

# Wheat Ridge Open Space Areas Biological Inventory 2000



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## **Acknowledgments**

The Colorado Natural Heritage Program would like to thank the City of Wheat Ridge Open Space and the City of Wheat Ridge Parks Board for making this work possible. We also gratefully acknowledge and sincerely thank Margaret Paget for generously contributing her time and expertise to this project. As our primary contact she gave crucial assistance with orienting CNHP biologists within the Greenbelt and Lewis Meadows, and was extremely helpful in assisting with all aspects of this project. John McGuire and Dave Brossman provided the imagery data needed for generating the weed, plant association, rare plant, and animal data layers, and was very helpful. Rick Brune generously contributed his time and expertise with consultation and orientation in the study area, particularly with regards to *Spiranthes diluvialis*. The University of Colorado and the Colorado State University Herbaria provided important species distribution information. Bryan Behrends and Jeremy Siemers conducted the animal surveys in the study area. Jill Handwerk and Sarah Baumgartner provided valuable assistance in the field with weed mapping. The information management staff with CNHP was responsible for integrating the data resulting from the inventory into the Biological Conservation Datasystem. This effort was performed by Jill Handwerk, Jodie Bell, Jeremy Siemers, Alison Loar, Laurel Potts, and Adam Carheden. Crucial assistance with printing maps for the field and digitizing potential conservation areas and element occurrences was provided by Amy Lavender. Valuable editorial feedback was provided by Jill Handwerk, Beth Van Dusen, Rob Schorr, and Amy Lavender.

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## Executive Summary

In April 2000, the Colorado Natural Heritage Program (CNHP) was contracted by the City of Wheat Ridge to assess the natural heritage values and map vegetation types, selected weed species, rare plants, and selected animal species throughout the City of Wheat Ridge Greenbelt and Lewis Meadows. These areas are referred to collectively as "the study area" throughout this report. Field work for this project was completed during the summer and fall of 2000.

The goals of the project were to identify locations in the study area with natural heritage significance, generate a map of plant community assemblages, selected weeds, and selected animals, and offer suggestions for managing the biological resources of the study area. Areas of natural heritage significance were identified by 1) examining existing biological data, 2) accumulating additional information from other sources on rare or imperiled plant species, animal species, and significant plant communities (collectively called **elements**), and 3) conducting field surveys.

Weeds, vegetation, rare plants, and vertebrate observations were mapped successfully throughout the Greenbelt and in Lewis Meadows on 1:600 scale aerial photographs. These data will support continued conservation and overall management of the City of Wheat Ridge Open Space Areas.

One rare federally listed plant species, the Ute ladies'-tresses (*Spiranthes diluvialis*), has been known in the area since 1981. The Ute ladies'-tresses is considered globally imperiled (G2) and imperiled within Colorado (S2) by the Colorado Natural Heritage Program (see Table 1 for rank definitions). One occurrence of this species, comprised of approximately 18 suboccurrences, was revisited and mapped during this survey. Small examples of a critically imperiled (G1) plant association (Plains Cottonwood-Chokecherry Woodland) and a imperiled (G2) plant association (Plains Cottonwood-Snowberry Woodland) were also documented during this survey. A yet undescribed species of earth star (*Mycenastrum* sp. nov.), a type of puffball fungus, has also been recently documented in the Greenbelt, and thus far is known worldwide only from this location. Overall, the concentration of elements indicates that conservation in the City of Wheat Ridge Open Space will have state-wide as well as global consequences.

The portion of the open space with natural heritage significance (area where elements have been documented) is presented in this report as a **potential conservation area (PCA)**. One PCA was delineated for the Wheat Ridge Open Space Area prior to this survey and was modified as a result of this research. **The potential conservation area boundary designated in this report does not confer any regulatory protection on the area.** The boundary is based on our best estimate of the ecological processes needed to support the elements within that area. Areas of high biodiversity significance within the PCA are highlighted separately.

The new information gathered during this inventory was placed in the Natural Heritage Program's Biological and Conservation Database (BCD). The BCD is used throughout the entire Natural Heritage Network (which consists of eighty five offices throughout North America, Latin America, and South America) to maintain species and community information and to assess each element's degree of imperilment. By incorporating new information into the BCD we can refine our conservation priorities. The new information becomes part of a permanent record of Colorado's natural heritage.

The Natural Heritage Biological Inventory was conducted in several steps:

1. **Identify rare or imperiled species and significant plant communities with potential to occur in the City of Wheat Ridge Open Space.** Using known range and life history information, 19 natural heritage elements with the potential to occur in the Wheat Ridge Greenbelt and Lewis Meadows were identified, not including plant communities.
2. **Collect existing information.** CNHP databases were updated with information regarding the biology of the species as well as documented locations of the species within the City of Wheat Ridge Open Space. Sources included scientific literature, a prior CNHP biological inventory in Jefferson County, and materials provided by the City of Wheat Ridge Park Naturalist.
3. **Identify targeted inventory areas.** Using the information collected in step 2 and aerial photography, targeted inventory areas were identified based on several factors including the presence of potential habitat for rare or imperiled species and evidence of minimal human disturbance.
4. **Conduct field surveys.** The entire study area was scrutinized closely by CNHP biologists. Areas with potential for the presence of natural heritage elements (targeted inventory areas) were sought and carefully inventoried. Data on the presence of elements were recorded, and an estimate of overall biological quality of the location was made. All natural heritage elements were mapped at 1:600 scale and precise locations were determined using a GPS unit. Selected noxious weeds, rare plants, plant assemblages, and animal observations were mapped using 1:600 scale aerial photography provided by the City of Wheat Ridge. Sherman live traps were set for 551 trap nights to inventory small mammals in the open space. Digital shapefiles were developed for each of these layers to facilitate fine scale site specific management of the Open Space biological resources.
5. **Adjust the boundary of the potential conservation area.** Preliminary conservation planning boundaries were identified based on our best estimate of the ecological processes that support the Natural Heritage elements at the site.

## Overview of the Study Area

The City of Wheat Ridge Greenbelt is an urban riparian corridor at the base of the foothills of the Colorado Front Range. The centerpiece of the Greenbelt is Clear Creek, which flows in a predominantly west to east direction through the City of Wheat Ridge. Elevation within the Greenbelt ranges from 5,450 feet on the ridgetop at its western edge near Youngsfield Street, to 5,280 feet at its eastern terminus at Harlan Street. The entire Greenbelt area is biologically important, as it provides connectivity along the riparian corridor with the upstream watershed of Clear Creek. Thus, even mountain lions have been seen in the City of Wheat Ridge Greenbelt. Though heavily used currently and historically, it remains an area that is endowed with considerable biological diversity and natural heritage significance. The Clear Creek riparian corridor supports occurrences of imperiled plants and plant associations. Although they have become surrounded by urban development during the past century, these remain valuable assets to the City of Wheat Ridge as well as to global biodiversity.

