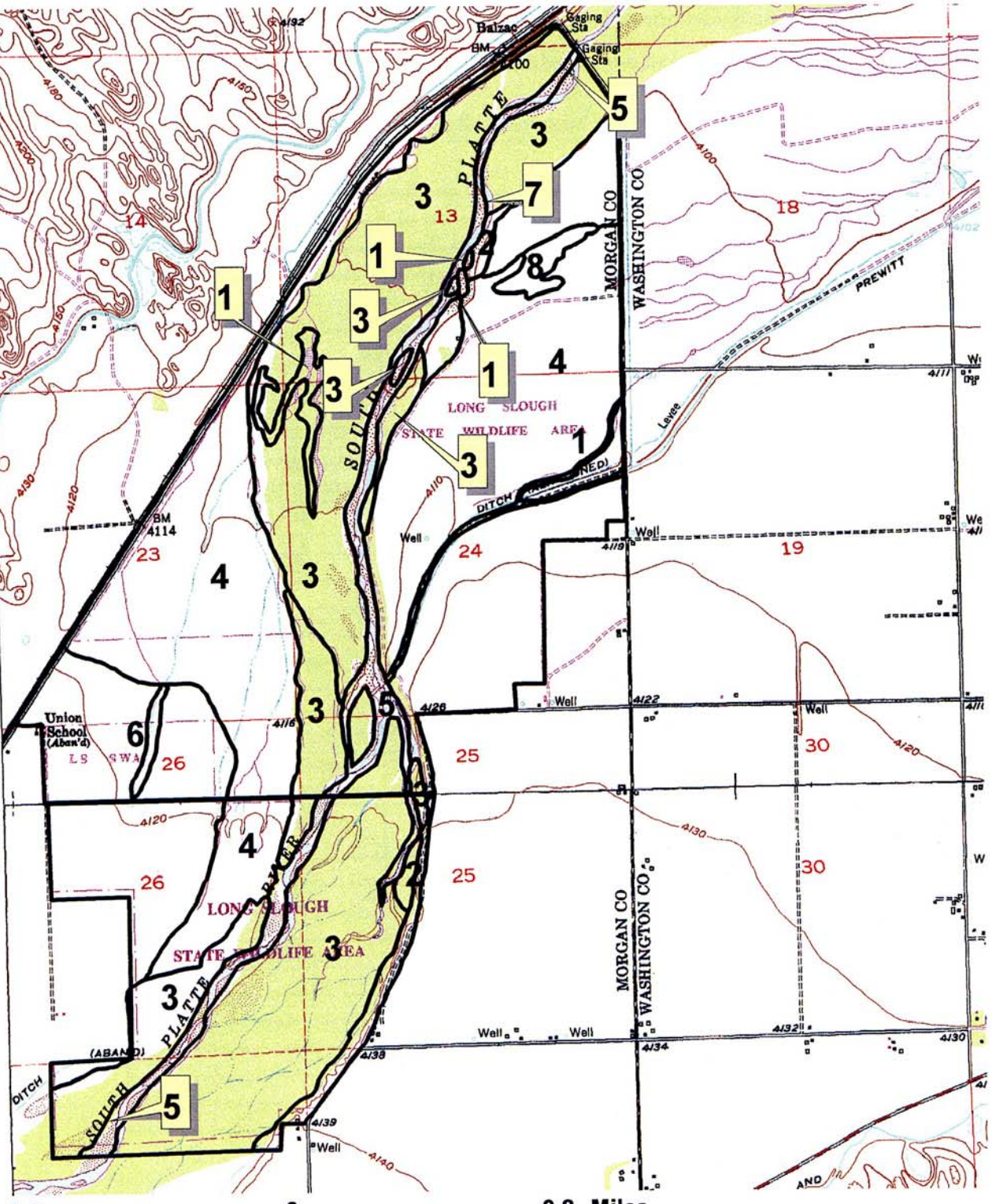
Anthropogenic Disturbances: Historically large floods were common on the South Platte River often destroying newly established vegetation. These floods seldom occur now because of alterations to the river. Also irrigation diversions and water diversion from west of the Continental Divide to the Front Range have altered the hydrologic regime by providing more consistent baseflows than historically occurred.

Many acres along the South Platte River floodplain have been converted to crop lands or hay meadows. Several non-native species have been planted on the SWA and have invaded stands of natural native vegetation in some places. Quackgrass (*Elytrigia repens*) and another non-native wheatgrass (possibly intermediate wheatgrass - *Elytrigia intermedia*) have been planted in meadows that were scoured by floods on the SWA. Other common non-native species include Japanese brome (*Bromus japonicus*), smooth brome (*Bromus inermis*), horseweed (*Conyza canadensis*), leafy spurge (*Euphorbia esula*), ragweed (*Ambrosia artemisiifolia*), and Canada thistle (*Cirsium arvense*).

Management Comments: Along with habitat loss and fragmentation, invasion of non-native plant species may be one of the greatest threats to biodiversity. Numerous studies have shown that areas invaded by non-native species have reduced populations of native plant and animal species (Bedunah 1992, Melgoza et al. 1990, Belcher and Wilson 1989, Bock and Bock 1988).

Other Information: A Master Management Plan was prepared for the SWA in 1984. In depth inventories for animals and plants have not been conducted (B. Miles pers. comm.). Ducks Unlimited has recently purchased water rights to help insure the long-term viability of waterfowl habitat. Money has also been provided by GOCO Wetlands Initiative to purchase water rights. An aerial photograph is available in house at CNHP (NAPP color-infrared aerial photograph 992-197, Oct. 1, 1989).

Figure 1: National Wetlands Inventory Mapping Units at Elliott SWA



Elliott SWA and NWI Wetlands

NWI Mapping Units

1 - PEMC	5 - R2OWZ
2 - PEMW	6 - PFLY
3 - PFOW	7 - PFO/EMW
4 - PEMA	8 - PEM/FLW

See the tables following this figure for text descriptions of NWI mapping units.

Plant Communities and Abundant Non-native Species Present in NWI Mapping Units

The following calculations of area are based on the mapping units presented in Figure 1.

Mapping Unit 1 - Palustrine, emergent, seasonally flooded (PEMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Cattail (*Typha latifolia*)	30%	7
Hardstem bulrush (*Scirpus acutus*)	30%	7
Threesquare bulrush (*Scirpus pungens*)	20%	5
Prairie cordgrass (*Spartina pectinata*)	20%	5
Non-native Species Abundance & Most Common Species	<10%	
Quackgrass (*Elytrigia repens*)		

Mapping Unit 2 - Palustrine, emergent, intermittently flooded/temporary (PEMW).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Cottonwood/prairie cordgrass (*Populus deltoides*/*Spartina pectinata*)	90%	11
Coyote willow (*Salix exigua*)	10%	1
Non-native Species Abundance & Most Common Species	>25%	
Quackgrass (*Elytrigia repens*)		
Smooth brome (*Bromus inermis*)		

Mapping Unit 3 - Palustrine, forested, intermittently flooded/temporary (PFOW).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Cottonwood/prairie cordgrass (*Populus deltoides*/*Spartina pectinata*)	80%	644
Coyote willow (*Salix exigua*)	10%	80
Open water	10%	80
Non-native Species Abundance & Most Common Species	>25%	
Canada thistle (*Cirsium arvense*)		
Japanese brome (*Bromus japonicus*)		
Kochia (*Kochia scoparia*)		
Leafy spurge (*Euphorbia esula*)		
Quackgrass (*Elytrigia repens*)		
Smooth brome (*Bromus inermis*)		

Mapping Unit 4- Palustrine, emergent, temporary flooded (PEMA).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Non-native (planted) meadows	100%	660
Non-native Species Abundance & Most Common Species	>25%	
Canada thistle (*Cirsium arvense*)		
Kochia (*Kochia scoparia*)		
Quackgrass (*Elytrigia repens*)		
Smooth brome (*Bromus inermis*)		

Mapping Unit 5 - Riverine, lower perennial, open water, intermittently exposed/permanent (R2OWZ).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Open water	90%	95
Cattail (*Typha latifolia*) and hardstem bulrush (*Scirpus acutus*)	10%	11
Non-native Species Abundance & Most Common Species	None noted	

Mapping Unit 6 - Palustrine, flat, saturated/semipermanent/seasonal (PFLY).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Open water	90%	6
Threesquare bulrush (*Scirpus pungens*) and saltmarsh bulrush (*Scirpus maritimus*)	10%	<1
Non-native Species Abundance & Most Common Species	None noted	

Mapping Unit 7 - Palustrine, forested/emergent, intermittently flooded/temporary (PFO/EMW).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Cottonwood/prairie cordgrass (*Populus deltoides*/*Spartina pectinata*)	100%	NA
Non-native Species Abundance & Most Common Species	>25%	
Leafy spruge (*Euphorbia esula*)		
Quackgrass (*Elytrigia repens*)		
Smooth brome (*Bromus inermis*)		

Mapping Unit 8 - Palustrine, emergent/flat, intermittently flooded/temporary (PEM/FLW).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Inland saltgrass-foxtail barley (*Distichlis spicata-Hordeum jubatum*)	100%	16
Non-native Species Abundance & Most Common Species	>25%	

Functions and Values of NWI Wetland Types

NWI type - PEMC

HYDROLOGY	
Hydrologic Regime	Seasonal, intermittently
Water Source/HGM Class	S. Platte River/depressional
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	None observed
Presence/Distribution of Saline Soils	None observed
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	High
Flood Attenuation and Storage	High
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	High
Sediment/Shoreline Stabilization	High
Groundwater Discharge/Recharge	High
Uniqueness	Low
Recreation Potential	High – hunting
Production/Export/Food chain support	Moderate
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - PEMW

HYDROLOGY	
Hydrologic Regime	Intermittently flooded - temporary
Water Source/HGM Class	S. Platte River/depressional
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	None observed
Presence/Distribution of Saline Soils	None observed
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	High
Flood Attenuation and Storage	High
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	High
Sediment/Shoreline Stabilization	High
Groundwater Discharge/Recharge	High
Uniqueness	Low
Recreation Potential	High – hunting
Production/Export/Food chain support	Moderate
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - PFOW

HYDROLOGY	
Hydrologic Regime	Intermittently flooded - temporary
Water Source/HGM Class	S. Platte River/riverine
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	None observed
Presence/Distribution of Saline Soils	None observed
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	High
Flood Attenuation and Storage	High
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	High
Sediment/Shoreline Stabilization	High
Groundwater Discharge/Recharge	High
Uniqueness	High
Recreation Potential	High –hunting
Production/Export/Food chain support	Moderate
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - PEMA

HYDROLOGY	
Hydrologic Regime	Temporary
Water Source/HGM Class	S. Platte River/depressional
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	None observed
Presence/Distribution of Saline Soils	None observed
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	High
Flood Attenuation and Storage	High
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	High
Sediment/Shoreline Stabilization	High
Groundwater Discharge/Recharge	High
Uniqueness	Low
Recreation Potential	High – hunting
Production/Export/Food chain support	Moderate
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - R2OWZ

HYDROLOGY	
Hydrologic Regime	Intermittently exposed - permanent
Water Source/HGM Class	S. Platte River/riverine
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	None observed
Presence/Distribution of Saline Soils	None observed
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	High
Flood Attenuation and Storage	High
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	High
Sediment/Shoreline Stabilization	High
Groundwater Discharge/Recharge	High
Uniqueness	Low
Recreation Potential	High – hunting
Production/Export/Food chain support	Moderate
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - PFLY

HYDROLOGY	
Hydrologic Regime	Saturated/Semi-permanent/Seasonal
Water Source/HGM Class	S. Platte River/depressional
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	None observed
Presence/Distribution of Saline Soils	None observed
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	NA
Flood Attenuation and Storage	High
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	High
Sediment/Shoreline Stabilization	High
Groundwater Discharge/Recharge	High
Uniqueness	Moderate
Recreation Potential	High – hunting
Production/Export/Food chain support	Moderate
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - PFO/EMW

HYDROLOGY	
Hydrologic Regime	Intermittently Flooded/Temporary
Water Source/HGM Class	S. Platte River/depressional and riverine
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	None observed
Presence/Distribution of Saline Soils	None observed
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	High
Flood Attenuation and Storage	High
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	High
Sediment/Shoreline Stabilization	High
Groundwater Discharge/Recharge	High
Uniqueness	High
Recreation Potential	High – hunting
Production/Export/Food chain support	High - habitat diversity, detritus
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - PEM/FLW

HYDROLOGY	
Hydrologic Regime	Intermittently flooded/Temporary
Water Source/HGM Class	S. Platte River/depressional
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	None observed
Presence/Distribution of Saline Soils	None observed
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	High
Flood Attenuation and Storage	High
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	High
Sediment/Shoreline Stabilization	High
Groundwater Discharge/Recharge	High
Uniqueness	High
Recreation Potential	High – hunting
Production/Export/Food chain support	Moderate
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - R40WKF

HYDROLOGY	
Hydrologic Regime	Intermittent/Semi-permanent
Water Source/HGM Class	S. Platte River and irrigation/riverine
SOILS	
Presence/Distribution of Organic Soils	Present-along shore
Fens	None observed
Presence/Distribution of Saline Soils	None observed
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	High
Flood Attenuation and Storage	High
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	High
Sediment/Shoreline Stabilization	High
Groundwater Discharge/Recharge	High
Uniqueness	High
Recreation Potential	High –hunting
Production/Export/Food chain support	Moderate
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

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A Natural Heritage Assessment and Inventory of Wetlands At Flagler Reservoir State Wildlife Area

Prepared for*:*
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May 1999

Location: The Flagler Reservoir State Wildlife Area (SWA) is located approximately 4 miles west of the town of Flagler, Colorado. The site can be accessed from several county roads in the area.

Legal Description: T9S R50 W, parts of sections 3, 4, and 9.

General Description: The SWA encompasses about 400 acres surrounding and including Flagler Reservoir, an impoundment on the South Fork of the Republican River. Elevations range from approximately 4680 to 4770 feet. Cottonwood (*Populus deltoides*) trees dominate the vegetation around the lake, generally in a narrow band. Other wetland plant communities occur in small patches or bands, either along the shore or growing in standing water.

Agricultural fields and land in the Conservation Reserve Program (CRP) are common nearby, especially to the west. Native grasslands dominate the adjacent lands in most other directions. Shortgrass and mixedgrass prairie species are common on steep slopes and bluffs around the reservoir. Tallgrasses occur along gently sloping draws around the reservoir.

The SWA is located in a relatively broad valley, with steep slopes rising to the flat uplands. The slopes to the east of the SWA are steeper and more dissected than those to the west. Wetland plant communites are confined to the shore and the tributaries to the reservoir.

Currently, the SWA is mainly used for fishing, and limited waterfowl, small game, and deer hunting.

Imperiled Species and/or Natural Communities Known from the SWA:

(This section is not available)

Wetland description: Flagler Reservoir is an artificial, flood control impoundment on the South Fork of the Republican River. The wetlands along Flagler Reservoir are mainly confined to the banks of the impoundment or in the shallow water near the shore. Cottonwood stands dominate the vegetation along the banks in bands that are generally only a few meters in width. Larger stands occur at the upstream end of the reservoir and below the dam. Peach-leafed willow (*Salix amygdaloides*) and coyote willow (*Salix exigua*) are common with the cottonwood. Western wheatgrass (*Pascopyrum smithii*), saltgrass (*Distichlis spicata*), and sand dropseed (*Sporobolus cryptandrus*) are the most common native understory species around the reservoir. Sedges (*Carex* spp.) are more common below the dam. Some small cottonwood stands have been inundated. Small patches of cattail (*Typha latifolia)* and hardstem bulrush (*Scirpus acutus)* occur where soils are saturated or inundated, generally along the shoreline or in shallow water. The cattail and hardstem bulrush plant communities become more extensive along the tributaries upstream of the reservoir. All of these plant communities are relatively common on the eastern plains of Colorado.

Table 5. Wetland and Riparian Plant Communities known from the SWA

Scientific Name	Common Name
Populus deltoides/*Distichlis spicata*	Plains cottonwood/inland saltgrass
Typha latifolia	Cattail
Scirpus acutus	Hardstem bulrush

Note that not every example of a plant community at a site meets the criteria for tracking in the CNHP databases. In general, most rare communities and high quality examples of common communities are tracked. Therefore all communities listed in this table may not be included in the list of Natural Heritage elements at the site (Table 1).

Hydrology: The natural hydrology is altered by numerous small impoundments on tributaries to the South Fork of the Republican River upstream of the reservoir, and by the reservoir itself.

Anthropogenic Disturbances: The landscape surrounding the SWA is a mixture of native prairie and agricultural fields. Numerous non-native species are common in the SWA, mostly in close proximity to the reservoir. Common non-native tree and shrub species include crack willow (*Salix fragilis*), Russian olive (*Elaeagnus angustifolia*), and saltcedar (*Tamarix ramosissima*). The most abundant non-native forbs and grasses include common kochia (*Kochia scoparia*), Canada thistle (*Cirsium arvense*), Japanese brome (*Bromus japonicus*), smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), alfalfa (*Medicago sativa*), and white sweetclover (*Melilotus alba*).