The Wheat Ridge Open Space portion of Clear Creek is near the base of its alluvial outwash from the mountains, where historically it began a more meandering course through a broad floodplain. Today it is highly channelized and is largely isolated from its floodplain; only significant flood events (ie, 100 year floods) are likely to result in flooding of the floodplain. In most places the riverbed is composed of quaternary alluvium.

Most soils within the Greenbelt are classified as torrifluvents. These soils are gravelly, deep, and excessively drained, and underlie most of the flat floodplain areas within the Greenbelt. They are easily eroded and depleted, and have poor water holding capabilities. Ustic torriothents, also common in the Greenbelt, are loamy soils that are found on active slopes adjacent to Clear Creek. These underlie the ridge south of the creek along the eastern portion of the Greenbelt. Clayey, shale-derived soils (Nunn-Denver, Denver Kutch) are found on the slopes of the ridge in many areas west of Anderson Park, and elsewhere throughout the Greenbelt (USDA, SCS 1980).

To the south of the creek is the "ridge" of Wheat Ridge, much of which lies within the City of Wheat Ridge Greenbelt. Numerous seeps emerge from the ridge and support a mesic flora of native and introduced trees, shrubs, and forbs on its north facing slopes throughout the Greenbelt. In a few areas on top of the ridge, remnants of the shrublands and grasslands that historically occupied the area of Wheat Ridge remain in small, isolated patches. Runoff from the numerous seeps along the ridge collects on the relictual floodplain below, resulting in numerous wetlands dominated by cattails (*Typha* sp.) and willows (*Salix* sp.). This is most pronounced in the western portion of the Greenbelt. Surface water from the surrounding urban area is directed off of this ridge as well. The wetlands below probably serve as a buffer and a natural filter to this surface water before it enters Clear Creek. Pulses of water that typically flow from residential areas during heavy rains would tend to be buffered by these areas, decreasing the chance of potential flooding to areas downstream.

The flood plain of Clear Creek has been significantly altered during the last century. Historically it was hayed and grazed, probably intensively in some areas. Smooth brome (*Bromopsis inermis*) is abundant and is a relict of the more agrarian days in the Greenbelt. The alluvial substrate underlying much of the flood plain has also been mined for gravel from numerous gravel pits. Gravel is still actively mined downstream, but has ceased in the City of Wheat Ridge Open Space. Due to the high water table, water was pumped out of the pits during mining, but today the abandoned pits have become human-made lakes. West Lake, Bass Lake, Tabor Lake, and Prospect Lake all originated in this way. The reclaimed area disturbed during mining was apparently revegetated with seed mixes including smooth brome and crested wheatgrass (*Agropyron cristatum*).

The Wheat Ridge Greenbelt is home to the Ute ladies'-tresses (*Spiranthes diluvialis*), a federally listed plant species in the orchid family. This species has been found at approximately 18 locations along the Greenbelt from West Lake to Anderson Park. Through what is probably the result of serendipity, it is even found in the reclaimed area of the former gravel mines. Rick Brune (pers. com. 2000) postulates that propagules from this species were present in topsoil that was removed from the haymeadows and riparian area prior to mining. Where soil was deposited in moist areas, a few plants were able to populate the floodplain. This is perhaps the most parsimonious explanation for the presence of this species in the vicinity of West Lake and Bass Lake.

The Ute ladies'-tresses, considered globally imperiled (G2S2) by the Colorado Natural Heritage Program, is currently known from scattered locations in eight western states, with the majority of the known occurrences along the Colorado Front Range. It requires moist but open sites, and is usually found in sub-irrigated alluvial soils along streams or in open meadows in floodplains. In Colorado its elevation ranges from 4500 to 6800 feet. It is threatened primarily by habitat destruction resulting from residential development of its front range habitat. Noxious weed invasion and shading are secondary threats to this species.

Weeds represent a significant management challenge in the study area. Seven of the top ten prioritized weed species listed in the State Noxious Weed Act (Colorado Noxious Weed Act 2000) are present and abundant in the City of Wheat Ridge Open Space. Numerous other invasive species on the State Noxious Weed List are problematic as well. Other species that are not listed also represent significant problems. The most nefarious of these species is Russian olive (*Eleagnus angustifolia*), which is abundant throughout the Greenbelt. The buckthorn (*Rhamnus cathartica*) is also problematic. Exotic grasses such as smooth brome (*Bromopsis inermis*), crested wheatgrass (*Agropyron cristatum*), redtop (*Agrostis* spp.), and cheatgrass (*Anisantha tectorum*) are formidable barriers to the restoration of a native flora to the Greenbelt.

### **Overview of Plant Community Assemblages**

The land within and around the Wheat Ridge Greenbelt has been used for a variety of human needs over the last century or more. The plant assemblages that currently exist on



the Greenbelt are the result of those historic uses, including land use practices that occurred on surrounding lands. For example, recent use of one area for temporary storage and treatment of woody storm debris has eliminated the native plant assemblages and promoted an infestation of weedy species. Many native and non-native ornamental species planted on surrounding properties have escaped cultivation and become established within the Greenbelt. Additionally, off-site changes to the hydrology of Clear Creek have resulted in down-cutting of the stream, and effect the composition and structure of riparian vegetation within the Greenbelt. Accordingly, the existing vegetation within the Greenbelt consists of a diverse mix of native, non-native, and invasive species arrayed in assemblages that only minimally resemble the native communities that existed there before European settlement. Nonetheless, identifying and mapping these assemblages as they occur across the Greenbelt will be very valuable to future management of the area.

Identifying and describing plant assemblages in an area such as the Wheat Ridge Greenbelt is valuable for effective management and planning. Existing standardized systems for classification of vegetation, such as the United States National Vegetation Classification have typically been designed to describe areas of natural vegetation, and are difficult to apply to assemblages modified by many years of human use. Whereas a standardized classification would document known and recognized community types, we have provided a description of all of the cover types that occur on the Greenbelt. Where possible, we have attempted to identify components of what may have been the native communities present on the site. This approach will allow site managers to begin to evaluate options for removal of non-native species and possible restoration of historically native community types.

In some areas, remnants of what may have been the natural plant communities are visible, however, the species composition and structure in these areas is different than would occur naturally. Typically these are the areas with an overstory of large and very mature cottonwood trees (*Populus* sp.). Cottonwood species native to the area include plains cottonwood (*Populus deltoides* ssp. *monilifera*), narrowleaf cottonwood (*P. angustifolia*), and lanceleaf cottonwood (*P. acuminata*). Depending on soil moisture and other factors, the understory vegetation in these areas would have been either a patchy mix of shrubby species and grasses, or dominated entirely by grasses and forbs. At present, these areas are a mix of native, non-native, and invasive species. It is uncertain what communities may have been present in areas currently without a mature cottonwood component.