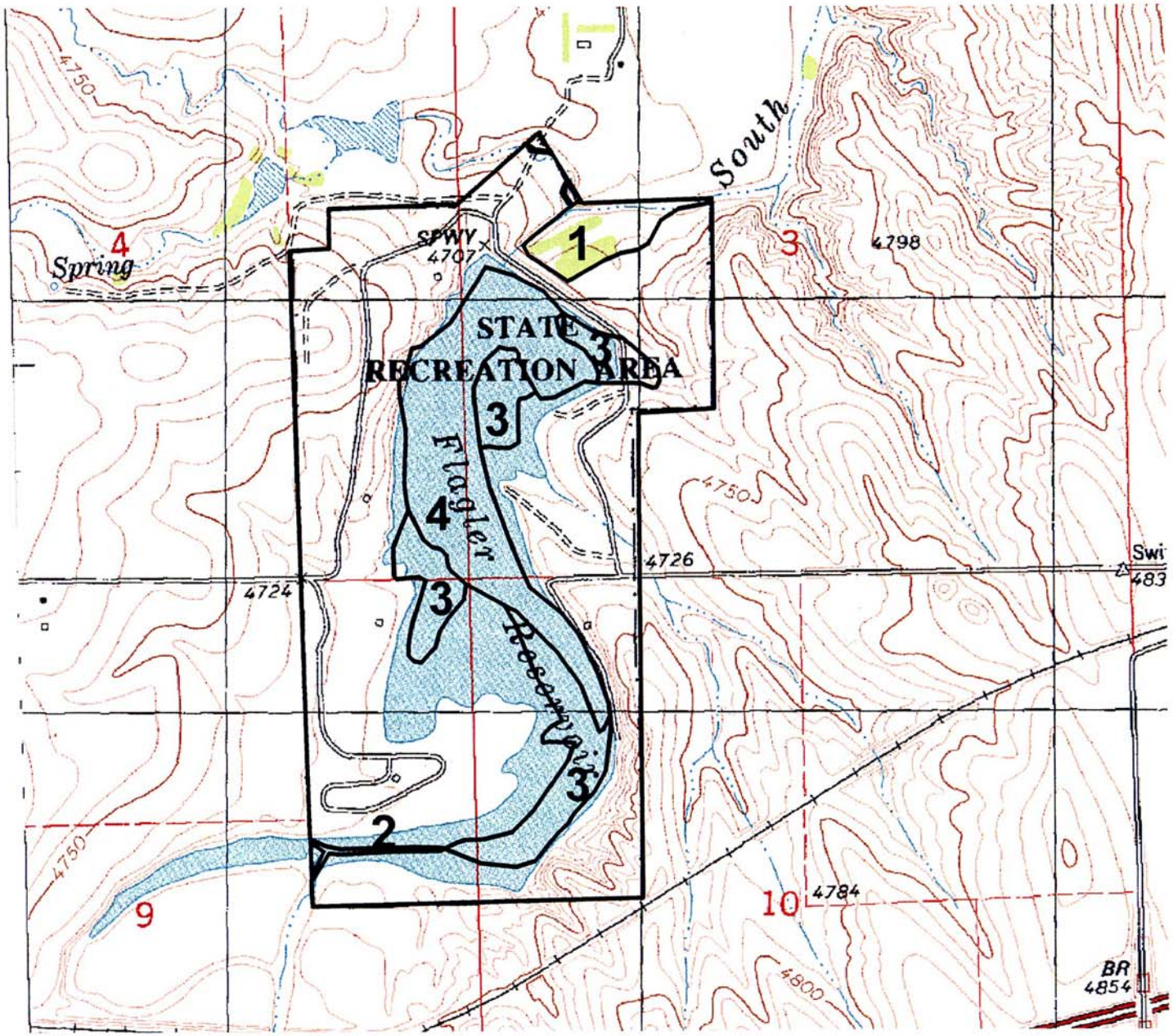
Several native warm-water fish are present in the reservoir but other non-native species have been stocked for sport fishing (e.g. wiper, channel catfish, crappie, tiger muskie, walleye, and largemouth bass) (T. Seamans – pers. comm.).

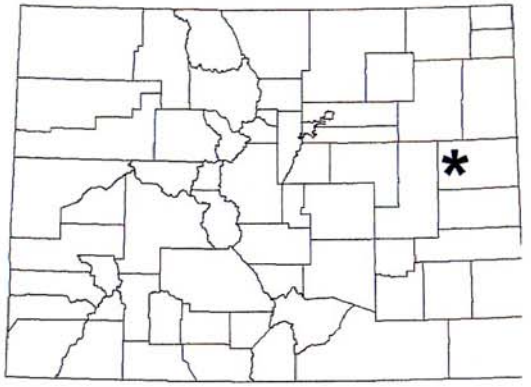
Management Comments: Along with habitat loss and fragmentation, invasion of non-native plant species may be one of the greatest threats to biodiversity. Numerous studies have shown that areas invaded by non-native species have reduced populations of native plant and animal species (Bedunah 1992, Melgoza et al. 1990, Belcher and Wilson 1989, Bock and Bock 1988).

Reducing the abundance of these species would probably take continuous, intensive management. The seed source for many of these species are present at the SWA and the nearby area. The additional moisture and disturbance from water fluctuations in the reservoir provides suitable habitat for many of the non-native plants.

Other Information: It is unknown if a Master Management Plan exists for the site. Comprehensive biological inventories have not been conducted at the SWA (T. Seamans – pers. comm.). Some food plots have been planted on the SWA to provide food for small game.

Figure 1: National Wetlands Inventory Mapping Units at Flagler Reservoir SWA





Flagler Reservoir SWA and NWI Wetlands

NWI Mapping Units

1 - PSS/EMC
2 - PSSW
3 - PEMC
4 - POWF

See the tables following this figure for text descriptions of NWI mapping units.

N
W E
S

0.4 0 0.4 0.8 Miles

Plant Communities and Abundant Non-native Species Present in NWI Mapping Units

The following calculations are based on the NWI mapping units presented in Figure 1. Several of the NWI polygons for this SWA are not accurate. Plant community abundance is not estimated for those mapping units. Instead the total acres of the NWI mapping unit are presented (these are noted with an asterisk*).

Mapping Unit 1 - Palustrine, scrub-shrub/emergent, seasonally flooded (PSS/EMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Cottonwood forests (*Populus deltoides*)	50%	5
Sedge meadows (*Carex s*pp.)	50%	5
Non-native Species Abundance & Most Common Species	>25%	
Kochia (*Kochia scoparia*)		
Smooth brome (*Bromus inermis*)		
Kentucky bluegrass (*Poa pratensis*)		
Alfalfa (*Medicago sativa*)		
White sweetclover (*Melilotus alba*)		
Canada thistle (*Cirsium arvense*)		

Mapping Unit 2 - Palustrine, scrub-shrub, intermittently flooded-temporary (PSSW).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Cottonwood/inland saltgrass (*Populus deltoides*/*Distichlis spicata*)	100%	1*
Non-native Species Abundance & Most Common Species	>25%	
Crack willow (*Salix fragilis*)		
Russian olive (*Elaeagnus angustifolia*)		
Saltcedar (*Tamarix ramosissima*)		
Alfalfa (*Medicago sativa*)		
Canada thistle (*Cirsium arvense*)		
Japanese brome (*Bromus japonicus*)		
Kentucky bluegrass (*Poa pratensis*)		
Kochia (*Kochia scoparia*)		
Smooth brome (*Bromus inermis*)		
White sweetclover (*Melilotus alba*)		

Mapping Unit 3 - Palustrine, emergent, seasonally flooded (PEMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Cottonwood/inland saltgrass (*Populus deltoides*/*Distichlis spicata*)	100%	34*
Non-native Species Abundance & Most Common Species	>25%	
Russian olive (*Elaeagnus angustifolia*)		
Saltcedar (*Tamarix ramosissima*)		
Alfalfa (*Medicago sativa*)		
Canada thistle (*Cirsium arvense*)		
Kentucky bluegrass (*Poa pratensis*)		
Kochia (*Kochia scoparia*)		
White sweetclover (*Melilotus alba*)		

Mapping Unit 4 - Palustrine, open water, semipermanent (POWF).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Cattail (*Typha latifolia*) & Hardstem bullrush (*Scirpus acutus*)	10%	*
Open water		48*
Non-native Species Abundance & Most Common Species	None noted	

Functions and Values of NWI Wetland Types

NWI type - PSS/EMC

HYDROLOGY	
Hydrologic Regime	Seasonal
Water Source/HGM Class	Flagler Reservoir/depressional
SOILS	
Presence/Distribution of Organic Soils	None
Fens	None
Presence/Distribution of Saline Soils	None
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	Moderate
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	Low
Sediment/Shoreline Stabilization	Low – sparsely vegetated
Groundwater Discharge/Recharge	Low – clayey soils
Uniqueness	Low
Recreation Potential	High – hunting, fishing, boating
Production/Export/Food chain support	Low
LANDSCAPE CONTEXT	
Type of surrounding land uses	Native rangeland and agricultural land
Type and proportion of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - PSSW

HYDROLOGY	
Hydrologic Regime	Intermittently flooded-temporary
Water Source/HGM Class	Flagler Reservoir/depressional
SOILS	
Presence/Distribution of Organic Soils	None
Fens	None
Presence/Distribution of Saline Soils	None
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	Moderate
Flood Attenuation and Storage	Moderate
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	Low
Sediment/Shoreline Stabilization	Low – sparsely vegetated
Groundwater Discharge/Recharge	Low – clayey soils
Uniqueness	Low
Recreation Potential	High – fishing, hunting
Production/Export/Food chain support	Low
LANDSCAPE CONTEXT	
Type of surrounding land uses	Native rangeland and agricultural land
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - PEMC

HYDROLOGY	
Hydrologic Regime	Seasonal
Water Source/HGM Class	Flagler Reservoir/depressional
SOILS	
Presence/Distribution of Organic Soils	None
Fens	None
Presence/Distribution of Saline Soils	None
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	Moderate
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	Low
Sediment/Shoreline Stabilization	Low – sparsely vegetated
Groundwater Discharge/Recharge	Low – clayey soils
Uniqueness	Low
Recreation Potential	High – fishing, hunting
Production/Export/Food chain support	Low
LANDSCAPE CONTEXT	
Type of surrounding land uses	Native rangeland and agricultural land
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - POWF

HYDROLOGY	
Hydrologic Regime	Semi-permanent
Water Source/HGM Class	Flagler Reservoir/depressional
SOILS	
Presence/Distribution of Organic Soils	None
Fens	None
Presence/Distribution of Saline Soils	None
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	Moderate
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	Low
Sediment/Shoreline Stabilization	Low – sparsely vegetated
Groundwater Discharge/Recharge	Low – clayey soils
Uniqueness	Low
Recreation Potential	High – boating, fishing, hunting
Production/Export/Food chain support	Low
LANDSCAPE CONTEXT	
Type of surrounding land uses	Native rangeland and agricultural land
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

Literature Cited:

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A Natural Heritage Assessment and Inventory of Wetlands at Lake Dorothey State Wildlife Area

Prepared for*:*
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May 1999

Location: Lake Dorothey State Wildlife Area (SWA) is located 12 miles southeast of Trinidad, Colorado, immediately north of the New Mexico state line. Access is via Raton, New Mexico on New Mexico Highway 72 to Road 526.

Legal Description: T35S R62W, parts of sections 8, 17

General Description: The Lake Dorothey SWA encompasses the headwaters of Schwachheim Creek, which drains the southern slope of Raton Mesa and flows south into Lake Dorothey and then into Lake Maloya in New Mexico. Elevations at the SWA range from approximately 7600 to 8800 feet. Open ponderosa pine (*Pinus ponderosa*) stands and Gambel's oak (*Quercus gambelii*) woodlands dominate the upland vegetation. Moist toe slopes also support stands of blue spruce (*Picea pungens*) and locust thickets (*Robinia neomexicana*), choke cherry (*Prunus virginiana*), American plum (*Prunus americana*), and snowberry (*Symphoricarpos* spp.).

The SWA is located in a small valley on the south side of a large mesa. The valley bottom is less than ¼ mile wide over most of the area and narrows into 'V' shaped canyons at the upper reaches of the drainage. The topography is characterized by a deep valley with moderate channel entrenchment and a low gradient, generally level marshy area above Lake Dorothey. Hydric soils are scattered along the stream channel and in the flats above the lake.

Lake Dorothey is owned by the city of Raton, New Mexico and leased to Colorado Division of Wildlife on ten-year intervals. Management of the site focuses primarily on providing access for fishing in Lake Dorothey and hunting in the surrounding area. A fishery is maintained in Lake Dorothey by stockings of rainbow trout and Pikes Peak cutthroat trout (*Oncorhynchus clarki*). The site is a popular place for elk, mule deer, and turkey hunting. Past use has been for livestock grazing.

At its southern edge, the SWA adjoins Sugarite Canyon State Park in New Mexico and to the north, James M. John SWA. Most of the other surrounding land is privately owned and used for livestock grazing.

Imperiled Species and/or Natural Communities Known from Lake Dorothey SWA: One occurrence of a plant species tracked by the Colorado Natural Heritage Program was documented at the SWA. The gayfeather (*Liatris ligulistylis*) is demonstrably secure on a global scale, but imperiled to critically imperiled in Colorado. Nesting Peregrine falcons have been documented from nearby (J. Aragon – pers. comm.) and numerous other plants and animals tracked by CNHP are known from the nearby area.

Table 6. Imperiled Species and/or Natural Communities Known from Lake Dorothey SWA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	*EO Rank
Liatris ligulistylis	Gayfeather	G5?	S1S2	--	--	--	C

*EO = Element Occurrence

Wetland description: Due to the steeply dissected terrain, the major wetlands of this SWA are located along the drainage of Schwachheim Creek. Above Lake Dorothey, the wetlands are primarily riparian shrublands dominated by Rocky Mountain willow (*Salix monticola*), with Bebb's willow (*S. bebbiana*) and coyote willow (*S. exigua*) as important associates. As the canyon narrows upstream, Colorado blue spruce (*Picea pungens*) and white fir (*Abies concolor*) become prevalent. Small patches of narrowleaf cottonwood (*Populus angustifolia*) also occur in the upper drainage. None of these wetlands are extensive and all are limited to within 20 feet of the stream channel by steep canyon walls. The assemblages compose a structurally diverse riparian/toeslope environment with multiple age classes and good cover for wildlife.

Due to the impoundment forming Lake Dorothey, fine textured alluvium has accumulated above the reservoir, forming a low gradient meadow with abundant mesic and hydric vegetation. Mesic patches are dominated by timothy (*Phleum pratense*), redtop (*Agrostis stolonifera*), and many forbs, particularly yarrow (*Achillea millefolium*), golden banner (*Thermopsis montana*), and groundsel (*Packera* spp.). There are also abundant young coyote willows (*Salix exigua*) which are vigorously colonizing this area. In the small, shallow sloughs and abandoned meanders are dense stands of emergent species, including Canada reedgrass (*Calamagrostis canadensis*), beaked sedge (*Carex utriculata*), aquatic sedge (*C. aquatilis*), and small-flowered bulrush (*Scirpus microcarpus*).

In and around the reservoir, the wetland communities are restricted to the shallow fringes near the shoreline. A beaked sedge (*Carex utriculata*) marsh is the most extensive plant community, and forms a 4-6 foot wide fringe around most of the reservoir, but broadleaf cattail (*Typha latifolia*) also forms several large stands, generally in deeper water than the sedge. Pondweed (*Potamogeton* spp.) and water smartweed (*Polygonum amphibium*) plant communities occur in slightly deeper water than the cattail community.

Below the dam, there is a riparian community dominated by a mixture of coyote willow, Rocky Mountain willow, Bebb's willow, and whiplash willow (*Salix lucida* ssp. *caudata*). Coyote willow is the most abundant shrub. Because the riparian area is very narrow and contains a mix of microhabitats and willow species, it is difficult to classify the vegetation into discrete units.

The wetland species present in the area are relatively common throughout much of the Rocky Mountains. Thorough inventories have not been conducted in the area but it is suspected that the plant communities documented at the Lake Dorothey SWA would not be uncommon around the Raton Mesa, as similar habitats appear to be common.

Table 7. Wetland and Riparian Plant Communities known from the SWA

Scientific Name	Common Name
Salix exigua/bare ground	Coyote willow/ bare ground
Salix exigua/mesic graminoid	Coyote willow/mesic graminoid
Salix monticola/mesic forb	Rocky Mountain willow/mesic forb
Salix monticola-Salix bebbiana/mesic forb	Rocky Mountain willow-Bebb's willow/mesic forb
Polygonum amphibium	Water smartweed
Potamogeton spp.	Pondweed
Scirpus acutus	Hardstem bulrush
Scirpus pungens	Threesquare bulrush
Spartina pectinata	Prairie cordgrass
Typha latifolia	Cattail

Note that not every example of a plant community at a site meets the criteria for tracking in the CNHP databases. In general, most rare communities and high quality examples of common communities are tracked. Therefore all communities listed in this table may not be included in the list of Natural Heritage elements at the site (Table 1).