We identified two areas on the Greenbelt with the components of communities listed by the CNHP as globally imperiled. These include the critically imperiled Plains Cottonwood-Narrowleaf Cottonwood/Chokecherry Woodland (G1Q) and the imperiled Plains Cottonwood-Snowberry Woodland (G2). The size of these areas is small and the condition is affected by the presence of non-native and invasive species. However, these examples may be remnants of the community type that naturally occurred there. Although the quality of these natural communities is poor, these areas could serve as references for restoration of these community types in other parts of the Greenbelt where

conditions would be appropriate for their establishment. Community characterization abstracts for these community types are presented in Appendix 2.

## **The Natural Heritage Network and Biodiversity**

Colorado is well known for its rich diversity of geography, wildlife, plants, and plant communities. However, like many other states, it is experiencing a loss of much of its native flora and fauna. This decline in biodiversity is a global trend resulting from human population growth, land development, and subsequent habitat loss. Globally, the loss in species diversity has become so rapid and severe that Wilson (1988) has compared the phenomenon to the great natural catastrophes at the end of the Paleozoic and Mesozoic eras.

The need to address this loss in biodiversity has been recognized for decades in the scientific community. However, many conservation efforts made in this country were not based upon preserving biodiversity; instead, they primarily focused on preserving game animals, striking scenery, and locally favorite open spaces. To address the absence of a methodical, scientifically-based approach to preserving biodiversity, Robert Jenkins, in association with The Nature Conservancy, developed the Natural Heritage Methodology in 1978.

Recognizing that rare and imperiled species are more likely to become extinct than common ones, the Natural Heritage Methodology ranks species according to their rarity or degree of imperilment. The ranking system is scientifically based upon the number of known locations of the species as well as its biology and known threats. By ranking the relative rareness or imperilment of a species, the quality of its populations, and the importance of associated conservation sites, the methodology can facilitate the prioritization of conservation efforts so the most rare and imperiled species may be preserved first. As the scientific community began to realize that plant communities are equally important as individual species, this methodology has also been applied to ranking and preserving rare plant communities, as well as the best examples of common communities.

The Natural Heritage Methodology is used by Natural Heritage Programs throughout North, Central, and South America, forming an international database network. Natural Heritage Network data centers are located in each of the 50 U.S. states, five provinces of Canada, and 13 countries in South and Central America and the Caribbean. All of these offices are part of the Association for Biodiversity Information (ABI). All heritage data is added yearly to a central data system that is managed by ABI. This data enables scientists to monitor the status of species from a state, national, and global perspective. It also enables conservationists and natural resource managers to make informed, objective decisions in prioritizing and focusing conservation efforts.

### **What is Biological Diversity?**

Protecting biological diversity has become an important management issue for many natural resource professionals. Biological diversity at its most basic level includes the full range of species on Earth, from species such as bacteria, and protists, through

multicellular kingdoms of plants, animals, and fungi. At finer levels of organization, biological diversity includes the genetic variation within species, both among geographically separated populations and among individuals within a single population. On a wider scale, diversity includes variations in the biological communities in which species live, the ecosystems in which communities exist, and the interactions between these levels. All levels are necessary for the continued survival of species and plant communities, and all are important for the well-being of humans. It stands to reason that biological diversity should be of concern to all people.

The biological diversity of an area can be described at four levels:

1. **Genetic Diversity** -- the genetic variation within a population and among populations of a plant or animal species. The genetic makeup of a species is variable between populations within its geographic range. Loss of a population results in a loss of genetic diversity for that species and a reduction of total biological diversity for the region. This unique genetic information cannot be reclaimed.
2. **Species Diversity** -- the total number and abundance of plant and animal species and subspecies in an area.
3. **Community Diversity** -- the variety of plant communities within an area that represent the range of species relationships and inter-dependence. These communities may be diagnostic or even restricted to an area. It is within communities that all life dwells.
4. **Landscape Diversity** -- the type, condition, pattern, and connectedness of natural communities. A landscape consisting of a mosaic of natural communities may contain one multifaceted ecosystem, such as a wetland ecosystem. A landscape also may contain several distinct ecosystems, such as a riparian corridor meandering through shortgrass prairie. Fragmentation of landscapes, loss of connections and migratory corridors, and loss of natural communities all result in a loss of biological diversity for a region. Humans and the results of their activities are integral parts of most landscapes.

## **Colorado's 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 state-wide 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 at CNHP gathers comprehensive information on the 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 map the data using the Biodiversity Tracking System (BIOTICS), and ArcView / Oracle based datasystem designed by the Association for Biodiversity Information (ABI). Textual information is entered into the Biological and Conservation Datasystem (BCD).

carefully plot the data on 1:24,000 scale U.S.G.S. maps and enter it into the Biological and Conservation Database. This locational information is incorporated into Biotics, an ArcView-based program designed specifically for natural heritage programs. 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. The parent organization for this network is the Association for Biodiversity Information (ABI), based in Arlington, VA. CNHP has effective relationships with many 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, the Bureau of Land Management, 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 enables us to evaluate the significance of each location to the conservation of natural biological diversity in Colorado and in the nation. By using species imperilment ranks and quality ratings for each location, priorities can be established for the protection of the most sensitive or imperiled PCAs. A continually updated locational database and priority-setting system such as that maintained by CNHP provides an effective, proactive land-planning tool.

### **The Natural Heritage Ranking System**

Information is gathered by CNHP on Colorado's plants, animals, and plant communities. Each of these species and plant 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 (e.g., 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. Also of importance are the size of the geographic range, the number of individuals, trends in both population and distribution, identifiable threats, and the number of already protected occurrences.

Element imperilment 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. For example, the lynx, which is thought to be secure in northern North America but is known from less than 5 current locations in Colorado, is ranked G5S1. The Rocky Mountain Columbine which is known only from Colorado, from about 30 locations, is ranked a G3S3. Further, a tiger beetle that is only known from one location in the world at the Great Sand Dunes National Park is ranked G1S1. CNHP actively collects, maps, and electronically processes specific occurrence information for elements considered extremely imperiled to vulnerable (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. A complete description of each of the Natural Heritage ranks is provided in Table 1.

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 1, ranks followed by a "B", e.g., S1B, indicate that the rank applies only to the status of breeding occurrences. Similarly, ranks followed by an "N", e.g., 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 imperilment 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**

**G/S1** Critically imperiled globally/state because of rarity (5 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 (6 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, usually.

**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.

Notes: Where two numbers appear in a state or global rank (e.g., S2S3), the actual rank of the element falls between the two numbers.