Hydrology: The water source that fills the lake is direct and natural from the runoff from Raton Mesa. Lake Dorothey is an artificial impoundment owned by the city of Raton, New Mexico. The hydrology of the streams above the lake appears to be functioning naturally although some water sources on the mesa have been developed to provide water for livestock. Spring floods resulting from snowmelt probably occur in most years. Intense summer thunderstorms are common in the area and may occasionally result in significant flooding events that could move sediments and alter channel morphology. One small, active beaver dam was observed on the creek upstream of the lake.

Anthropogenic Disturbances: The landscape around the wetland complex is dominated by natural vegetation, providing natural connectivity for species requiring both wetland and upland habitats. Some small areas in the meadows around the wetlands are dominated by non-native plant species. It is unknown if these were planted during reservoir construction or are a result of disturbance from livestock grazing. Non-native plant species which are abundant include redtop, timothy, red clover (*Trifolium pratense*), Canada thistle (*Cirsium arvense*), burdock (*Arctium minus*), and locust (*Robinia neomexicana*).

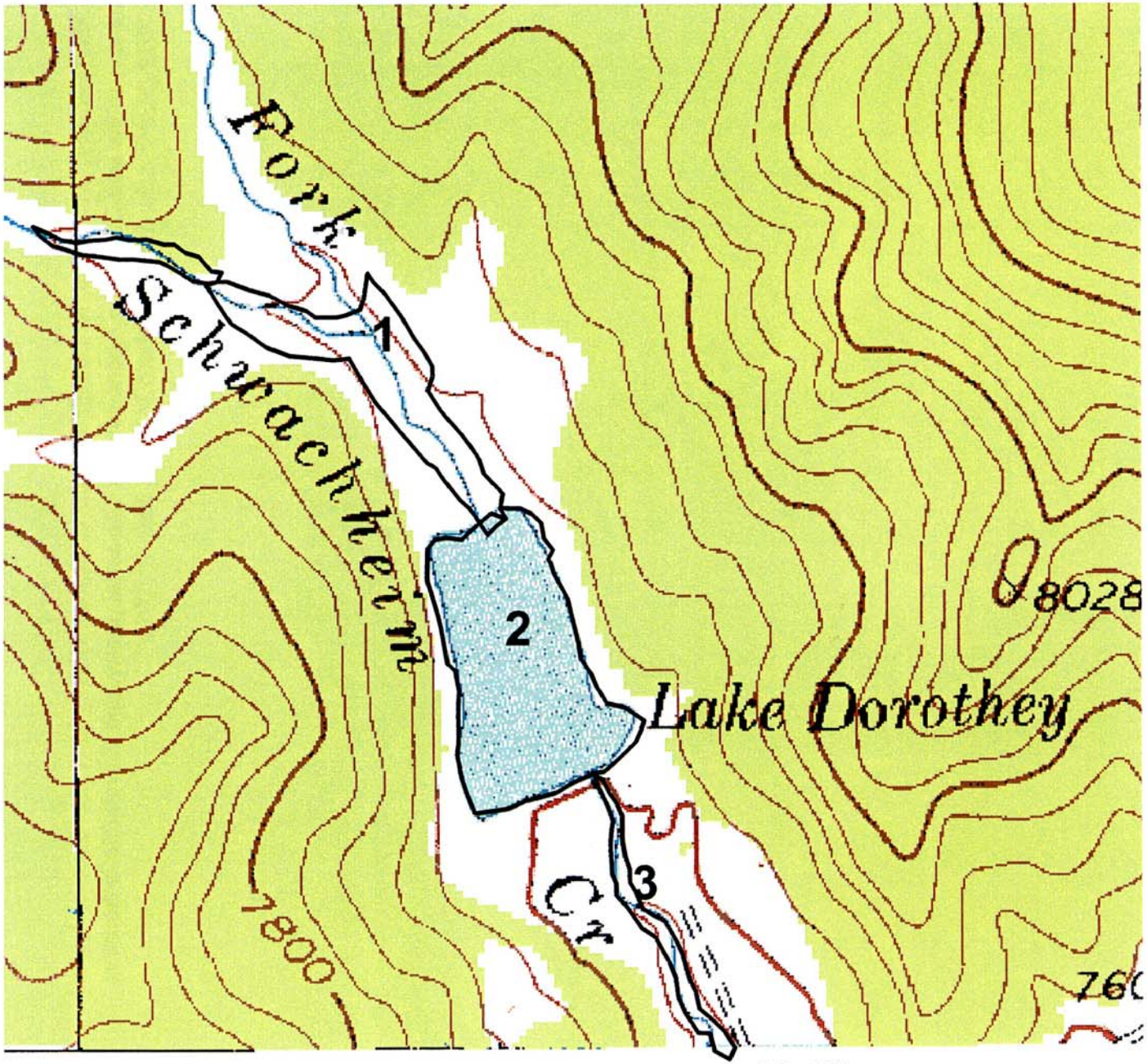
Non-native fish, including yellow perch and suckers, move upstream from Lake Maloya to Lake Dorothey (J. Aragon – pers. comm.).

Management Comments: Along with habitat loss and fragmentation, invasion of non-native plant species may be one of the greatest threats to biodiversity. Numerous studies have shown that areas invaded by non-native species have reduced populations of native plant and animal species (Bedunah 1992, Melgoza et al. 1990, Belcher and Wilson 1989, Bock and Bock 1988).

Maintaining the natural hydrologic regime on the tributaries to Lake Dorothey would continue to help protect the wetland/riparian resources above the lake. Natural beaver activity is an important influence on the hydrology of the streams and should be maintained if possible.

Other Information: A Master Management Plan for the James M. John SWA is available in the DOW Pueblo office. The Colorado Bird Observatory has done breeding bird surveys around Lake Dorothey. Staff from the Denver Museum of Natural History have also done biological surveys in the area (J. Aragon – pers. comm.). An aerial photograph is available in-house at CNHP (NAPP color-infrared, photo 3474-78, June 4, 1991).

Figure 1: National Wetland Inventory Mapping Units at Lake Dorothey SWA



Lake Dorothey SWA and NWI Wetlands

NWI Mapping Units
1 - PEMC
2 - POWZ
3 - PEMC

See the tables following this figure for text descriptions of NWI mapping units.

N
W
E
S

0 0.5 Miles

Plant Communities and Abundant Non-native Species Present in NWI Mapping Units
The following calculations are based on the NWI mapping units presented in Figure 1.

Mapping Unit 1 - Palustrine, emergent, seasonally flooded (PEMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Rocky Mountain willow/mesic forb (*Salix monticola*/mesic forb)	70%	4
Coyote willow/mesic graminoid (*Salix exigua*/mesic graminoid)	20%	1
Rocky Mountain willow-Bebb willow/mesic forb (*Salix monticola-Salix bebbiana*/mesic forb	10%	<1
Non-native Species Abundance & Most Common Species	>25%	
Canada thistle (*Cirsium arvense*)		
Burdock (*Arctium minus*)		
Redtop (*Agrostis stolonifera*)		
Timothy (*Phleum pratense*)		
Red clover (*Trifolium pratense*)		
Locust (*Robinia neomexicana*)		

Mapping Unit 2 - Palustrine, open water, intermittently exposed/permanent (POWZ).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Beaked sedge (*Carex utriculata*)	<10%	<1
Cattail (*Typha latifolia*)	<10%	<1
Water smartweed (*Polygonum amphibium*)	<10%	<1
Pondweed (*Potamogeton* sp.)	<10%	<1
Open water	90%	10
Non-native Species Abundance & Most Common Species	None noted	

Mapping Unit 3 - Palustrine, emergent, seasonally flooded (PEMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Mixed willow (*Salix* spp.)	100%	1
Non-native Species Abundance & Most Common Species	>25%	
Canada thistle (*Cirsium arvense*)		
Burdock (*Arctium minus*)		
Redtop (*Agrostis stolonifera*)		
Timothy (*Phleum pratense*)		
Red clover (*Trifolium pratense*)		
Locust (*Robinia neomexicana*)		

Functions and Values of NWI Wetland Types

NWI type - PEMC

HYDROLOGY	
Hydrologic Regime	Seasonally flooded
Water Source/HGM Class	Schwachheim Creek/riverine
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	None observed
Presence/Distribution of Saline Soils	None observed
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	Moderate
Flood Attenuation and Storage	High
Dynamic Surface Water Storage	Moderate
Sediment/ Toxicant Retention	High
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	Moderate
Uniqueness	Low
Recreation Potential	High – hunting and fishing
Production/Export/Food chain support	Moderate
LANDSCAPE CONTEXT	
Type of surrounding land uses	Native rangeland and forests
Surrounding land ownership	Private and public
Connectivity with other natural areas	Contiguous - J.M. John SWA and Sugarite Canyon State Park (NM)
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources

NWI type - POWZ

HYDROLOGY	
Hydrologic Regime	Permanent
Water Source/HGM Class	Lake Dorothey/depressional
SOILS	
Presence/Distribution of Organic Soils	None observed
Fens	None observed
Presence/Distribution of Saline Soils	None observed
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Low
General Wildlife Habitat	Moderate
General Fish Habitat	High
Flood Attenuation and Storage	High
Dynamic Surface Water Storage	Moderate
Sediment/ Toxicant Retention	High
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	Moderate
Uniqueness	Low
Recreation Potential	High – hunting and fishing
Production/Export/Food chain support	Moderate
LANDSCAPE CONTEXT	
Type of surrounding land uses	Native rangeland and forests
Type of surrounding land ownership	Private and public
Connectivity with other natural areas	Contiguous - J. M. John SWA and Sugarite Canyon State Park (NM)
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources

Literature Cited:

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A Natural Heritage Assessment And Inventory of Wetlands at Mount Evans State Wildlife Area

Prepared for*:*
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May 1999

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Colorado State University

Location: The Mount Evans State Wildlife Area is located 9 miles west of the town of Evergreen, Colorado. The area can be accessed by driving 5 miles west on Highway 74 from Evergreen, then following 480 road southwest for the remaining 4 miles to the site.

Legal Description: T5S R72W all or parts of sections 17, 18, 19; T5S R73W all or parts of sections 11, 12, 13, 14, 24.

General Description: The Mount Evans SWA comprises approximately 4000 acres of montane woodlands and canyon bottom habitats on the eastern flank of Mount Evans. Elevations range from approximately 8000 to 9400 feet. The eastward sloping site is largely vegetated with open forests and woodlands of ponderosa pine (*Pinus ponderosa*), with Douglas-fir (*Pseudotsuga menziesii*) and Colorado blue spruce (*Picea pungens*) on moist topographic positions. On upper slopes, stands of lodgepole pine (*Pinus contorta*) and aspen (*Populus tremuloides*) are common. Bear Creek and two tributaries, Lost Creek and Indian Creek, pass through the site. The steep, rugged topography is largely unfavorable for extensive wetland development and wetlands closely line the major stream drainages, with the exception of Grass Creek and several other small meadows.

Western portions of the SWA experienced severe infestations of spruce budworm and Douglas-fir bark beetle in the late 1980s. In 1991, the Beartrack fire burned through the area. As a result, upper Bear Creek canyon and adjacent slopes contain large quantities of downed woody debris in various stages of decay. Many of these logs have formed debris dams in the canyon. Much of the upper canyon is undergoing succession and dense stands of raspberry (*Rubus idaeus*) and fireweed (*Epilobium angustifolium*) dominate the lower canyon areas.

There are two main wetland types at the SWA. Numerous old beaver dams help form the wetlands along Grass Creek. This results in stepped topography with herbaceous plant communities dominating the area. The wetlands along Bear Creek are formed where the stream has cut a v-shaped canyon and appears to be actively eroding. The riparian vegetation is alternately dominated by coniferous and deciduous species such as Rocky Mountain willow (*Salix monticola),* Engelmann spruce (*Picea engelmannii*), blue spruce, thinleaf alder *(Alnus incana),* and water birch (*Betula occidentalis).*

The site is managed as elk (*Cervus elaphus*) habitat area and is extensively used as winter range by that species. It is also an important calving area for elk. Since 1976 the SWA has been closed from January 1 to June 15 to avoid disturbance of wintering or calving elk. The extensive raspberry patches of upper Bear Creek canyon are also heavily used by black bear (*Ursus americanus*) for foraging. Management activities at the site have included prescribed fire, planting of ponderosa pine seedlings, planting of oak (*Quercus gambelii*) for turkey, and aspen cutting to increase regeneration (R. Matzner – pers. comm.). Hunting, mountain biking, hiking, and fishing are popular recreational activities at the SWA.

Lands managed by the Arapaho National Forest to the west border the SWA. The eastern border of the Mount Evans Wilderness Area (U.S.F.S.) is within a few miles of the SWA. Increasing residential development to the east could potentially result in more conflicts and threats to wildlife and other natural resources.

Although in-depth wetland inventories have not been conducted in the area, similar habitat is abundant in nearby areas; therefore it is suspected that similar wetlands would be common.

Imperiled Species and/or Natural Communities Known from the SWA: No species or plant communities tracked by the Colorado Natural Heritage Program are known to occur at the SWA.

Wetland description: The Grass Creek drainage on the SWA is characterized by an estimated 30-50 meter wide herbaceous meadow with a shallow, sluggish creek flowing through it. The creek appears to be only marginally perennial and 0.5-1 m wide. There are essentially two vegetation types in the meadow, moist grasslands on the toeslopes above the creek, and a wetland type within 1-5 meters of the stream. The site is largely inhabited by nonnative species, but dense, robust stands of Canada reedgrass (*Calamagrostis canadensis*) are common over much of the valley bottom. Panicled bulrush (*Scirpus microcarpus)* is very common along the margin of the stream channel, growing with beaked sedge (*Carex utriculata*) and aquatic sedge (*Carex aquatilis*). A series of overgrown beaver dams occur along the stream and give the floodplain a terraced topography in places. Canada reedgrass, Kentucky bluegrass (*Poa pratensis*), and timothy (*Phleum pratense)* are common on the dams. Beaked sedge, aquatic sedge, and panicled bulrush occupy the old pools. Some groundwater seepage enters the meadow from the south and the site appears to be intermediate between a true fen and a riverine system. Organic materials are present in the soil, but they are quite patchy and thinner (4-10 inches) than in typical fens.

The Bear Creek drainage supports a typical montane riparian system in good condition. The stream has cut a "V" shaped canyon and appears to be actively eroding. The riparian wetlands are not very extensive and closely line the stream channel. The riparian vegetation is alternately dominated by coniferous and deciduous species. Coniferous species dominate where the stream gradient is higher and the reaches are eroding. Deciduous species are more common on narrow alluvial terraces along the streamside. Rocky Mountain willow, Engelmann spruce, blue spruce, thinleaf alder, and water birch are locally abundant in small patches. Due to abundant downed logs, this area is difficult to access and appears to be rather unaffected by livestock grazing and other impacts. The channel passes through a canyon for most of its length and the floodplain varies from 30 to 100 feet in width. Downed woody debris is abundant in the stream channel and on the lower slopes of the canyon.

The SWA is fairly steep and dissected by actively eroding stream channels. There are possibly other small wetlands within the reserve. Judging from the topography and elevation, it is doubtful that an exhaustive search would identify other extensive wetlands on the SWA property. The Rocky Mountain willow/Canada reedgrass plant community identified here is somewhat uncommon. Most of the other wetland and riparian plant communities identified are common throughout much of the Colorado Rocky Mountains.

Table 8. Wetland and Riparian Plant Communities known from the SWA

Scientific Name	Common Name
Picea engelmannii-Picea pungens	Engelmann spruce-blue spruce
Salix monticola/Calamagrostis canadensis	Rocky Mountain willow/Canada reedgrass
Alnus incana/mesic forb	Thinleaf alder/mesic forb
Betula occidentalis	Water birch
Calamagrostis canadensis	Canada reedgrass
Scirpus microcarpus	Panicled bulrush
Carex utriculata	Beaked sedge

Note that not every example of a plant community at a site meets the criteria for tracking in the CNHP databases. In general, most rare communities and high quality examples of common communities are tracked.

Hydrology: The hydrology on Bear Creek and Grass Creek is natural. Only minor irrigation diversions are present on the property (R. Matzner – pers. comm.). The headwaters of Bear Creek originate in Mount Evans Wilderness Area managed by the U.S. Forest Service.

Anthropogenic Disturbances: Smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), Canada thistle (*Cirsium arvense*), quackgrass (*Elytrigia repens*), redtop (*Agrostis stolonifera*), timothy (*Phleum pratense*), and white clover (*Trifolium repens*) are common in or near several of the wetlands.