## Legal Designations

### **Natural Heritage imperilment ranks should not be interpreted as legal designations.**

Although most species protected under state or federal endangered species laws are extremely rare, not all rare species receive legal protection. Legal status is designated by either the U.S. Fish and Wildlife Service under the Endangered Species Act or by the Colorado Division of Wildlife under Colorado Statutes 33-2-105 Article 2. In addition, the U.S. Forest Service recognizes some species as "Sensitive," as does the Bureau of Land Management. Table 2 defines the special status assigned by these agencies and provides a key to the abbreviations used by CNHP.

**Table 2. Federal and State Agency Special Designations.**

<b>Federal Status:</b>	
1. U.S. Fish and Wildlife Service (58 Federal Register 51147, 1993) and (61 Federal Register 7598, 1996)	
<b>LE</b>	Endangered; taxa formally listed as endangered.
<b>E(S/A)</b>	Endangered due to similarity of appearance with listed species.
<b>LT</b>	Threatened; taxa formally listed as threatened.
<b>P</b>	Proposed E or T; taxa formally proposed for listing as endangered or threatened.
<b>C</b>	Candidate: taxa for which the Service has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened.
2. U.S. Forest Service (Forest Service Manual 2670.5) (noted by the Forest Service as "S")	
<b>FS</b>	Sensitive: those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by:
a.	Significant current or predicted downward trends in population numbers or density.
b.	Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.
3. Bureau of Land Management (BLM Manual 6840.06D) (noted by BLM as "S")	
<b>BLM</b>	Sensitive: those species found on public lands, designated by a State Director, that could easily become endangered or extinct in a state. The protection provided for sensitive species is the same as that provided for C (candidate) species.
<b>State Status:</b>	
1. Colorado Division of Wildlife	
<b>E</b>	Endangered
<b>T</b>	Threatened
<b>SC</b>	Special Concern



### **Table 3. Weed Ranking**

The Colorado Noxious Weed Act, Title 35, Article 5.5, C.R.S. (2000) lists species designated as State Noxious Weeds in Colorado. All weeds listed in the act are ranked as follows:

<b>A</b>	State Noxious Weeds. These species have been identified by individual counties as problem weeds in the county's area or have been recommended for management through public testimony.
<b>B</b>	Top Ten Prioritized Weed Species. These weed species are recognized as the top ten prioritized weed species for Colorado. These species are the most widespread and cause the greatest economic impact in Colorado.
<b>C</b>	Not Yet Widespread. These weed species may not yet be present or are not yet widespread or causing great economic impact within Colorado. However, counties and local advisory boards are encouraged to contain and eradicate these species before they proliferate and significantly impact the economic and environmental values of the lands of the state.

### **Element Occurrence Ranking**

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 their ecological quality 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 3 factors:

**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.

**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.

**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 of E is assigned. Possible EO-Ranks and their appropriate definitions are as follows:

- A** The occurrence is relatively large, pristine, defensible, and viable.
- B** The occurrence is small but in good condition, or large but moderately impacted by human activity.
- C** The occurrence is small, in poor condition, but still viable and worthy of conservation efforts.
- D** The occurrence does not merit conservation efforts because it is too degraded or not viable.
- H** Historically known, but not verified for an extended period of time.
- X** Extirpated.
- E** Extant. The occurrence does not contain enough information to rank using the above ranks.

## **Potential Conservation Areas**

In order to successfully protect populations or occurrences, it is helpful to delineate Potential Conservation Areas. These PCAs focus on capturing the ecological processes that are necessary to support the continued existence of a particular element occurrence of natural heritage significance. Potential Conservation Areas may include a single occurrence of a rare element or a suite of rare element occurrences or significant features.

The goal of the process is to identify a land area that can provide the habitat and ecological processes upon which a particular element occurrence, or suite of element occurrences, depends for their continued existence. The best available knowledge of each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features, vegetative cover, as well as current and potential land uses. **The boundary does not automatically exclude all activity.** It is hypothesized that some activities will prove degrading to the element or the process on which they depend, while others will not. Consideration of specific activities or land use changes proposed within or adjacent to the preliminary conservation planning boundary should be carefully considered and evaluated for their consequences to the element on which the conservation unit is based.

## **Potential Conservation Planning Boundaries**

Once the presence of rare or imperiled species or significant plant communities has been confirmed, the first step towards their protection is the delineation of a **preliminary** conservation planning boundary. In general, the potential conservation area boundary is our best estimate of the primary area supporting the long-term survival of targeted species and plant communities. In developing such boundaries, CNHP staff considered a number of factors that include, but are not limited to:

- the extent of current and potential habitat for the elements present, considering the ecological processes necessary to maintain or improve existing conditions;
- species movement and migration corridors;
- maintenance of surface water quality within the PCA and the surrounding watershed;
- maintenance of the hydrologic integrity of the groundwater;
- land intended to buffer the PCA against future changes in the use of surrounding lands;
- exclusion or control of invasive exotic species;
- land necessary for management or monitoring activities.

As the label "conservation planning" indicates, the boundaries presented here are for planning purposes. They delineate ecologically sensitive areas where land-use practices should be carefully planned and managed to ensure that they are compatible with protection goals for natural heritage resources and sensitive species. **Please note that these boundaries are based primarily on our understanding of the ecological systems. A thorough analysis of the human context and potential stresses was not conducted. All land within the conservation planning boundary should be considered an integral part of a complex economic, social, and ecological landscape that requires wise land-use planning at all levels.**

### **Off-Site Considerations**

Furthermore, it is often the case that all relevant ecological processes cannot be contained within a PCA of reasonable size. Taken to the extreme, the threat of ozone depletion could expand every PCA to include the whole globe. The boundaries illustrated in this report signify the immediate, and therefore most important, area in need of protection. Continued landscape level conservation efforts are needed. This will involve county-wide efforts as well as coordination and cooperation with private landowners, neighboring land planners, and state and federal agencies.

### **Ranking of Potential Conservation Areas**

One of the strongest ways that CNHP uses element and element occurrence ranks is to assess the overall biodiversity significance of a PCA, which may include one or many element occurrences. Based on these ranks, each PCA is assigned a **biodiversity** (or B-) **rank**:

- B1**    Outstanding Significance: only location known for an element or an excellent occurrence of a G1 species.
- B2**    Very High Significance: one of the best examples of a community type, good occurrence of a G1 species, or excellent occurrence of a G2 or G3 species.
- B3**    High Significance: excellent example of any community type, good occurrence of a G3 species, fair occurrence of a G2 species, or a large concentration of good occurrences of state-rare species.
- B4**    Moderate or Regional Significance: good example of a community type, fair occurrences of a G3 species, excellent or good occurrence of state-rare species.
- B5**    General or State-wide Biodiversity Significance: good or marginal occurrence of a community type, S1, or S2 species.