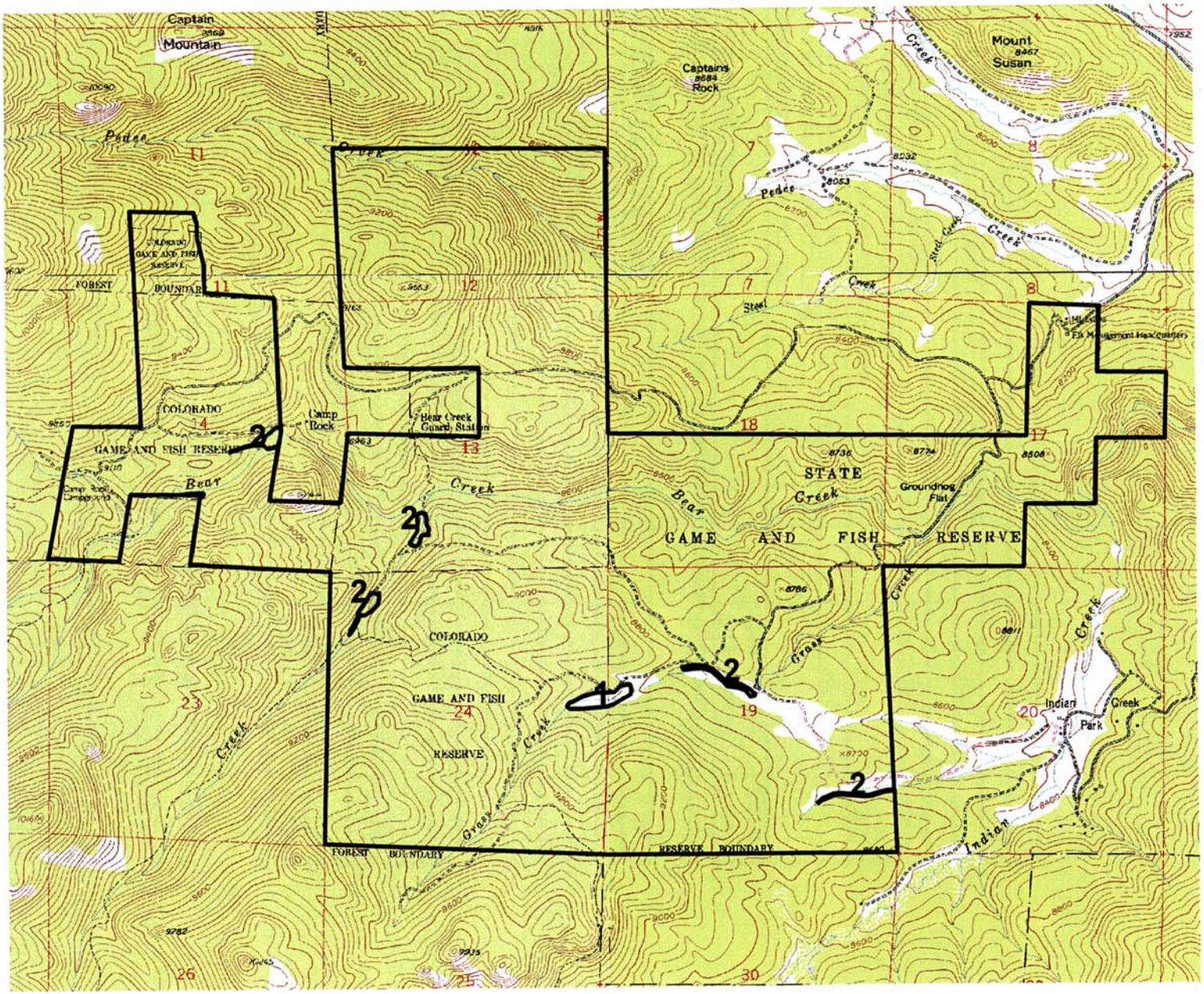
Rainbow, brook, and Snake River cutthroat trout have been stocked in Bear Creek in the past. None have been stocked in the last two years due to the problems with whirling disease (R. Matzner – pers. comm.).

Management Comments: In general the soils and site hydrology appear to be intact and quite favorable to the persistence of native wetland plant communities. The vegetation, however, appears to indicate past disturbance. Non-native species such as Kentucky bluegrass, timothy, and white clover are presently abundant along Grass Creek. Along with habitat loss and fragmentation, invasion of non-native plant species may be one of the greatest threats to biodiversity. Numerous studies have shown that areas invaded by non-native species have reduced populations of native plant and animal species (Bedunah 1992, Melgoza et al. 1990, Belcher and Wilson 1989, Bock and Bock 1988).

Although native species are now used in reseeding mixes, past land-use activities may have allowed invasion of many of the non-native species. Often non-native grass species such as smooth brome and timothy were planted to increase forage production or brought in by grazing.

Other Information: A Master Management Plan (1991), timber management plan (early 1980s), and weed management plan have been completed for the area and are available at the Denver DOW office. The Colorado State Forest Service assisted with development of the timber management plan, which involves timber harvesting, prescribed burning, and replanting. Members of the Audubon Society have compiled bird lists for the area. The Evergreen Naturalists have also done biological inventories on the property (R. Matzner – pers. comm.).

Figure 1: National Wetlands Inventory Mapping Units at Mount Evans SWA



Mt. Evans SWA and NWI Wetlands

NWI Mapping Units
1 - PEMC
2- PSS/EMC

See the tables following this figure for text descriptions of NWI mapping units.

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Plant Communities and Abundant Non-native Species Present in NWI Mapping Units

The following calculations are based on the NWI mapping units presented in Figure 1.

Mapping Unit 1 - Palustrine, emergent, seasonally flooded (PEMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Canada reedgrass (*Calamagrostis canadensis*)	70%	5
Panicled bulrush (*Scirpus microcarpus*)	20%	1
Beaked sedge (*Carex utriculata*)	10%	<1
Non-native Species Abundance & Most Common Species	>25%	
Smooth brome (*Bromus inermis*)		
Quackgrass (*Elytrigia repens*)		
Kentucky bluegrass (*Poa pratensis*)		
Canada thistle (*Cirsium arvense*)		
Redtop (*Agrostis stolonifera*)		
Timothy (*Phleum pratense*)		
White clover (*Trifolium repens*)		

Mapping Unit 2 - Palustrine, scrub-shrub/emergent, seasonally flooded (PSS/EMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Engelmann spruce-blue spruce (*Picea engelmannii-Picea pungens*)	40%	2
Thinleaf alder/mesic forb (*Alnus incana*/mesic forb)	30%	2
Rocky Mountain willow/Canada reedgrass (*Salix monticola*/*Calamagrostis canadensis*)	20%	1
Water birch (*Betula occidentalis*)	10%	<1
Non-native Species Abundance & Most Common Species	<10%	
Timothy (*Phleum pratense*)		
White clover (*Trifolium repens*)		

Functions and Values of NWI Wetland Types

NWI type - PEMC

HYDROLOGY	
Hydrologic Regime	Seasonal
Water Source/HGM Class	Grass, Lost, Bear Creeks/riverine and Slope
SOILS	
Presence/Distribution of Organic Soils	Present on Grass Creek but less than 1 acre
Fens	None
Presence/Distribution of Saline Soils	None
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Low
General Wildlife Habitat	Very high
General Fish Habitat	Low
Flood Attenuation and Storage	Moderate
Dynamic Surface Water Storage	Moderate
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Low
Recreation Potential	High-hunting
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Forested
Type of surrounding land ownership	Public land, US Forest Service
Connectivity with other natural areas	Contiguous
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources

NWI type - PSS/EMC

HYDROLOGY	
Hydrologic Regime	Seasonal
Water Source/HGM Class	Bear Creek/riverine and slope
SOILS	
Presence/Distribution of Organic Soils	None
Fens	None
Presence/Distribution of Saline Soils	None
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Low
General Wildlife Habitat	Very high
General Fish Habitat	Moderate
Flood Attenuation and Storage	Moderate
Dynamic Surface Water Storage	Moderate
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Low
Recreation Potential	High – hunting, fishing
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Forested
Type of surrounding land ownership	Public land, US Forest
Connectivity with other natural areas	Contiguous
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediments from natural sources

Literature Cited:

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A Natural Heritage Assessment And Inventory of Wetlands at Queens State Wildlife Area

Prepared for:
Colorado Division of Wildlife
6060 Broadway
Denver, Colorado 80216

Prepared by:
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May 1999

Location: The Queens State Wildlife Area (SWA) is located about 15 miles north of Lamar, CO. The site can be accessed from several county roads off of Highway 287.

Legal Description: T19S R47W all or a part of sections 7, 8, 9, 14-23, 26, 27, 29, 30, 35; T19S R48W all or parts of sections 12, 13, 24, 25.

General Description: The Queens State Wildlife Area encompasses over 4400 acres of rolling to flat shortgrass prairie, sandsage prairie, agricultural land, and shallow lakes and associated wetlands at elevations ranging from approximately 3830 to 4000 feet. Several large reservoirs (Neegronda, Mud Lake, Neesopah, Neenoshe, and Neeskah) are located partially in or adjacent to the SWA. The large reservoirs are filled and connected to each other by numerous canals and irrigation diversions. These reservoirs are formed in what was historically a system of large depressional lowlands or playas. Before European settlement the amount of water in these lowlands was probably highly variable over time, largely influenced by seasonal and yearly weather patterns. The wetlands on the property are confined to the shores of the reservoirs and to some canals and diversions which connect the reservoirs. Wetlands are dominated by cottonwood (*Populus deltoides*), salt cedar (*Tamarix ramosissima*), and a variety of herbaceous species. Water levels appear to fluctuate greatly from season to season and year to year. Relatively flat topography and a mixture of sandsage (*Artemisia filifolia*) and shortgrass prairie, and agricultural fields characterize the surrounding area. A significant amount of native prairie has been converted to agricultural production in the area.

Management of the SWA mainly focuses on providing a warm water fishery and waterfowl hunting. A local irrigation company controls water levels in the reservoirs. The Division of Wildlife allows farming on approximately 400 acres on the property in exchange for public hunting access on approximately 5000 acres of adjacent private land.

Imperiled Species and/or Natural Communities Known from the SWA: Two imperiled bird species are known to occur on the SWA, the Western snowy plover and the Piping plover. Numerous other species of concern have been documented from the nearby area.

Table 9. Natural Heritage elements at the SWA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	*EO Rank
Charadrius alexandrinus nivosus	Western snowy plover	G4T3	S1B	LT	SC	FS	--
Charadrius melodus	Piping plover	G3	S1B	LT	T	--	A

* Element Occurrence

Wetlands description: The wetlands at the SWA are very diverse, ranging from open water and emergent wetlands to riparian woodlands. Locations of certain wetland types may be temporary, depending on the management of irrigation water. For example, many areas delineated as having emergent herbaceous or shrub vegetation on the National Wetland Inventory (Cowardin *et al*. 1979) maps from 1975 were forested, and inundated late in the summer of 1998. Many of these wetland types probably occur around the reservoirs in shifting locations and patterns depending on the levels of water in the reservoirs.

The vegetation around most of Neeskah Reservoir is dominated by the cottonwood/inland saltgrass (*Populus deltoides*/*Distichlis spicata*) plant community, which was partly inundated in August 1998. Flood debris was present in some of the trees. Cottonwoods were regenerating along the reservoir. Rough cocklebur (*Xanthium strumarium*) and inland saltgrass are common on mudflats on the south shore. Small patches of submerged cattail (*Typha* sp.) and bulrush (*Scirpus* sp.) occur on the southeast side of the reservoir in standing water. At the interface of the wetland and upland zones small patches of inland saltgrass, western wheatgrass (*Pascopyrum smithii*), vine mesquite (*Panicum obtusum*), and alkali sacaton (*Sporobolus airoides*) mix together. The southern and eastern shores generally have far fewer trees and shrubs than the rest of the reservoir. Around Neeskah Reservoir the cottonwood/inland saltgrass plant community dominates about 30% of the shoreline, the inland saltgrass-cocklebur plant community about 60%, and the cattail and bulrush plant communities about 10%.

The narrow band of cottonwoods occurs along the shore of Neegronda Reservoir and is currently inundated. Many trees looked stressed, possibly indicating that they have been inundated for some time. Inland saltgrass and threesquare bulrush (*Scirpus pungens*) are common in the understory. Some bands of trees exist further into the water and appear to be nearly dead or dying. Salt cedar is present in small amounts. Within the SWA the cottonwood/inland saltgrass plant community dominates about 90% of the shoreline and salt cedar about 10%.

The eastern shoreline of Mud Lake has some salt cedar high above the current reservoir level. Below the level of the saltcedar a western wheatgrass (*Pascopyrum smithii*) plant community occurs, followed by the witchgrass (*Panicum capillare*) plant community closer to water level, and finally the water knotweed (*Polygonum amphibium*) plant community directly above the current water level. On the SWA lands these plant communities occur in relatively equal abundance. The canal connecting Mud Lake to Neenoshe Reservoir has abundant cottonwood and peach-leaf willow (*Salix amygdaloides*) growing along it.

Curlytop knotweed (*Polygonum lapathifolium*) and water knotweed are common near the canal that connects Neenoshe Reservoir to Neeskah Reservoir. In and around Neenoshe Reservoir a few small patches of cattail and bulrush are currently inundated. Scattered cottonwood trees and salt cedar shrubs occur on areas higher above the waterline. The cottonwood/western wheatgrass plant community dominates most of the south shoreline highest above the water level. Closer to the water level, the cottonwood/inland saltgrass community dominates. Mud flats near the dam on the southeast shoreline of Neenoshe Reservoir support a plant community dominated by inland saltgrass (*Distichlis spicata)* and fragrant flatsedge (*Cyperus odoratus)*. This plant community occurs immediately above the current water level. Cottonwood seedlings are very common on these mud flats often with as many as 20-30 seedlings per square meter. On the SWA property the inland saltgrass-fragrant flatsedge plant community, the cottonwood/western wheatgrass plant community, and the cottonwood/inland saltgrass community equally dominate about 80% of the wetland area. Approximately 10% of the wetland area is dominated by curlytop knotweed and water knotweed plant communities. Cattail and bulrush plant communites dominate about 10% of the wetland area.

Table 10. Wetland and Riparian Plant Communities known from the SWA

Scientific Name	Common Name
Populus deltoides/*Distichlis spicata*	Cottonwood/inland saltgrass
Populus deltoides/*Pascopyrum smithii*	Cottonwood/western wheatgrass
Distichlis spicata-Cyperus odoratus	Inland saltgrass-fragrant flatsedge
Polygonum amphibium-Polygonum lapathifolium	Water knotweed-curlytop knotweed
Distichlis spicata-Xanthium strumarium	Inland saltgrass-cocklebur
Typha latifolia	Cattail
Scirpus pungens	Threesquare bulrush

Note that not every example of a plant community at a site meets the criteria for tracking in the CNHP databases. In general, most rare communities and high quality examples of common communities are tracked. Therefore all communities listed in this table may not be included in the list of Natural Heritage elements at the site (Table 1).

Hydrology: The hydrology of the reservoirs is controlled by irrigation canals and diversions. Major fluctuations in water levels and duration of flooding can occur from year to year. Polygons delineated by the National Wetlands Inventory (Cowardin et al. 1979) in 1975 as intermittently or temporarily flooded were inundated during much of the summer of 1998 (which was an unusually wet summer). As a result, accurately quantifying the extent of the plant communities present on the SWA was impossible using the National Wetlands Inventory polygons.

Anthropogenic Disturbances: Non-native species are abundant on the SWA in nearly all of the plant communities. The most common non-native species include salt cedar, Russian olive, black locust (*Robinia pseudoacacia*), Canada thistle (*Cirsium arvense*), ragweed (*Ambrosia psilostachya*), stinkgrass (*Eragrostis cilianensis*), verbena (*Verbena bracteata*), kochia (*Kochia scoparia)*, yellow sweetclover (*Melilotus officinalis*), white sweetclover (*Melilotus alba*), and barnyardgrass (*Echinochloa crus-galli*). Russian olive (*Elaeagnus angustifolia*) has been planted along the road at the south end of the reservoir.

Management Comments: Along with habitat loss and fragmentation, invasion of non-native plant species may be one of the greatest threats to biodiversity. Numerous studies have shown that areas invaded by non-native species have reduced populations of native plant and animal species (Bedunah 1992, Melgoza et al. 1990, Belcher and Wilson 1989, Bock and Bock 1988).