If an element occurrence is unranked due to a lack of information the element occurrence rank is considered a C rank. Similarly, if an element is a GU or G? it is treated as a G4. The B rank is lowered one rank for a subspecies.

### **Protection Urgency Ranks**

Protection urgency ranks (P-ranks) refer to the time frame in which conservation protection should occur. In most cases, this rank refers to the need for a major change of protective status (e.g., agency special area designations or ownership). The urgency for protection rating reflects the need to take legal, political, or other administrative measures to alleviate threats that are related to land ownership or designation. The following codes are used to indicate the rating which best describes the urgency to **protect** the area:

- P1** Protection actions needed immediately. It is estimated that current stresses may reduce the viability of the elements in the PCA within 1 year.
- P2** Protection actions may be needed within 5 years. It is estimated that current stresses may reduce the viability of the elements in the PCA within this approximate timeframe.
- P3** Protection actions may be needed, but probably not within the next 5 years. It is estimated that current stresses may reduce the viability of the elements in the PCA if protection action is not taken.
- P4** No protection actions are needed in the foreseeable future.
- P5** Land protection is complete and no protection actions are needed.

A protection action involves increasing the current level of legal protection accorded one or more tracts within a potential conservation area. It may also include activities such as educational or public relations campaigns or collaborative planning efforts with public or private entities to minimize adverse impacts to element occurrences at a site. It does not include management actions. Threats that may require a protection action are as follows:

- 1) Anthropogenic forces that threaten the existence of one or more element occurrences at a PCA; e.g., development that would destroy, degrade or seriously compromise the long-term viability of an element occurrence and timber, range, recreational, or hydrologic management that is incompatible with an element occurrence's existence;
- 2) The inability to undertake a management action in the absence of a protection action; e.g., obtaining a management agreement;
- 3) In extraordinary circumstances, a prospective change in ownership or management that will make future protection actions more difficult.

## **Management Urgency Ranks**

Management urgency ranks (M-ranks) loosely indicate the time frame in which a change in management of the element or PCA should occur. This rank refers to the need for management in contrast to protection (e.g., increased fire frequency, decreased herbivory, weed control, etc.). The urgency for management rating focuses on land use management or land stewardship action required to maintain element occurrences at the potential conservation area.

A management action may include biological management (prescribed burning, removal of exotics, mowing, etc.) or people and site management (building barriers, rerouting trails, patrolling for collectors, hunters, or trespassers, etc.). Management action does not include legal, political, or administrative measures taken to protect a potential conservation area. The following codes are used to indicate the action needed to be taken at the area:

- M1** Management actions may be required within one year or the element occurrences could be lost or irretrievably degraded.
- M2** New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA.
- M3** New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA.
- M4** Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences.
- M5** No management needs are known or anticipated in the PCA.

## **Methods**

### **Identify Targeted Elements of Global and State-wide Concern**

The information collected in the previous step was used to refine a potential element list and to refine our search areas. In general, species and plant communities that have been recorded from the City of Wheat Ridge Open Space, or from adjacent areas, are included in this list. Species or plant communities which prefer habitats that are not included in this study area were removed from the list.

The following list of elements includes those elements currently monitored by CNHP that have the potential to occur in the City of Wheat Ridge Open Space. Based on this information the CNHP field inventories targeted 19 rare species. Any high quality examples of common plant communities or examples of rare plant communities were also sought during the field inventories; thus the targeted plant communities are not listed here.

The amount of effort given to the inventory for each of these elements is prioritized according to the element's rank. Globally-rare (G1 - G3) elements are given highest priority; state-rare elements are second.

**Table 4. Targeted Elements of Global or State-wide Concern**

List of potential elements, organized by taxonomic group, identified for the City of Wheat Ridge Open Space Inventory in 2000. Please see Table 1 for rank explanations.

Scientific Name	Common Name	Rank	Agency Sensitive	Number of Known Occurrences in the area	Likelihood of finding more occurrences
<i>Astragalus plattensis</i>	Platte River Milkvetch	G5S1		1 (historical)	Low
<i>Ribes americanum</i>	American Currant	G5S2		1 (historical)	Moderate
<i>Spiranthes diluvialis</i>	Ute Ladies'-Tresses	G2S2	LT	1	High
<i>Mimulus ringens</i>	Square Stem Monkeyflower	G5SH		0	Low
<i>Acorus calamus</i>	Sweet Flag	G?SH		0	Moderate
<i>Apios americana</i>	American Ground Nut	G5S1		1 (extirpated)	Moderate
<i>Viola pedatifida</i>	Prairie Violet	G5S2		1 (historical)	Low
<i>Sisyrinchium demissum</i>	Blue - Eyed Grass	G5S2		1	Moderate
<i>Cypripedium pubescens</i>	Yellow Lady's Slipper	G5S2		1	High
<i>Carex torreyi</i>	Torrey Sedge	G4S1		1	Moderate
<i>Crataegus chrysocarpa</i>	Yellow Hawthorn	G5S1		1	Moderate
<i>Gaura neomexicana ssp. coloradensis</i>	Colorado Butterfly Weed	G3T2S1	FS, PT	0	Low
<i>Erynnis martialis</i>	Mottled Dusky Wing	G4S2S3		1 recent, 2 historical	Low
<i>Notropis cornutus</i>	Common Shiner	G5S2		1 (historical)	Low
<i>Callophrys mossii schryveri</i>	Moss's Elfin	G4T3 S2S3		1 (historical)	Low
<i>Celastrina humulus</i>	Hops Feeding Azure	G2S2		0	High if wild hops are present
<i>Gila robusta</i>	Roundtail Chub	G2G3S2	BLM, SC	1 (historical)	Low
<i>Zapus hudsonius preblei</i>	Preble's Meadow Jumping Mouse	G5T2S1	FS, LT, SC	1	Moderate
<i>Rana pipiens</i>	Northern Leopard Frog	G5S3	BLM, FS, SC	0	Moderate



### **Identify Targeted Inventory Areas**

Survey sites were chosen based on their likelihood of harboring rare or imperiled species or significant plant communities. Previously documented locations were targeted, and additional potential areas were chosen using available information sources. Precisely known element locations were always included so that they could be verified and updated. Areas with potentially high natural values were chosen using aerial photographs, geology maps, and vegetation surveys. Aerial photography is perhaps the most useful tool in this step of the process. 1:600 scale aerial photographs provided by the City of Wheat Ridge were used for this project.

### **Conduct Field Surveys for Natural Heritage Elements**

Survey sites were visited at the appropriate time as dictated by the phenology of the individual elements. Ute ladies'-tresses populations were visited in August when flowers make the plants discernable from the grasses and rushes surrounding them.