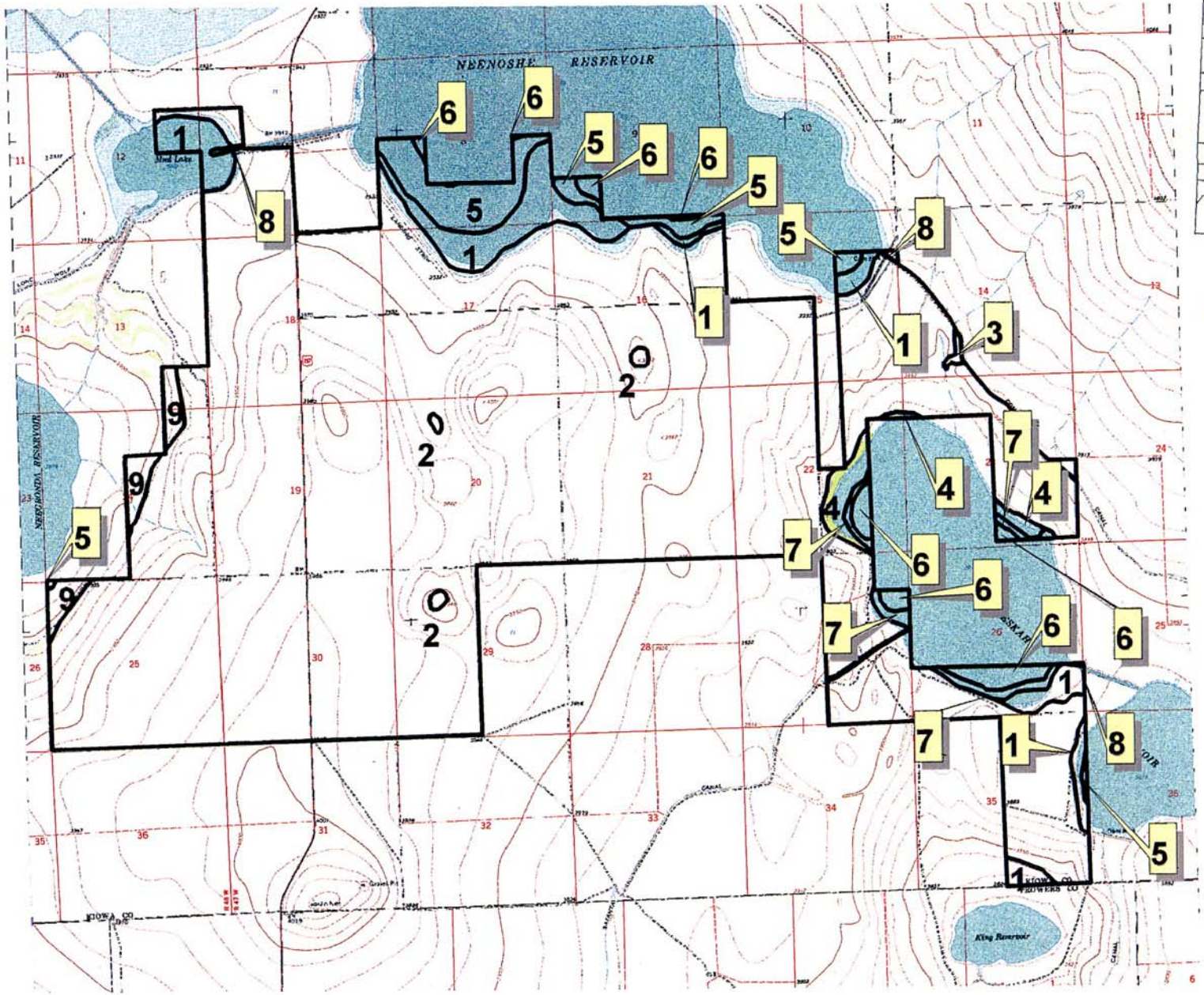
Changes in water levels in the reservoirs leave mudflats that are often invaded by a number or annual species, both native and non-native. These unnatural changes in the water level may impact native wetland species by either flooding out those species which are not adapted to extended periods of inundation, or by lowering the water table quickly below the rooting zone of plants. When changes in the water level are drastic, species that are adapted to fairly specific moisture regimes may not be able to survive.

Because Western snowy plovers and Piping plovers are known to breed along lakeshores around the SWA, management which affects extent of the sandbars and salt flats could impact the amount of breeding habitat for these species.

Other Information: A Master Management Plan for the SWA was prepared in 1985 and is available at the Lamar office of the Colorado Division of Wildlife (DePra, M. – pers. comm.). A bird checklist was included in the plan. DOW has hunting access on approximately 5000 acres of adjacent private lands in exchange for allowing agricultural use of about 400 acres on the

SWA. Aerial photographs are available in house at CNHP (NAPP color-infrared, photos 982-088, 982-090, 983-047, 983-049, October 8, 1988).

Figure 1: National Wetlands Inventory Mapping Units at Queens SWA



Queens SWA and NWI Wetlands

NWI Mapping Units

1 - PEMKW
2 - Pf
3 - PEMC
4 - PSS/EMKW
5 - L2FLKW
6 - L20WKF
7 - L2FLKC
8 - R4SBKC
9 - PSS/EMW

See the tables following this figure for text descriptions of NWI mapping units.

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NWI Wetland Types and Abundance

The following calculations are based on the NWI mapping units presented in Figure 1. Because the NWI mapping units do not represent the current wetlands distribution, the abundance of each plant community at the site could not be accurately assessed. The following figures are from the digitized NWI maps.

NWI Mapping Unit	Total Acres
Mapping Unit 1 - Palustrine, emergent, artificial, intermittently flooded, temporary (PEMKW)	365
Mapping Unit 2 - Palustrine, farmed (Pf)	15
Mapping Unit 3 - Palustrine, emergent, seasonally flooded (PEMC)	7
Mapping Unit 4 - Palustrine scrub-shrub/emergent, artificial, intermittently flooded, temporary (PSS/EMKW)	73
Mapping Unit 5 - Lacustrine, littoral, flat, artificial, intermittently flooded, temporary (L2FLKW)	207
Mapping Unit 6 - Lacustrine, littoral, open water, artificial, intermittently flooded, temporary (L2OWKF)	92
Mapping Unit 7 – Lacustrine, littoral, flat, artificial, intermittently flooded (L2FLKC)	47
Mapping Unit 8 – Riverine, intermittent, streambed, artificial, intermittently flooded (R4SBKC)	4
Mapping Unit 9 – Palustrine, scrub-shrub/emergent, intermittently flooded temporary (PSS/EMW)	87

Functions and Values of NWI Wetland Types

NWI type - PEMKW

HYDROLOGY	
Hydrologic Regime	Intermittently flooded - artificial
Water Source/HGM Class	Neenoshe Reservoir/depressional
SOILS	
Presence/Distribution of Organic Soils	None observed
Fens	None observed
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high – Western snowy and piping plover present
General Wildlife Habitat	Very high – concentrations of waterfowl
General Fish Habitat	High –warm water fish
Flood Attenuation and Storage	High – debris, woody shrub/tree present
Dynamic Surface Water Storage	Low – low precipitation area
Sediment/ Toxicant Retention	Moderate – adjacent to agriculture, restricted outlet
Sediment/Shoreline Stabilization	Moderate – trees and grasses present
Groundwater Discharge/Recharge	Low – clayey soil
Uniqueness	Moderate
Recreation Potential	High – fishing, boating, hunting
Production/Export/Food chain support	Low
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - PF

HYDROLOGY	
Hydrologic Regime	None
Water Source/HGM Class	Artificial – no water present 1998/Not applicable
SOILS	
Presence/Distribution of Organic Soils	None
Fens	None
Presence/Distribution of Saline Soils	None
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	None
General Wildlife Habitat	Low – deer, crows
General Fish Habitat	None
Flood Attenuation and Storage	None
Dynamic Surface Water Storage	Low – likely retains some precipitation
Sediment/ Toxicant Retention	None
Sediment/Shoreline Stabilization	None
Groundwater Discharge/Recharge	None
Uniqueness	None
Recreation Potential	None
Production/Export/Food chain support	None
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - PEMC

HYDROLOGY	
Hydrologic Regime	Seasonal Irrigation canal
Water Source/HGM Class	Irrigation canal/depressional
SOILS	
Presence/Distribution of Organic Soils	None
Fens	None
Presence/Distribution of Saline Soils	None
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Low
General Wildlife Habitat	Low – deer
General Fish Habitat	Low
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	Low – adjacent to agriculture
Sediment/Shoreline Stabilization	Low
Groundwater Discharge/Recharge	Low – clayey soils
Uniqueness	Low
Recreation Potential	Low
Production/Export/Food chain support	Low
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - PSS/EMKW

HYDROLOGY	
Hydrologic Regime	Intermittently flooded
Water Source/HGM Class	Irrigation, reservoirs/depressional
SOILS	
Presence/Distribution of Organic Soils	None observed
Fens	None observed
Presence/Distribution of Saline Soils	Present, especially along lacustrine fringe
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very High – western snowy and piping plover
General Wildlife Habitat	High – deer, coyote, waterfowl
General Fish Habitat	High – warm water fish
Flood Attenuation and Storage	Moderate – debris present, but clayey soils
Dynamic Surface Water Storage	Low – low precipitation
Sediment/ Toxicant Retention	Moderate – adjacent to croplands
Sediment/Shoreline Stabilization	Moderate – woody vegetation present
Groundwater Discharge/Recharge	Low – clayey soils
Uniqueness	Low
Recreation Potential	High – fishing, hunting
Production/Export/Food chain support	Low – low habitat diversity
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - L2FLKW

HYDROLOGY	
Hydrologic Regime	Intermittently flooded
Water Source/HGM Class	Reservoirs and irrigation canal/ depressional
SOILS	
Presence/Distribution of Organic Soils	None
Fens	None
Presence/Distribution of Saline Soils	Present along shore line
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	High
Flood Attenuation and Storage	Moderate
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	Low
Uniqueness	Very high
Recreation Potential	High
Production/Export/Food chain support	Low
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - L2OWKF

HYDROLOGY	
Hydrologic Regime	Semi-permanent
Water Source/HGM Class	Artificial/depressional
SOILS	
Presence/Distribution of Organic Soils	None
Fens	None
Presence/Distribution of Saline Soils	Moderate along shore
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	High
Flood Attenuation and Storage	Moderate
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Low
Groundwater Discharge/Recharge	Low
Uniqueness	Low
Recreation Potential	High
Production/Export/Food chain support	Low
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - L2FLKC

HYDROLOGY	
Hydrologic Regime	Seasonal
Water Source/HGM Class	Artificial/depressional
SOILS	
Presence/Distribution of Organic Soils	None
Fens	None
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	High
Flood Attenuation and Storage	Moderate
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate to low
Groundwater Discharge/Recharge	Low
Uniqueness	Low
Recreation Potential	High
Production/Export/Food chain support	Low
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

NWI type - R4SBKC

HYDROLOGY	
Hydrologic Regime	Intermittent
Water Source/HGM Class	Artificial-Reservoirs/riverine
SOILS	
Presence/Distribution of Organic Soils	None
Fens	None
Presence/Distribution of Saline Soils	None
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	None
General Wildlife Habitat	Low
General Fish Habitat	Low
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	Low
Sediment/Shoreline Stabilization	Low
Groundwater Discharge/Recharge	Low
Uniqueness	Low
Recreation Potential	Low
Production/Export/Food chain support	Low
LANDSCAPE CONTEXT	
Type of surrounding land uses	Agricultural and native rangeland
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment and nutrients from adjacent agricultural lands

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Cowardin, L.M., V. Carter, F.C. Golet, and E. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31. U.S. Fish and Wildlife Service, Washington, DC.

Melgoza, G., R.S. Nowak, and R.J. Tausch. 1990. Soil water exploitation after fire: competition between *Bromus tectorum* and two native species. Oecologia 83:7-13.

A Natural Heritage Assessment and Inventory of Wetlands at Russell Lakes State Wildlife Area

Prepared for:
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Denver, Colorado 80216

Prepared by:
Steve Kettler, Daniel A. Sarr, and Denise Culver
Colorado Natural Heritage Program
Colorado State University
Fort Collins, CO 80523

May 1999

Location: The Russell Lakes State Wildlife Area (SWA) is located east of Highway 285 about 10 miles south of Saguache, CO. The SWA can be accessed from county roads off of Highway 285.

Legal Description: T43N, R8E all or parts of sections19-22, 27-31, 33, 34.

General Description: The Russell Lakes SWA is located in the northern San Luis Valley, Colorado's driest mountain park. The valley is bounded on the east by the Sangre de Cristo Mountains and on the west by the San Juan Mountains. The SWA is located east of Highway 285 approximately 10 miles south of Saguache, and covers an area of approximately 4650 acres. The topographic relief at the SWA is nearly flat. Elevations range from approximately 7560 – 7580 feet. Highest elevations are at the western margin and the lowest where Russell Creek drains eastward off the site. Upland plant communities are mostly dominated by rabbitbrush (*Chrysothamnus nauseosus*) stands, often with blue grama (*Bouteloua gracilis*) in the understory. A shallow underground water table and mildly undulating topography provide habitat for expansive freshwater wetlands, meadows, alkali shrublands, and ephemerally wet alkali basins. This wetland diversity provides habitat for a variety of common and uncommon plants and animals. Similar wetland systems occur in other parts of the San Luis Valley.

The hydrology at the SWA has been altered by several artesian wells on the property. Water levels are intensively managed on the SWA. Numerous canals and other diversions have been developed to move the water around the site. The SWA is managed mainly to provide habitat for waterfowl and other migratory birds. Waterfowl hunting is very popular.

Imperiled Species and/or Natural Communities Known from the SWA: This site supports one of the largest known populations of the globally rare slender spiderflower (*Cleome multicaulis*). The slender spiderflower has a fairly broad global range from southern Wyoming to central Mexico. In spite of its large geographic range, the plant is spatially limited by its specific habitat requirements. It requires moist, alkaline soils for germination and growth. In addition to strict moisture and alkaline needs, the slender spiderflower appears to do well with some form of soil disturbance. These discriminating restrictions limit the slender spiderflower to the edges of alkaline playa lakes and wetlands. The Closed Basin of Colorado contains the most numerous, largest, and healthiest populations of the slender spider-flower known in the world.

Russell Lakes SWA also represents known breeding habitat for numerous state-rare wetland-dependent bird species. These include the Snowy Egret, Black-Necked Stilt, Black-Crowned Night-Heron, and White-Faced Ibis.

Table 11. Imperiled Species and/or Natural Communities Known from the SWA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	*EO Rank
Carex lanuginosa	Montane wet meadow	G3?	S3	--	--	--	A
Cleome multicaulis	Slender spiderflower	G2G3	S2S3	--	--	--	A
Cleome multicaulis	Slender spiderflower	G2G3	S2S3	--	--	--	A
Cleome multicaulis	Slender spiderflower	G2G3	S2S3	--	--	--	A
Cleome multicaulis	Slender spiderflower	G2G3	S2S3	--	--	--	--
Sisyrinchium demissum	Blue-eyed grass	G5	S2	--	--	--	--
Egretta thula	Snowy egret	G5	S2B, SZN	--	--	--	A
Himantopus mexicanus	Black-necked stilt	G5	S3B, SZN	--	--	--	
Nycticorax nycticorax	Black-crowned night-heron	G5	S3B, SZN	--	--	--	A
Nycticorax nycticorax	Black-crowned night-heron	G5	S3B, SZN	--	--	--	A
Nycticorax nycticorax	Black-crowned night-heron	G5	S3B, SZN	--	--	--	A
Nycticorax nycticorax	Black-crowned night-heron	G5	S3B, SZN	--	--	--	--
Nycticorax nycticorax	Black-crowned night-heron	G5	S3B, SZN	--	--	--	--
Nycticorax nycticorax	Black-crowned night-heron	G5	S3B, SZN	--	--	--	--
Nycticorax nycticorax	Black-crowned night-heron	G5	S3B, SZN	--	--	--	--
Plegadis chihi	Whte-faced ibis	G5	S2B, SZN	--	--	FS	B

Species listed more than once occurred in multiple locations and/or populations.
*EO = Element Occurrence

Wetland description: Vegetation within the wetlands varies considerably along salinity and moisture gradients. The larger lakes, which are predominantly freshwater, support well developed aquatic and shoreline emergent plant communities dominated by species such as pondweeds (*Potamogeton* spp.), spikerush (*Eleocharis palustris*), hardstem bulrush (*Scirpus acutus*), and threesquare bulrush (*Scirpus pungens*). Several large stands of broadleaf cat-tail (*Typha latifolia*) occur near the artesian wells, where salinity is lowest. Along Russell Creek and around the outer margins of the large freshwater lakes are meadows dominated by slimstem reedgrass (*Calamagrostis stricta*) and woolly sedge (*Carex lanuginosa*). Smallbeak sedge (*Carex simulata*) becomes locally abundant around springs towards the western edge of the site, and Baltic rush (*Juncus balticus*) is common where soils are slightly saline. Basins with irregular or short duration flooding accumulate salts (due to evaporation) and support inland saltgrass (*Distichlis spicata*), alkali cordgrass (*Spartina gracilis*), and/or western wheatgrass

(*Pascopyrum smithii*) meadows. Spikerush may also dominate these ephemeral wetlands if moisture is sufficient. Adjacent alkali flats and dunes are dominated by greasewood (*Sarcobatus vermiculatus*) and rabbitbrush (*Chrysothamnus* spp.) vegetation, respectively.

The slender spiderflower (*Cleome multicaulis*) forms extensive stands at this site. This annual plant flourishes on alkali soils that remain moist throughout the growing season. Stands can be seen throughout the Russell Lakes site, usually growing in rings around the wetland basins at about the same elevation above standing water as the Baltic rush plant community.