The methods used in the surveys vary according to the elements that were being targeted. In most cases, the appropriate habitats were visually searched in a systematic fashion that would attempt to cover the area as thoroughly as possible in the given time. Some types of organisms require special techniques in order to capture and document their presence. The techniques used for each taxon are summarized below:

**Amphibians:** visual or with aquatic nets

**Mammals:** Sherman live traps, visual

**Plants:** visual

**Plant communities:** visual, collect qualitative composition data

Precise locational data were obtained for all occurrences of natural heritage elements identified in the survey. Polygons were drawn on 1:600 scale aerial photographs and UTM coordinates were determined using a Garmin 12CX GPS unit. Coordinates thus determined are accurate to within approximately six meters. Other data recorded at each occurrence included numbers observed, breeding status, habitat description, disturbance features, observable threats, and potential protection and management needs. The overall significance of each occurrence, relative to others of the same element, was estimated by rating the quality (size, vigor, etc.) of the population or community, the condition or naturalness of the habitat, and the long-term viability of the population or community. These factors are combined into an element occurrence rank, useful in refining conservation priorities. See the section on Natural Heritage Methodology for more information about element occurrence ranking.

### **Delineate Potential Conservation Areas**

To prioritize specific areas for conservation efforts, Potential Conservation Area (PCA) boundaries were delineated. Such a boundary is an estimation of the minimum area

needed to ensure persistence of the element. In order to ensure the preservation of an element, the ecological processes that support that occurrence must be preserved. The preliminary conservation planning boundary is meant to include features on the surrounding landscape that provide these functions. Data collected in the field are essential to delineating such a boundary, but other sources of information such as aerial photography are also used. These boundaries are considered preliminary and additional information about the PCA or the element may call for alterations to the boundaries.

### **Mapping Plant Community Assemblages**

Because the plant assemblages of the Wheat Ridge Greenbelt are the product of many years of modification and are a unique function of the site history, it is not possible to classify the vegetation according to one of the standardized classification systems. Therefore, to categorize the different communities present on the Greenbelt, we grouped the different assemblages into three formations based on the form of the dominant species. As necessary, we used modifiers on these three formations to designate the position of the community within the landscape or another differing characteristic. The three formations include grass/forb dominated areas, shrub dominated areas, and tree dominated areas. The secondary modifiers are described in the text and include floodplain, raised bank, elevated floodplain, bluffslopes, and irrigated, non irrigated, maintained, and non maintained.

We designated each assemblage with a two digit code to identify the formation and specific assemblage within that formation on the aerial photos and in the written descriptions. The first digit in the two digit number designates the formation, while the second digit designates the assemblage within that formation. For example, the grass-forb formation is designated with a 10 and each assemblage within that formation is serially higher than 10.

Over the course of the summer we made three multi-day trips to the Greenbelt to survey the areas, map the vegetation, and write descriptions for the community associations. We traveled throughout the Greenbelt on foot to identify and describe the assemblages present there. We described the assemblages based on the dominant species present and did not attempt to place assemblages into predefined classes. While in the field, we drew the approximate boundaries of different community assemblages on 1:600 scale aerial photography and identified the polygon formed by the boundary with the appropriate two-digit code.

Upon return to the office, we used ArcView 3.2 to digitize the polygons over the image of the aerial photograph to create electronic maps for the distribution of each assemblage.

### **Mapping and Sampling Animals**

Small mammals were sampled in the study area using Sherman live traps. These traps were suitable for sampling for the Preble's meadow jumping mouse (*Zapus hudsonius*

*preblei*) as well as for conducting a general census of the small mammal species present in the study area. Traps were baited with whole oats and a ball of polyfil batting was provided for insulation.

Trapping efforts for Preble's meadow jumping mouse were conducted in appropriate riparian habitat. One trapline of 120 traps (#2 on trapline map) was established and resampled for four nights (nights of August 22 through August 26). The trapline was established on the south side of Clear Creek and ran east from near the Prospect Park pedestrian bridge east to the sewage treatment plant area. The location of the trapline is shown on the accompanying maps. A total of 480 trapnights were planned for this study, but due to tampering with traps by Greenbelt visitors, rain, and raccoon scavenging, the sampling intensity was reduced to 431 trap nights. 400 trapnights on at least three consecutive nights is generally recognized as the minimum sampling intensity for a valid presence/absence assessment of this subspecies in an area.

Additionally, four traplines (#1, 3, 4, and 5 on trapline map) were established to roughly determine small mammal species richness in the study area. A total of 120 additional trap nights on two nights (nights of August 18 and 19) were sampled for this effort. On August 18, trapline #1 was lost entirely to tampering from visitors to the Greenbelt. This trapline was subsequently moved west on August 19 to a new location (#4 and #5 on trapline map).

During the day, visual surveys were conducted throughout the study area for the presence of other vertebrate species. Observations of mammals, birds, reptiles, and amphibians were recorded on 1:600 scale aerial photographs as points in the field. This point coverage was subsequently digitized and used to create a shapefile of point observations of vertebrates within the study area during this inventory. It is likely that the vertebrates observed during this short period in the field are also present in many other parts of the study area. The species list created for this report is by no means exhaustive and does not reflect the true species richness or full species distributions in the study area.

### **Mapping Weeds**

Due to the small area (~300 acres) and management needs of the study area, weeds were mapped on a very fine scale in this study. In all, 18 species of weeds and undesirable plant species were mapped throughout the study area (Table 5). All weed occurrences were mapped at 1:600 scale on field copies of the 1:600 aerial photographs. Weed occurrences were mapped to a resolution of approximately 20 feet. Thus, where two occurrences of the same species were found within 20 feet of each other they were amalgamated into a single polygon. For shrubs and trees (*Rhamnus cathartica*, *Eleagnus angustifolia*), the smallest polygon size usually equates to a single individual. This is considerably more resolution than most weed mapping efforts in the state currently use, but it was assumed that this level of precision would facilitate eradication, management, and restoration efforts. Poison Ivy (*Toxicodendron rydbergii*) was not mapped in the western portion of the Greenbelt (in the vicinity of West Lake and Bass Lake). In areas where many weed polygons overlapped, color coding was used in the field in some cases

to reduce confusion. Following mapping in the field, all weed polygons were digitized and attributed in an ArcView 3.2 shapefile.

The species list for the Wheat Ridge Greenbelt Plant Inventory produced by Ray Sperger (Sperger 2000) was updated and expanded during the weed mapping field work. See Appendix 1 for the updated species list.

Table 5. Weed and undesirable plant species mapped in the City of Wheat Ridge Open Space. See Table 3 for an explanation of weed ranks under the State Noxious Weed Act.