Hardstem bulrush stands along the margins of the lakes provide excellent habitat for nesting white-faced ibis (*Plegadis chihi*), black-crowned night heron (*Nycticorax nycticorax*), snowy egret (*Egretta thula),* cattle egret (*Bubulcus ibis*), marsh wren (*Cistothorus palustris*), and perhaps the occasional migrating great egret (*Casmerodius albus*). The perennial lakes also provide habitat for chorus frog (*Pseudacris triseriata*), Great Plains toad (*Bufo cognatus*), introduced carp (*Cyprinus carpio*), and Rio Grande chub (*Gila pandora*), which serve, among other things, to feed the abundance of nesting birds.

Although most of the wetland plant communities are relatively common in the western U.S., several uncommon plant and animal species are known to occur at the SWA. The wetlands are very important for a variety of migratory birds.

Table 12. Wetland and Riparian Plant Communities known from the SWA

Scientific Name	Common Name
Sarcobatus vermiculatus/*Distichlis spicata*	Greasewood/inland saltgrass
Carex lanuginosa	Woolly sedge
Carex lanuginosa –Calamagrostis stricta	Woolly sedge-slimstem reedgrass
Distichlis spicata	Inland saltgrass
Eleocharis palustris	Common spikerush
Juncus balticus	Baltic rush
Lemna *sp.*	Duckweed
Polygonum amphibium	Water knotweed
Potamogeton *sp.*	Pondweed
Scirpus acutus	Hardstem bulrush
Scirpus pungens	Threesquare bulrush
Typha latifolia	Cattail

Note that not every example of a plant community at a site meets the criteria for tracking in the CNHP databases. In general, most rare communities and high quality examples of common communities are tracked. Therefore all communities listed in this table may not be included in the list of Natural Heritage elements at the site (Table 1).

Hydrology: Russell Springs is the natural water source for the Russell Lakes SWA, but this flow has been augmented by several large artesian wells that discharge freshwater from the confined aquifer under the site. Hydrologists feel that the wetlands at Russell Lakes SWA are mostly natural but may be somewhat more extensive because of water augmentation.

Anthropogenic Disturbances: A change from flood irrigation techniques to center-pivot irrigation in recent years has reduced the amount of foraging habitat for white-faced ibis and, in

turn, reduced the number of ibis using the area (Ron Ryder pers. comm.). Since center-pivot irrigation uses water more efficiently, there is less wet ground that provides foraging areas for these birds.

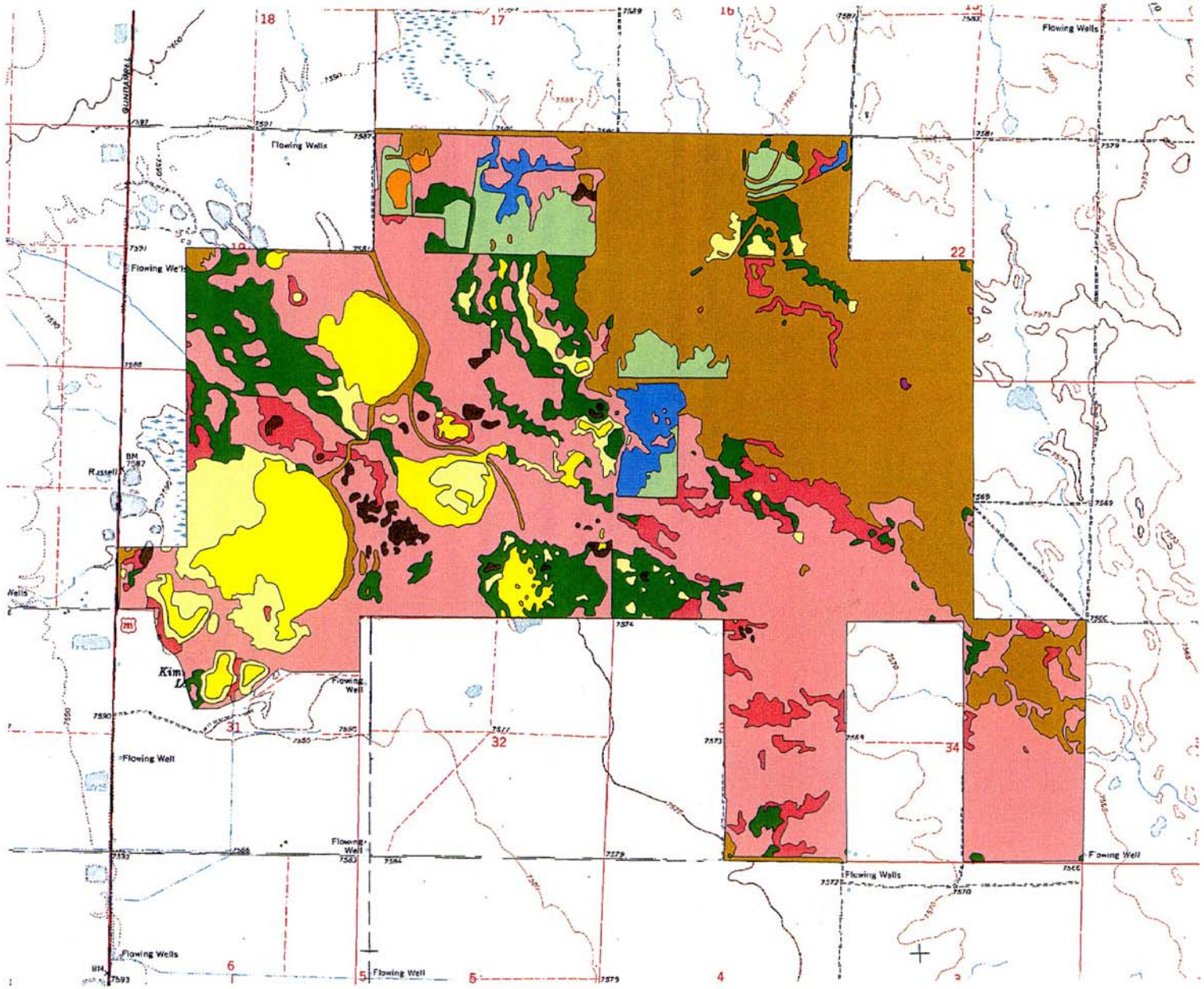
Non-native species are present on the SWA but are common only on access roads. Non-native species generally occur throughout the greasewood/inland saltgrass plant community, but are not abundant. The most common non-native species are white-top (*Cardaria* spp.), tall wheatgrass (*Elytrigia elongata),* kochia (*Kochia* sp.), Russian thistle (*Salsola* sp.), and Canada thistle (*Cirsium arvense*).

Management Comments: Stable hydrologic conditions are critical to the maintenance of the vegetated and open water wetlands, which are critical for many of the nesting birds at the site. Cooper and Severn (1992) report that a regional water table decline could detrimentally impact the wetlands. If water management efforts at this site change drastically, waterbirds that once depended on the historic wetlands (and subsequent flooded croplands) present in the San Luis Valley, may disappear from the area.

White-faced Ibis are extremely sensitive to changing conditions in the environment during breeding cycles (including fluctuating water levels). Nest abandonment is a common response to disturbance or changing conditions (Ryder et al. 1979, Ryder and Manry 1994).

Other Information: An aerial photograph of the area is available in-house at CNHP (NAPP color-infrared, photograph 1053-33, August 26, 1989).

Figure 1: National Wetlands Inventory Mapping Units at Russell Lakes SWA



Russell Lakes SWA and NWI Wetlands

- L2ABG
- PABF
- PABFh
- PABFx
- PABH
- PEMA
- PEMC
- PEMCh
- PEMF
- PEMFh
- PEMJ
- PUSAh
- PUSC
- R4SBA
- Uplands

See the tables following this figure for text descriptions of NWI mapping units.

N
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Plant Communities and Abundant Non-native Species Present in NWI Mapping Units

The following calculations are based on the NWI mapping units presented in Figure 1.

Mapping Unit 1 – Lacustrine, littoral, aquatic bed, intermittently exposed (L2ABG).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Scattered *Potamogeton* sp. (pondweed) and *Lemna* sp. (duckweed)	100%	304
Non-native Species Abundance & Most Common Species	None noted	

Mapping Unit 2 – Palustrine, aquatic bed, semi-permanently flooded (PABF).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Open water with some *Potamogeton* sp. (pondweed) and *Lemna* sp. (duckweed)	100%	45
Non-native Species Abundance & Most Common Species	None noted	

Mapping Unit 3 - Palustrine, aquatic bed, semi-permanently flooded, diked/impounded (PABFh).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
None	100%	11
Non-native Species Abundance & Most Common Species	None noted	

Mapping Unit 4 - Palustrine, aquatic bed, semi-permanently flooded, excavated (PABFx).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
None	100%	<1
Non-native Species Abundance & Most Common Species	None noted	

Mapping Unit 5 – Palustrine, aquatic bed, permanently flooded (PABH).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Well pond	100%	<1
Non-native Species Abundance & Most Common Species	None noted	

Mapping Unit 6 – Palustrine, emergent, temporarily flooded (PEMA).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Inland saltgrass (*Distichlis spicata*) with alkali cordgrass (*Spartina gracilis*)	100%	231
Non-native Species Abundance & Most Common Species	None noted	

Mapping Unit 7 - Palustrine, emergent, seasonally flooded (PEMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Woolly sedge-slimstem reedgrass (*Carex lanuginosa-Calamagrostis stricta*)	40%	192
Baltic rush (*Juncus balticus)*	30%	144
Common spikerush (*Eleocharis palustris)*	20%	96
Threesquare bulrush (*Scirpus pungens*)	10%	48
Non-native Species Abundance & Most Common Species	None-noted	

Mapping Unit 8 - Palustrine, emergent, seasonally flooded, diked/impounded (PEMCh).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Woolly sedge-slimstem reedgrass (*Carex lanuginosa-Calamagrostis stricta*)	40%	30
Baltic rush (*Juncus balticus)*	30%	22
Common spikerush (*Eleocharis palustris)*	20%	15
Threesquare bulrush (*Scirpus pungens*)	10%	7
Non-native Species Abundance & Most Common Species	None noted	

Mapping Unit 9 - Palustrine, emergent, semi-permanently flooded (PEMF).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Hardstem bulrush *(Scirpus acutus)*	90%	215
Cattail (*Typha latifolia*)	10%	24
Non-native Species Abundance & Most Common Species	None noted	

Mapping Unit 10 - Palustrine, emergent, semi-permanently flooded, diked/impounded (PEMFh).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Hardstem bulrush *(Scirpus acutus)*	90%	153
Cattail (*Typha latifolia*)	10%	17
Non-native Species Abundance & Most Common Species	None noted	

Mapping Unit 11 - Palustrine, emergent, intermittently flooded (PEMJ).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Greasewood/inland saltgrass *Sarcobatus vermiculatus*/*Distichlis spicata*	100%	1747
Non-native Species Abundance & Most Common Species	>25%	
Kochia (*Kochia* sp.)		
Russian thistle (*Salsola* sp.)		

Mapping Unit 12 – Palustrine, unconsolidated shore, temporally flooded, diked/impounded (PUSAh).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
None	100%	<1
Non-native Species Abundance & Most Common Species	None noted	

Mapping Unit 13 - Palustrine, unconsolidated shore, seasonally flooded, diked/impounded (PUSC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Mostly dry playa lakes with some Pursh seepweed (*Suaeda calceoliformis*) and salt heliotrope (*Heliotropium curassavicum*)	100%	40
Non-native Species Abundance & Most Common Species	None noted	

Mapping Unit 14 – Riverine, intermittent, streambed, temporary (R4SBA).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Streambed	100%	<1
Non-native Species Abundance & Most Common Species	None noted	

Functions and Values of NWI Wetland Types

NWI type – L2ABG

HYDROLOGY	
Hydrologic Regime	Permanent
Water Source/HGM Class	Russell Lakes/depressional
SOILS	
Presence/Distribution of Organic Soils	None noted
Fens	None noted
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	Very high
General Fish Habitat	High – Rio Grande chub in nearby streams
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Moderate
Recreation Potential	High – hunting, bird watching
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Rangeland and irrigated agriculture
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources and some sediments and nutrients from agricultural fields

NWI type - PABF

HYDROLOGY	
Hydrologic Regime	Permanent
Water Source/HGM Class	Russell Lakes/depressional
SOILS	
Presence/Distribution of Organic Soils	None noted
Fens	None noted
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	Very high
General Fish Habitat	High – Rio Grande chub in nearby streams
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Moderate
Recreation Potential	High – hunting, bird watching
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Rangeland and irrigated agriculture
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources and some sediments and nutrients from agricultural fields

NWI type - PABFh

HYDROLOGY	
Hydrologic Regime	Semi-permanent, seasonal, artificial
Water Source/HGM Class	Russell Lakes/depressional
SOILS	
Presence/Distribution of Organic Soils	None noted
Fens	None noted
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	Very high
General Fish Habitat	High – Rio Grande chub in nearby streams
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Moderate
Recreation Potential	High – hunting, bird watching
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Rangeland and irrigated agriculture
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources and some sediments and nutrients from agricultural fields

NWI type - PABFx

HYDROLOGY	
Hydrologic Regime	Semi-permanent
Water Source/HGM Class	Russell lakes/depressional
SOILS	
Presence/Distribution of Organic Soils	None noted
Fens	None noted
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	Very high
General Fish Habitat	High – Rio Grande chub in nearby streams
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Moderate
Recreation Potential	High – hunting, bird watching
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Rangeland and irrigated agriculture
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources and some sediments and nutrients from agricultural fields

NWI type - PABH

HYDROLOGY	
Hydrologic Regime	Permanent
Water Source/HGM Class	Russell Lakes/depressional
SOILS	
Presence/Distribution of Organic Soils	None noted
Fens	None noted
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	Very high
General Fish Habitat	High – Rio Grande chub in nearby streams
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Moderate
Recreation Potential	High – hunting, bird watching
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Rangeland and irrigated agriculture
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources and some sediments and nutrients from agricultural fields

NWI type - PEMA

HYDROLOGY	
Hydrologic Regime	Temporary
Water Source/HGM Class	Russell Creek-Russell Lakes/riverine, depressional
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	None noted
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	Very high
General Fish Habitat	High – Rio Grande chub in nearby streams
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Moderate
Recreation Potential	High – hunting, bird watching
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Rangeland and irrigated agriculture
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources and some sediments and nutrients from agricultural fields

NWI type - PEMC

HYDROLOGY	
Hydrologic Regime	Seasonal
Water Source/HGM Class	Russell Creek, Russell Lakes/riverine, depressional
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	None noted
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	Very high
General Fish Habitat	High – Rio Grande chub in nearby streams
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Moderate
Recreation Potential	High – hunting, bird watching
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Rangeland and irrigated agriculture
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources and some sediments and nutrients from agricultural fields

NWI type - PEMCh

HYDROLOGY	
Hydrologic Regime	Seasonal
Water Source/HGM Class	Russell Creek/riverine
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	None noted
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	Very high
General Fish Habitat	High – Rio Grande chub in nearby streams
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Moderate
Recreation Potential	High – hunting, bird watching
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Rangeland and irrigated agriculture
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources and some sediments and nutrients from agricultural fields

NWI type - PEMF

HYDROLOGY	
Hydrologic Regime	Semi-permanent
Water Source/HGM Class	Russell Lakes/depressional
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	None noted
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	Very high
General Fish Habitat	High – Rio Grande chub in nearby streams
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Moderate
Recreation Potential	High – hunting, bird watching
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Rangeland and irrigated agriculture
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources and some sediments and nutrients from agricultural fields

NWI type – PEMFh

HYDROLOGY	
Hydrologic Regime	Semi-permanent
Water Source/HGM Class	Russell Lakes/depressional
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	None noted
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	Very high
General Fish Habitat	High – Rio Grande chub in nearby streams
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Very high
Recreation Potential	High – hunting, bird watching
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Rangeland and irrigated agriculture
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources and some sediments and nutrients from agricultural fields

NWI type - PEMJ

HYDROLOGY	
Hydrologic Regime	Intermittent
Water Source/HGM Class	Russell Creek and intermittent streams/riverine
SOILS	
Presence/Distribution of Organic Soils	None noted
Fens	None noted
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	Very high
General Fish Habitat	High – Rio Grande chub in nearby streams
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Moderate
Recreation Potential	High – hunting, bird watching
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Rangeland and irrigated agriculture
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources and some sediments and nutrients from agricultural fields

NWI type - PUSAh

HYDROLOGY	
Hydrologic Regime	Temporary
Water Source/HGM Class	Russell Lakes/depressional
SOILS	
Presence/Distribution of Organic Soils	None noted
Fens	None noted
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	Very high
General Fish Habitat	High – Rio Grande chub in nearby streams
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Moderate
Recreation Potential	High – hunting, bird watching
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Rangeland and irrigated agriculture
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources and some sediments and nutrients from agricultural fields

NWI type - PUSC

HYDROLOGY	
Hydrologic Regime	Seasonal
Water Source/HGM Class	Russell Lakes/depressional
SOILS	
Presence/Distribution of Organic Soils	None noted
Fens	None noted
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	Very high
General Fish Habitat	High – Rio Grande chub in nearby streams
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Moderate
Recreation Potential	High – hunting, bird watching
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Rangeland and irrigated agriculture
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources and some sediments and nutrients from agricultural fields

NWI type – R4SBA

HYDROLOGY	
Hydrologic Regime	Intermittent
Water Source/HGM Class	Russell Creek and irrigation canals/riverine
SOILS	
Presence/Distribution of Organic Soils	None noted
Fens	None noted
Presence/Distribution of Saline Soils	Present
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	Very high
General Fish Habitat	High – Rio Grande chub in nearby streams
Flood Attenuation and Storage	Low
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate
Groundwater Discharge/Recharge	High
Uniqueness	Moderate
Recreation Potential	High – hunting, bird watching
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Rangeland and irrigated agriculture
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from natural sources and some sediments and nutrients from agricultural fields

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A Natural Heritage Assessment and Inventory of Wetlands at Teter-Michigan Creek State Wildlife Area

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May 1999

Location: The Teter-Michigan Creek State Wildlife Area (SWA) is located approximately 3 miles west of Jefferson, CO. The site can be accessed from Road 35 off of Highway 285.