<b>CODE</b>	<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>	<b>RANK</b>
CEDI	<i>Acosta diffusa</i> (= <i>Centaurea diffusa</i> )	Diffuse Knapweed	B
CIAR	<i>Breea arvensis</i> (= <i>Cirsium arvense</i> )	Canada Thistle	B
CANU	<i>Carduus nutans</i>	Musk Thistle	B
CIVU	<i>Cirsium vulgare</i>	Bull Thistle	A
CLOR	<i>Clematis orientalis</i>	Chinese Clematis	A
COMA	<i>Conium maculatum</i>	Poison Hemlock	A
DIFU	<i>Dipsacus fullonum</i>	Common Teasel	C
DILA	<i>Dipsacus laciniatus</i>	Cutleaf Teasel	none
ELAN	<i>Eleagnus angustifolia</i>	Russian Olive	A
EUES	<i>Euphorbia esula</i>	Leafy Spurge	B
LIGE	<i>Linaria gennistifolia</i> ssp. <i>dalmatica</i>	Dalmatian Toadflax	B
LIVU	<i>Linaria vulgaris</i>	Yellow Toadflax	B
LYSA	<i>Lythrum salicaria</i>	Purple Loosestrife	B
ONAC	<i>Onopordum acanthium</i>	Scotch Thistle	A
RHCA	<i>Rhamnus cathartica</i>	Buckthorn	none
TARA	<i>Tamarix ramosissima</i>	Tamarisk	A
PI	<i>Toxicodendron rydbergii</i>	Poison Ivy	N/A

## Results

### **Prospect Park Potential Conservation Area**

One PCA, the Prospect Park Potential Conservation Area, was delineated to include all of the natural heritage elements identified in the City of Wheat Ridge Greenbelt. For management purposes, areas of biological interest within the PCA are highlighted below.

**Biodiversity Rank: B2** Very High significance

This PCA supports a good occurrence of a globally rare plant (*Spiranthes diluvialis*), a poor occurrence of a critically imperiled (G1Q) plant community (*Populus deltoides ssp. monilifera/Padus virginiana*), and a poor occurrence of an imperiled (G2) plant community (*Populus deltoides ssp. monilifera/Symphoricarpos alba*). Because D-ranked community occurrences are not incorporated into our database, they do not affect the biodiversity rank of this PCA. This PCA may also contain the only known occurrence worldwide of a newly discovered species of earth star (*Mycenastrum* (undescribed) sp. nov.).

**Protection Urgency Rank: P4** Low Urgency (as of 2000)

This PCA is protected as Open Space, but receives heavy user impacts due to its urban setting.

**Management Urgency Rank: M2** High Urgency (as of 2000)

Management action will be needed to maintain the plant and plant community occurrences in this PCA. Weed invasion threatens the occurrences within the PCA. Eradication or management of the weeds present within the occurrences would greatly enhance the quality and security of the occurrences. Human impacts have resulted in trampling and habitat degradation of *Spiranthes* in the PCA.

**Location:** Jefferson County, City of Wheat Ridge Open Space. Follows Clear Creek from the western portion of the Greenbelt in the vicinity of West Lake to the 44th Street underpass at Anderson Park.

**Legal Description:** U.S.G.S. 7.5 minute Golden quadrangle (T3S R69W S20, 21, 29) and Arvada quadrangle (T3S R69W S21, 22).

**General Description:**

This PCA includes the broadest part of the City of Wheat Ridge Greenbelt on its western side near Youngsfield Street, and tapers to the east near Anderson Park. Clear Creek flows through the PCA from west to east. A narrow area of connectivity with Jefferson County Open Space to the west remains in the creek channel, which is evidently used by wildlife such as mountain lions. The Kipling Street bridge over Clear Creek fragments the PCA, and marks the eastern limit of the wide part of the Greenbelt where residential

development has not proliferated on the floodplain. From Kipling to the 44th Street underpass at the eastern edge of the PCA, the floodplain is more developed but significant areas of the riparian corridor and floodplain remain, with good examples of cottonwood riparian woodlands and marginal habitat for Ute ladies'-tresses (*Spiranthes diluvialis*).

Human use of the area encompassed by the PCA has been and continues to be rather intensive. It is surrounded by residential development and suffers from edge effects impinged upon it by its urban surroundings. Historic grazing and haying followed by gravel mining has resulted in considerable disturbance and alteration of the natural flora and topography of the floodplain and creek. Man-made lakes resulting from gravel quarrying dominate the western portion of the floodplain. The creek has been significantly downcut and now is largely isolated from its floodplain. Amendments to the creek banks in many areas, such as the area south of Prospect Lake, has further served to alter the natural hydrology of the creek system.

Most of the area encompassed by the PCA was floodplain historically. The dominant vegetation types in the PCA are cottonwood riparian woodlands and non-native grasslands dominated by smooth brome (*Bromopsis inermis*). There are many former creek channels in the PCA which are typically dominated by wetland vegetation such as cattails (*Typha* spp.) and coyote willow (*Salix exigua*). Small creeks and irrigation ditches flow across the floodplain throughout the summer that are fed by seeps along the ridge to the south and by storm water runoff. Many of these creeks flow through dense vegetation that is virtually impenetrable, such as thickets of common buckthorn (*Rhamnus cathartica*).

One occurrence of Ute ladies'-tresses (*Spiranthes diluvialis*) is found within the PCA which is composed of approximately 18 locations scattered along the Greenbelt from West Lake to Anderson Park. These locations are collectively regarded as one occurrence by the CNHP. A general separation distance of one mile is used for occurrences of this species, with the assumption that there is some degree of genetic connectivity among plants within one mile of each other. Thus, since less than one mile separates each location in the Greenbelt, they are collectively regarded as a single occurrence by CNHP.

Due to a significant drought, 2000 was the worst year on record for this occurrence, with very few flowering individuals. In 2000, orchids were found at six of the known locations in the Greenbelt. No new locations were discovered as a result of this survey. Extensive work by Rick Brune since 1992 and by Tamara Wyhs in 1998 have resulted in a fairly thorough documentation of the locations of this species in the Greenbelt. Points and polygons included with the maps in this report are from Wyhs (1998). Detailed supplemental information summarizing all of the data presently available on the Ute ladies'-tresses in the Greenbelt is forthcoming, following data compilation and entry by the CNHP.

Populations at several locations are small even in good years (A, B, H in Wyhs 1998) or have not had plants since the area was surveyed (I through N in Wyhs 1998). For the two large suboccurrences near West Lake and Bass Lake (F and G in Wyhs 1998), counts of over 400 individuals have been obtained in past years, such as in 1999, which was the best year on record for Ute ladies'-tresses on the Greenbelt (pers. com. Rick Brune 2000).

**Biodiversity Rank Justification:** This PCA includes a good occurrence of the globally imperiled Ute ladies'-tresses (*Spiranthes diluvialis*). This species is known worldwide from 42 occurrences, many of which are threatened by development.