Legal Description: T8S, R76W, parts of section 2 and 11.

General Description: The Teter-Michigan Creek SWA is located on the northwestern side of South Park in a small valley along the eastern edge of the Mosquito Range. The SWA encompasses approximately 950 acres of wet meadows, riparian shrublands, and uplands. Elevations range from approximately 9550 to 9800 feet. The site was used as ranchland and hay meadows before being acquired by DOW in the early 1990s. Nearly the entire SWA supports wetlands or mesic meadows and is probably saturated for several weeks following spring runoff. Michigan Creek flows southward through the site along the eastern edge and supports a typical upper montane riparian shrubland with a lush understory. Areas of groundwater discharge are abundant in the valley bottom. There is one small, but well developed peatland (or fen) formed by groundwater upwelling along the western boundary of the SWA. Due to the presence of calcareous rocks in the upper watershed, it is likely that groundwater at this site is rich to extremely rich in nutrients.

The site was used as livestock pasture and hay meadows before being acquired by DOW in the early 1990s, and is presently grazed by domestic cattle and packstock (M. Lamb – pers. comm.). Diversions take water from the creek to irrigate the adjacent meadows. A small oil well is also present along the western edge of the site.

Imperiled Species and/or Natural Communities Known from the SWA: Two willow species that are globally common, but rare in Colorado, were documented at the site. These willows grow in the nutrient rich fen at the site. In Colorado, this type of fen is restricted to South Park where many have been significantly impacted by peat mining (Sanderson and March 1996).

Table 13. Imperiled Species and/or Natural Communities Known from the SWA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	*EO Rank
Salix candida	Silver willow	G5	S2	--	--	--	C
Salix myrtillifolia	Low blueberry willow	G5	S1	--	--	USFS	C

*EO = Element Occurrence

Wetland description: Mesic meadows that are irrigated in places dominate much of the SWA but are still dominated by native species. The vegetation in these meadows is highly variable. Minor changes in topography, such as seasonally flooded swales and intermittently flooded rises, support very different plant communities. Willow communities dominate the area adjacent to the creek. One small (less than 1 acre), perennially wet fen occurred within the meadow southwest of the Teter Ranch headquarters.

The wet meadows support plant communities dominated by tufted hairgrass (*Deschampsia cespitosa*), Baltic rush (*Juncus balticus*), beaked sedge (*Carex utriculata*), and mixed mesic grasses (no clear dominant species). The small fen located in this meadow supports small planeleaf willow/aquatic sedge (*Salix planifolia*/*Carex aquatilis*), sedge (*Carex simulata*), and shrubby cinquefoil/tufted hairgrass (*Pentaphylloides floribunda*/*Deschampsia cespitosa*)

plant communities. The fen is perennially flooded in the center and seasonally flooded along the edges. Peat deposits exceed 18" in depth and small mats of floating vegetation occur where water is upwelling.

The area along the creek is dominated by Rocky Mountain willow (*Salix monticola*). The understory is dominated by a mosaic of mesic to hydric species including Canada reedgrass (*Calamagrostis canadensis*), aquatic sedge, beaked sedge, and mixed mesic grasses.

The riparian wetlands on the site are common throughout much of the Colorado Rocky Mountains. The small, nutrient rich fen present is particularly rare in Colorado, only occurring in South Park.

Table 14. Wetland and Riparian Plant Communities known from the SWA

Scientific Name	Common Name
Salix monticola/*Calamagrostis canadensis*	Rocky Mountain willow/Canada reedgrass
Salix monticola/mesic graminoid	Rocky Mountain willow/mesic graminoid
Salix monticola/*Carex aquatilis*	Rocky Mountain willow/aquatic sedge
Salix planifolia/*Carex aquatilis*	Planeleaf willow/aquatic sedge
Pentaphylloides floribunda/*Carex aquatilis*	Shrubby cinquefoil/aquatic sedge
Carex aquatilis	Aquatic sedge
Carex simulata	Sedge
Carex utriculata	Beaked sedge
Deschampsia cespitosa	Tufted hairgrass
Juncus balticus	Baltic rush
Mixed mesic graminoids	Mixed mesic grasses

Note that not every example of a plant community at a site meets the criteria for tracking in the CNHP databases. In general, most rare communities and high quality examples of common communities are tracked. Therefore all communities listed in this table may not be included in the list of Natural Heritage elements at the site (Table 1).

Hydrology: The hydrology of Teter Creek has been somewhat altered by irrigation diversions. This may have resulted in wetlands being more abundant at the site than they were naturally and altered the distribution of these wetlands on the landscape. Beaver are present in the area and are an important ecological influence on the plant communities at the site.

Anthropogenic Disturbances: Irrigation diversions have altered the natural hydrology at the site. The area is used for livestock grazing. An oil well is present on the western edge of the site.

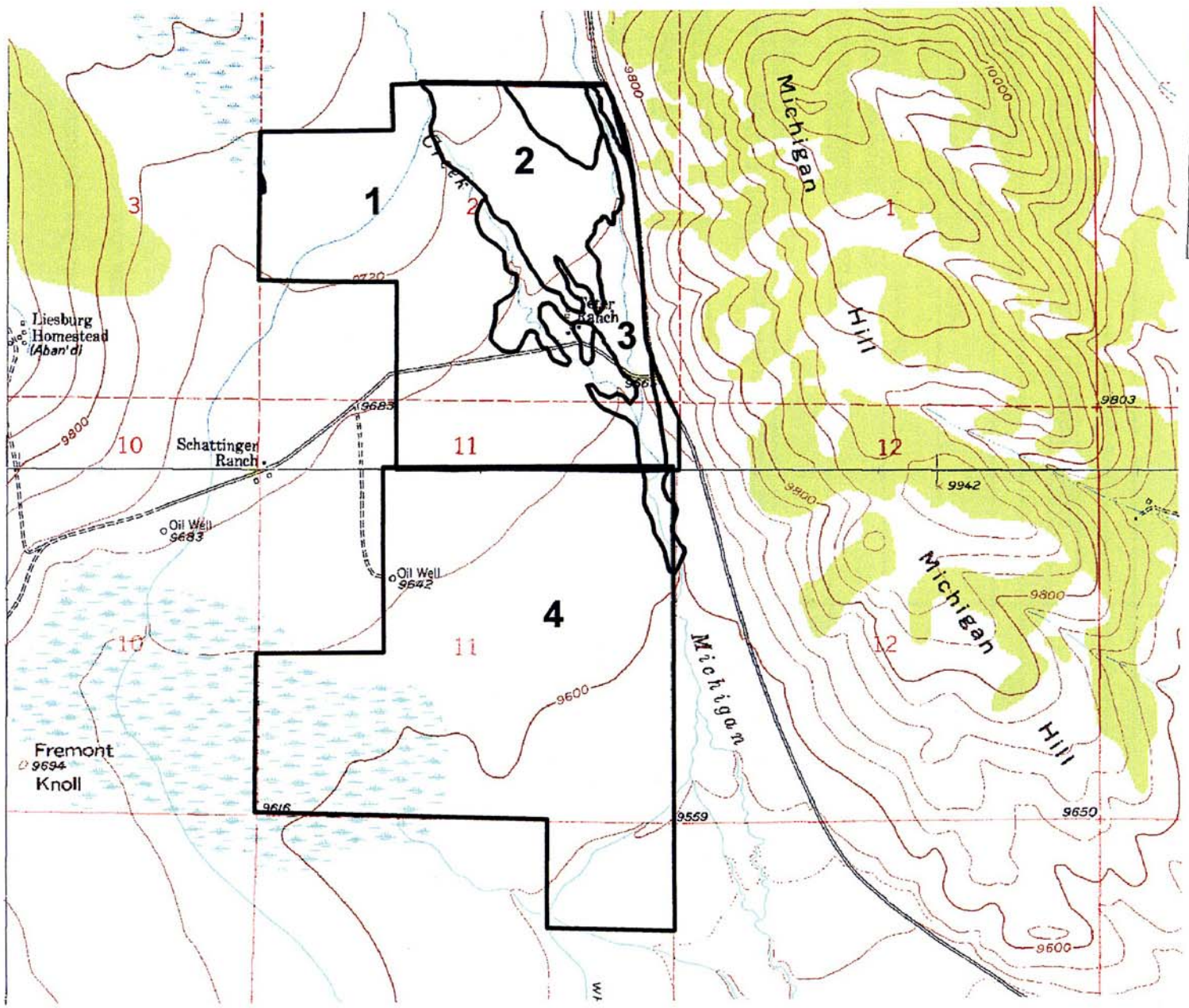
Non-native plant species are common, possibly as a result of planting of hay meadows in the watershed and/or livestock grazing. The most common are Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pratense*), smooth brome (*Bromus inermis*), and dandelion (*Taraxacum officinale*). Most of the site is still dominated by native species.

Management Comments: Along with habitat loss and fragmentation, invasion of non-native plant species may be one of the greatest threats to biodiversity. Numerous studies have shown that areas invaded by non-native species have reduced populations of native plant and animal species (Bedunah 1992, Melgoza et al. 1990, Belcher and Wilson 1989, Bock and Bock 1988). A prescribed fire of approximately 35 acres is scheduled for this spring (M. Lamb – pers. comm.)

Other Information: The following rare plant species are known to occur in fens in South Park: pale blue-eyed grass (*Sisyrinchium pallidum*), little bulrush (*Trichophorum pumilum*), green sedge (*Carex viridula*), Greenland primrose (*Primula egaliksensis*), autumn willow (*Salix serissima*), and Porter feathergrass (*Ptilagrostis porteri*). Surveys for these species earlier in the growing season (June-July) would need to be conducted to determine their presence or absence.

An aerial photograph of the area is available in-house at CNHP (NAPP colored-infrared, photo 1049-92, September 20, 1988). A Master Management Plan is currently being prepared for the property (M. Lamb – pers. comm.).

Figure 1: National Wetlands Inventory Mapping Units at Teter-Michigan Creek SWA



Teter-Michigan Creek SWA and NWI Wetlands

NWI Mapping Units

1 - PEMKC
2 - PEMKC
3 - PSS/EMC
4 - PEMKC

See the tables following this figure for text descriptions of NWI mapping units.

N
W E
S

0.5 0 0.5 1 1.5 Miles

Plant Communities and Abundant Non-native Species Present in NWI Mapping Units

The following calculations are based on the NWI mapping units presented in Figure 1.

Mapping Unit 1 - Palustrine, emergent, artificial, seasonally flooded (PEMKC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Mixed mesic grasses	60%	155
Tufted hairgrass (*Deschampsia cespitosa*)	20%	52
Baltic rush (*Juncus balticus*)	20%	52
Non-native Species Abundance & Most Common Species	<10%	
Kentucky bluegrass (*Poa pratensis*)		

Mapping Unit 2 - Palustrine, emergent, artificial, seasonally flooded (PEMKC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Mixed mesic grasses	50%	40
Tufted hairgrass (*Deschampsia cespitosa*)	30%	24
Baltic rush (*Juncus balticus*)	20%	16
Non-native Species Abundance & Most Common Species	<10%	
Kentucky bluegrass (*Poa pratensis*)		

Mapping Unit 3 - Palustrine, scrub-shrub/emergent, seasonally flooded (PSS/EMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Rocky Mountain willow/Canada reedgrass (*Salix monticola*/*Calamagrostis canadensis*)	40%	29
Rocky Mountain willow/mesic graminoid (*Salix monticola*/mesic graminoid)	40%	29
Rocky Mountain willow/aquatic sedge (*Salix monticola*/*Carex aquatilis*)	10%	7
Beaked sedge (*Carex utriculata*)	10%	7
Non-native Species Abundance & Most Common Species	>25%	
Kentucky bluegrass (*Poa pratensis*)		
Timothy (*Phleum pratense*)		

Mapping Unit 4 - Palustrine, emergent, artificial, seasonally flooded (PEMKC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Mixed mesic grasses	50%	249
Tufted hairgrass (*Deschampsia cespitosa*)	30%	149
Baltic rush (*Juncus balticus*)	20%	99
Non-native Species Abundance & Most Common Species	10-25%	
Smooth brome (*Bromus inermis*)		
Kentucky bluegrass (*Poa pratensis*)		
Dandelion (*Taraxacum officinale*)		

Functions and Values of NWI Wetland Types

NWI type - PEMKC

HYDROLOGY	
Hydrologic Regime	Seasonal/semi-permanent
Water Source/HGM Class	Teter Creek/riverine, slope
SOILS	
Presence/Distribution of Organic Soils	Present but localized
Fens	Present – less than 1 acre
Presence/Distribution of Saline Soils	None observed
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High
General Fish Habitat	Low
Flood Attenuation and Storage	Moderate
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Moderate – dense vegetation
Groundwater Discharge/Recharge	High
Uniqueness	Very high
Recreation Potential	Moderate
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Native rangeland and hay meadows
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from mostly natural sources

NWI type - PSS/EMC

HYDROLOGY	
Hydrologic Regime	Seasonal/semi-permanent
Water Source/HGM Class	Teter Creek/riverine
SOILS	
Presence/Distribution of Organic Soils	Present but localized
Fens	None observed
Presence/Distribution of Saline Soils	None observed
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Low
General Wildlife Habitat	High
General Fish Habitat	Moderate
Flood Attenuation and Storage	High
Dynamic Surface Water Storage	High
Sediment/ Toxicant Retention	Low
Sediment/Shoreline Stabilization	High
Groundwater Discharge/Recharge	Moderate
Uniqueness	Low
Recreation Potential	Moderate
Production/Export/Food chain support	High
LANDSCAPE CONTEXT	
Type of surrounding land uses	Native rangeland and hay meadows
Type of surrounding land ownership	Private
Connectivity with other natural areas	None
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from mostly natural sources

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A Natural Heritage Assessment and Inventory of Wetlands at Tomahawk State Wildlife Area

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May 1999

Natural Heritage Program COLORADO

Colorado State University

Location: The Tomahawk State Wildlife Area (SWA) is located approximately 10 miles southeast of Fairplay, CO. The site can be accessed from Highway 9.

Legal Description: T11S R76W parts of sections 13, 14, 23, 24, 25, 26

General Description: The Tomahawk SWA is located on the west side of South Park, a large, high elevation, intermountain park. The SWA encompasses approximately 1700 acres at elevations ranging from approximately 9000 to 9400 feet. Uplands are dominated by montane grasslands on level to gently sloping topography and forests on steeper slopes.

Wetlands occur along the relatively flat floodplain of the Middle Fork of the South Platte River. Steep slopes border the floodplain that is approximately ¼ mile wide at the upstream (north) end of the SWA and nearly 1 mile wide at the downstream (south) end of the SWA. The wetland hydrology has been moderately altered by irrigation diversions along the floodplain. Because the water rights were sold, haying is no longer conducted on the property. The area is still naturally subirrigated (M. Lamb – pers. comm.).

The Buffalo Peaks SWA encompasses a narrow part of the Middle Fork of the South Platte River immediately upstream of Tomahawk SWA. The nearby area is a mixture of private and public lands (Bureau of Land Management and State land) and is used mainly for cattle ranching. Peat mining has been a common activity in South Park.

Imperiled Species and/or Natural Communities Known from the SWA: An occurrence of a plant species imperiled on a global scale (pale blue-eyed grass) was documented at the SWA. Also documented at the SWA was an occurrence of a plant species secure on a global scale but imperiled to critically imperiled in Colorado (Pursh alpine groundsel).

Table 15. Imperiled Species and/or Natural Communities Known from the SWA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	*EO Rank
Sisyrinchium pallidum	pale blue-eyed grass	G2G3	S2	--	--	--	B
Packera (Senecio) pauciflora	Pursh alpine groundsel	G4G5	S1S2	--	--	--	C

*EO = Element Occurrence

Wetland description: Floodplain wetlands are present along the Middle Fork of the South Platte River. Some parts of the wetlands receive supplemental ground water from adjacent slopes. The wetlands support a mixture of plant communities including willow carrs, shrubby cinquefoil (*Pentaphylloides floribunda*) shrublands, wet meadows, and sedge (*Carex* spp.) wetlands. Dominant willow species include Rocky Mountain willow (*Salix monticola*), barrenground willow (*Salix brachycarpa*), planeleaf willow (*Salix planifolia*), and shining willow (*Salix lucida).* Common herbaceous species include tufted hairgrass (*Deschampsia cespitosa*), Canada reedgrass (*Calamagrostis canadensis*), woolly sedge (*Carex lanuginosa*), aquatic sedge (*Carex aquatilis*), beaked sedge (*Carex utriculata*), and Baltic rush (*Juncus balticus*). The SWA contains riparian wetland plant communities that are fairly common throughout the Colorado Rocky Mountains.

Table 16. Wetland and Riparian Plant Communities known from the SWA

Scientific Name	Common Name
Populus angustifolia/*Betula occidentalis*	Narrowleaf cottonwood/water birch
Pentaphylloides floribunda/*Deschampsia cespitosa*	Shrubby cinquefoil/tufted hairgrass
Salix monticola/*Carex aquatilis*	Rocky Mountain willow/aquatic sedge
Salix monticola/mesic graminoid	Rocky Mountain willow/mesic graminoid
Carex aquatilis	Aquatic sedge
Carex lanuginosa	Woolly sedge
Carex utriculata	Beaked sedge
Deschampsia cespitosa	Tufted hairgrass
Juncus balticus	Baltic rush

Note that not every example of a plant community at a site meets the criteria for tracking in the CNHP databases. In general, most rare communities and high quality examples of common communities are tracked. Therefore all communities listed in this table may not be included in the list of Natural Heritage elements at the site (Table 1).

Hydrology: The headwaters of the Middle Fork of the South Platte River originate about 25 miles to the northwest in the Tenmile Range. The wetlands receive water from the river but also receive some supplemental groundwater from adjacent slopes. Parts of the wetland system may have rich fen characteristics (high levels of calcium, magnesium, and other minerals). These rich fens are rare and have been significantly impacted by peat mining in South Park (Sanderson and March 1996).

Anthropogenic Disturbances: Floodplains in South Park are often used as hay meadows. Some have been planted with non-native plant species. These non-native species are often further spread through waterways or by animals. Non-native grass species common on the SWA include smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), and wheatgrass (*Elytrigia* sp.). Canada thistle (*Cirsium arvense*) is also abundant.

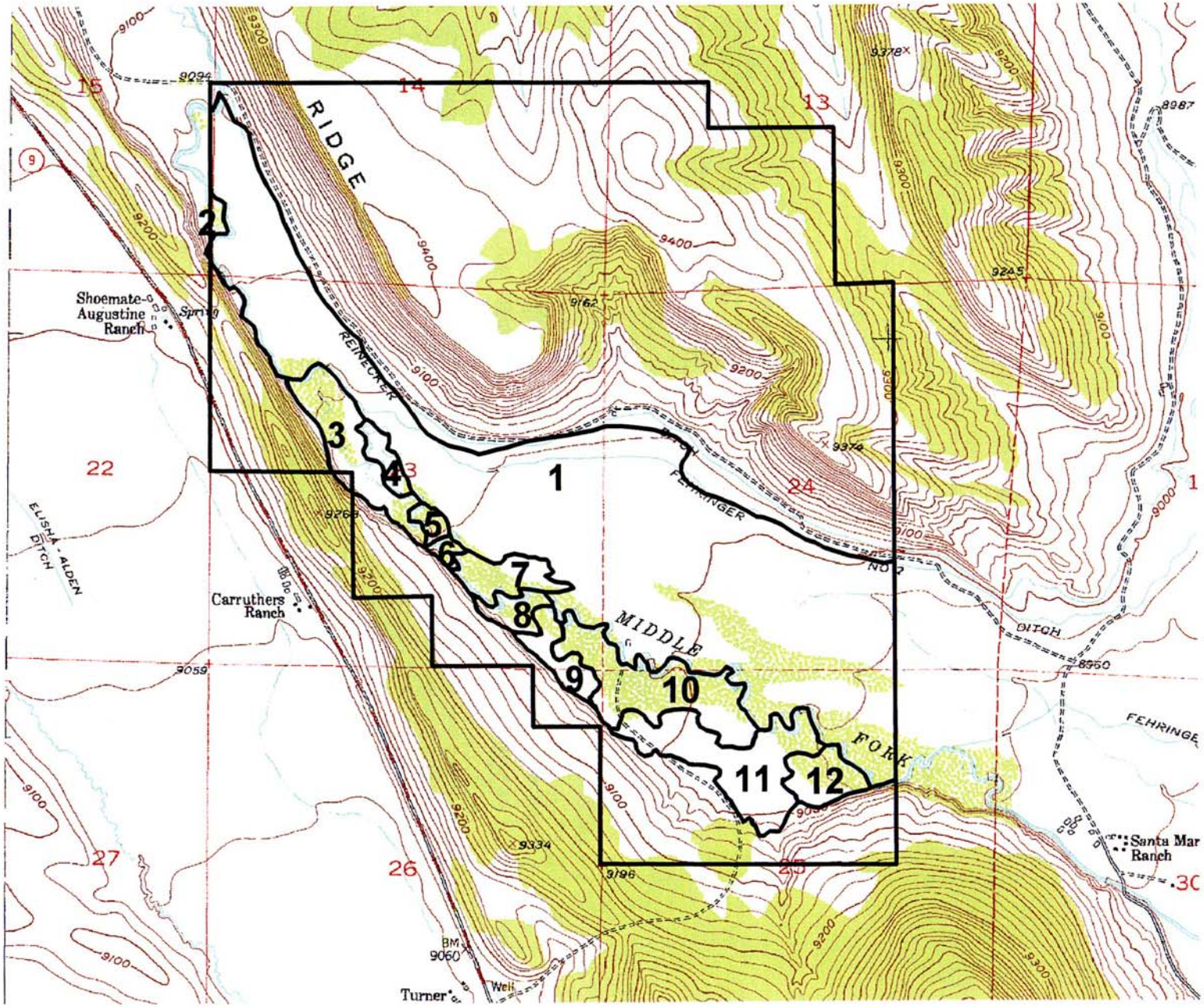
Management Comments: Along with habitat loss and fragmentation, invasion of non-native plant species may be one of the greatest threats to biodiversity. Numerous studies have shown that areas invaded by non-native species have reduced populations of native plant and animal species (Bedunah 1992, Melgoza et al. 1990, Belcher and Wilson 1989, Bock and Bock 1988).

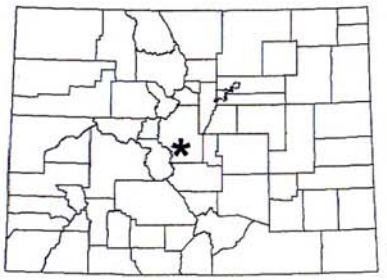
Reducing the abundance of non-native species would help improve the habitat for native plant and animals. Control of non-native species may be difficult. Natural flooding disturbances on the river create habitat for invasive species and the seed sources are undoubtedly present upstream. Grazing, burning, or application of herbicides may be required for control of the most common non-native species present.

DOW has plans to burn approximately 100 acres of the property this spring (M. Lamb – pers. comm.).

Other Information: An aerial photograph of the area is available in house at CNHP (NAPP color-infrared aerial photograph 1049-102, September 20, 1988). A Master Management Plan is available at the DOW Fairplay office. The area was acquired in the middle 1980s as mitigation for the building of Spinney Mountain Reservoir (M. Lamb – pers. comm.).

Figure 1: National Wetlands Inventory Mapping Units at Tomahawk SWA





Tomahawk SWA and NWI Wetlands

NWI Mapping Units

1 - PEMKC
2 - PEMKC
3 - PSS/EMC
4 - PSS/EMC
5 - PSS/EMC
6 - PSS/EMC
7 - PSS/EMC
8 - PSS/EMC
9 - PEMKC
10 - PSS/EMC
11 - PEMKC
12 - PSS/EMC

See the tables following this figure for text descriptions of NWI mapping units.

N
W E
S

Plant Communities and Abundant Non-native Species Present in NWI Mapping Units

The following calculations are based on the NWI mapping units presented in Figure 1.

Mapping Unit 1 - Palustrine, emergent, artificial, seasonally flooded (PEMKC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Mixed mesic meadow	60%	265
Tufted hairgrass (*Deschampsia cespitosa*)	20%	88
Aquatic sedge (*Carex aquatilis*)	10%	44
Upland inclusions	10%	44
Non-native Species Abundance & Most Common Species	>25%	
Smooth brome (*Bromus inermis*)		

Mapping Unit 2 - Palustrine, emergent, artificial, seasonally flooded (PEMKC). This mapping unit may be classified incorrectly on the National Wetland Inventory maps, as shrub communities are dominant (should be PSS/EMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Rocky Mountain willow/aquatic sedge (*Salix monticola*/*Carex aquatilis*)	30%	<1
Rocky Mountain willow/mesic graminoid (*Salix monticola*/mesic graminoid)	30%	<1
Baltic rush (*Juncus balticus*)	20%	<1
Aquatic sedge (*Carex aquatilis*)	10%	<1
Beaked sedge (*Carex utriculata*)	10%	<1
Non-native Species Abundance & Most Common Species	10-25%	
Kentucky bluegrass (*Poa pratensis*)		
Smooth brome (*Bromus inermis*)		
Canada thistle (*Cirsium arvense*)		

Mapping Unit 3 - Palustrine, scrub-shrub/emergent, seasonally flooded (PSS/EMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Rocky Mountain willow/mesic graminoid (*Salix monticola*/mesic graminoid)	60%	17
Tufted hairgrass (*Deschampsia cespitosa*)	20%	6
Woolly sedge (*Carex lanuginosa*)	20%	6
Non-native Species Abundance & Most Common Species	10-25%	
Canada thistle (*Cirsium arvense*)		
Kentucky bluegrass (*Poa pratensis*)		
Smooth brome (*Bromus inermis*)		

Mapping Unit 4 - Palustrine, scrub-shrub/emergent, seasonally flooded (PSS/EMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Rocky Mountain willow/mesic graminoid (*Salix monticola*/mesic graminoid)	50%	4
Tufted hairgrass (*Deschampsia cespitosa*)	20%	1
Woolly sedge (*Carex lanuginosa*)	20%	1
Non-native meadow (at northern edge)	10%	<1
Non-native Species Abundance & Most Common Species	>25%	
Canada thistle (*Cirsium arvense*)		
Kentucky bluegrass (*Poa pratensis*)		
Smooth brome (*Bromus inermis*)		

Mapping Unit 5 - Palustrine, scrub-shrub/emergent, seasonally flooded (PSS/EMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Rocky Mountain willow/mesic graminoid (*Salix monticola*/mesic graminoid)	70%	3
Woolly sedge (*Carex lanuginosa*)	20%	<1
Baltic rush (*Juncus balticus*)	10%	<1
Non-native Species Abundance & Most Common Species	10-25%	
Canada thistle (*Cirsium arvense*)		
Kentucky bluegrass (*Poa pratensis*)		
Smooth brome (*Bromus inermis*)		

Mapping Unit 6 - Palustrine, scrub-shrub/emergent, seasonally flooded (PSS/EMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Rocky Mountain willow/mesic graminoid (*Salix monticola*/mesic graminoid)	80%	2
Aquatic sedge (*Carex aquatilis*)	20%	<1
Non-native Species Abundance & Most Common Species	10-25%	
Canada thistle (*Cirsium arvense*)		
Kentucky bluegrass (*Poa pratensis*)		
Smooth brome (*Bromus inermis*)		
Timothy (*Phleum pratense*)		

Mapping Unit 7 - Palustrine, scrub-shrub/emergent, seasonally flooded (PSS/EMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Rocky Mountain willow/mesic graminoid (*Salix monticola*/mesic graminoid)	30%	5
Tufted hairgrass (*Deschampsia cespitosa*)	30%	5
Beaked sedge (*Carex utriculata*)	20%	3
Aquatic sedge (*Carex aquatilis*)	10%	2
Woolly sedge (*Carex lanuginosa*)	10%	2
Non-native Species Abundance & Most Common Species	>25%	
Canada thistle (*Cirsium arvense*)		
Smooth brome (*Bromus inermis*)		
Wheatgrass (*Elytrigia* sp.)		

Mapping Unit 8 - Palustrine, scrub-shrub/emergent, seasonally flooded (PSS/EMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Rocky Mountain willow/mesic graminoid (*Salix monticola*/mesic graminoid)	30%	3
Beaked sedge (*Carex utriculata*)	30%	3
Tufted hairgrass (*Deschampsia cespitosa*)	30%	3
Baltic rush (*Juncus balticus*)	10%	<1
Non-native Species Abundance & Most Common Species	10-25%	
Canada thistle (*Cirsium arvense*)		
Kentucky bluegrass (*Poa pratensis*)		
Smooth brome (*Bromus inermis*)		
Wheatgrass (*Elytrigia* sp.)		

Mapping Unit 9 - Palustrine, emergent, artificial, seasonally flooded (PEMKC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Rocky Mountain willow/mesic graminoid (*Salix monticola*/mesic graminoid)	50%	6
Beaked sedge (*Carex utriculata*)	40%	5
Narrow-leaf cottonwood/water birch (*Populus angustifolia*/*Betula occidentalis*	10%	1
Non-native Species Abundance & Most Common Species	<10%	
Canada thistle (*Cirsium arvense*)		
Kentucky bluegrass (*Poa pratensis*)		
Smooth brome (*Bromus inermis*)		

Mapping Unit 10 - Palustrine, scrub-shrub/emergent, seasonally flooded (PSS/EMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Rocky Mountain willow/mesic graminoid (*Salix monticola*/mesic graminoid)	60%	27
Shrubby cinquefoil/tufted hairgrass *(Pentaphylloides floribunda*/*Deschampsia cespitosa*)	20%	9
Tufted hairgrass (*Deschampsia cespitosa*)	20%	9
Non-native Species Abundance & Most Common Species	>25%	
Kentucky bluegrass (*Poa pratensis*)		
Smooth brome (*Bromus inermis*)		

Mapping Unit 11 - Palustrine, emergent, artificial, seasonally flooded (PEMKC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Shrubby cinquefoil/tufted hairgrass *(Pentaphylloides floribunda*/*Deschampsia cespitosa*)	60%	27
Rocky Mountain willow/mesic graminoid (*Salix monticola*/mesic graminoid)	30%	14
Beaked sedge (*Carex utriculata*)	10%	5
Non-native Species Abundance & Most Common Species	>25%	
Canada thistle (*Cirsium arvense*)		
Kentucky bluegrass (*Poa pratensis*)		
Smooth brome (*Bromus inermis*)		

Mapping Unit 12 - Palustrine, scrub-shrub/emergent, seasonally flooded (PSS/EMC).

Dominant Plant Communities	Proportion of Mapping Unit	Total Acres
Rocky Mountain willow/mesic graminoid (*Salix monticola*/mesic graminoid)	60%	9
Woolly sedge (*Carex lanuginosa*)	30%	4
Shrubby cinquefoil/tufted hairgrass *(Pentaphylloides floribunda*/*Deschampsia cespitosa*)	20%	3
Non-native Species Abundance & Most Common Species	>25%	
Canada thistle (*Cirsium arvense*)		
Kentucky bluegrass (*Poa pratensis*)		
Smooth brome (*Bromus inermis*)		

Functions and Values of NWI Wetland Types

NWI type - PEMKC

HYDROLOGY	
Hydrologic Regime	Seasonal
Water Source/HGM Class	Middle Fork of the S. Platte River/riverine
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	Present
Presence/Distribution of Saline Soils	None noted
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High – elk, antelope
General Fish Habitat	High
Flood Attenuation and Storage	Moderate – high order stream
Dynamic Surface Water Storage	Low
Sediment/ Toxicant Retention	Moderate
Sediment/Shoreline Stabilization	Very high
Groundwater Discharge/Recharge	Very high – several springs
Uniqueness	Moderate
Recreation Potential	Moderate – fishing, hunting
Production/Export/Food chain support	Moderate
LANDSCAPE CONTEXT	
Type of surrounding land uses	Native rangeland and hay meadows
Type of surrounding land ownership	Private and public (Buffalo Peaks SWA)
Connectivity with other natural areas	Contiguous
Position of wetland in relation to sediment, toxicant, or nutrient inputs	Receives sediment from mostly natural sources.

NWI type - PSS/EMC

HYDROLOGY	
Hydrologic Regime	Seasonal
Water Source/HGM Class	Middle Fork of the S. Platte River/riverine
SOILS	
Presence/Distribution of Organic Soils	Present
Fens	Present
Presence/Distribution of Saline Soils	None noted
WETLAND FUNCTIONS AND VALUES	
Habitat for S1,S2, and S3 ranked species	Very high
General Wildlife Habitat	High – elk, antelope
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