Table 6. Natural Heritage Element Occurrences at the Prospect Park PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
<i>Spiranthes diluvialis</i>	Ute Ladies'-Tresses	G2	S2	LT			B
<i>Populus deltoides</i> <i>ssp. monilifera</i> / <i>Padus virginiana</i>	Plains Cottonwood/ Chokecherry Riparian Woodland	G1Q	S?				D
<i>Populus deltoides</i> <i>ssp. monilifera</i> / <i>Symphoricarpos spp.</i>	Plains Cottonwood/ Snowberry Riparian Woodland	G2	S2				D

\*EO=Element Occurrence

**Boundary Justification:** The boundary encompasses the shores of West Lake and Bass Lake, where Ute ladies'-tresses is apparently expanding its range into the appropriate habitat found there (pers. com. Brune 2000). Prospect Lake is not included since the banks are steep and rocky, and the habitat does not appear suitable for Ute ladies'-tresses. Due to the occasional presence of potential Ute ladies'-tresses habitat along the riparian corridor of Clear Creek, and the presence of three suboccurrences, all of the corridor east to Anderson Park is included. The extensive cottonwood riparian woodland in the floodplain is circumscribed due to the potential for restoration to high quality natural communities throughout the area. The meadow west of the Miller Trailhead is included due to the presence of an undescribed species of earth star (*Mycenastrum* sp. nov.) (pers. com. Brace and Brace 2001). In general, the entire floodplain, both private and public portions, between Youngsfield Street and 44th Street is included within the PCA to include a functional portion of the riparian system on which the elements included in the PCA depend.

**Protection Comments:** Although the area is protected from residential development, it is difficult to ensure the security of the biological resources within it due to the heavy use and non-point source impacts impinged upon the PCA by the surrounding urban area. Edge effects render the PCA vulnerable to weed invasion and pollutants. Private lands within the PCA have limited protection from alteration.

**Management Comments:** Management actions are needed to stop the deterioration of the element occurrences in this PCA. Focusing actions on exotic species management holds promise for increasing the quality and security of the elements in the PCA.

Exotic species that are threatening Ute ladies'-tresses (*Spiranthes diluvialis*) in order of priority are teasel (*Dipsacus laciniatus*), leafy spurge (*Euphorbia esula*), Canada thistle (*Breca arvensis*), Russian olive (*Eleagnus angustifolia*), yellow toadflax (*Linaria vulgaris*), and diffuse knapweed (*Acosta diffusa*).

The Greenbelt's urban setting and high human visitation rate present special challenges to protecting the Ute ladies'-tresses. Problems that land managers and park naturalists must confront in this area have no simple or easy solutions. As human population densities increase worldwide and human settlements encroach upon rare plant habitat, finding solutions to these problems will become increasingly imperative if biodiversity conservation efforts are to be successful.

Some Ute ladies'-tresses plants have suffered from the effects of trampling by visitors to the Greenbelt. Clearly there is a need in the Greenbelt to take actions that help to reduce the human impacts on Ute ladies'-tresses. However, direct efforts to divert human impacts away from occurrences may or may not be effective, as fences and signs may actually attract people rather than deter them, and could even result in greater human impacts on the plants. Raising visitor awareness (posting durable educational signs throughout the Greenbelt, alerting visitors to this plant in educational presentations) may help reduce human impacts, although "loving the plant to death" is a very real possibility if many people begin to seek out this species in the Greenbelt.

The occurrence on the north shore of Bass Lake may benefit from a short fence that isolates the shore of the lake from the adjacent pedestrian path, since access to this location is extremely easy- it is difficult to imagine that any passing child would resist the temptation to walk to the lake shore in this location while passing by on the footpath. It is also one of the few places where the lake is accessible to fishing. Some sort of angler access infrastructure at another location might help divert impacts to the lakeshore away from the occurrence of Ute ladies'-tresses on the north shore of the lake, although again, this might attract more visitors to the lake and thus result in a net increase in human impact. Protecting the Ute ladies'-tresses successfully in the Greenbelt may in fact be an exercise in the art of subtlety.

### **Areas of interest within the PCA**

Five areas of interest stand out within this PCA due to their noteworthy biological resources. These areas are highlighted here to focus management attention to these "hotspots" within the Greenbelt. Because of the ecological connectivity and ease of weed dispersal, they should not be regarded as the only areas to focus management efforts. They are potential foci for beginning efforts to preserve the wealth of biodiversity that remains in the Greenbelt at present.

#### ***West Lake/Bass Lake***

The vast majority of the population of *Spiranthes diluvialis* resides in the vicinity of these two lakes. Most of the population is concentrated in two suboccurrences, in which more



than a thousand individuals have been observed in good years (CNHP 2000, pers. com. Brune 2000). Much of this area has been significantly disturbed and recontoured resulting from gravel quarrying in the area. Visitor use is heavy, and weeds are particularly problematic in this area as well. The high density of social trails threatens all of the suboccurrences. The two lake shore occurrences, one on West Lake and one on Bass Lake, are also threatened by trampling from hikers and people fishing. Geese have also been implicated in having a detrimental effect on seedling establishment where they forage intensively, as they do on the shores of West Lake.

### ***Clear Creek southeast of Prospect Park***

A small, somewhat degraded example of the Plains Cottonwood/Chokecherry Riparian Woodland community was identified east of Prospect Park near where the foot bridge crosses the creek. This community is restricted to the lower foothills canyons and outwash plains of the South Platte River and its Front Range tributaries. This community is ranked G1Q S? by the Colorado Natural Heritage Program. Although further research is needed, it is currently considered critically imperiled globally. The plains cottonwood riparian woodlands in this area are worthy of careful restoration efforts. It is possible that this area is representative of what may have once been present throughout more of the Greenbelt.

Several isolated locations of Ute ladies'-tresses are found in this vicinity also (see accompanying maps). Most of these are near social trails and are threatened by shading from heavy overstory development. Much of this reach of Clear Creek contains habitat that is currently marginally suitable for Ute ladies'-tresses. Historically the canopy was probably more open, which would have provided more appropriate conditions for this species.

### ***Area east of Bass Lake***

A small example of the rare Plains Cottonwood/ Snowberry Riparian Woodland community type was identified during the plant community assemblage mapping in this area. This community is found on the historic floodplain east of Bass Lake, approximately 200 meters east of the lake and adjacent to the developed footpath. Cottonwood riparian woodlands in this vicinity are potentially restorable to a high quality.

### ***Area of Anderson Park***

The riparian area adjacent to Anderson Park and to the west of the park along the east-west running portion of the creek is noteworthy on two accounts. A small population of *Spiranthes diluvialis* (one individual seen in 2000) and potential habitat for this species is present along the creek in this area. The cottonwood riparian woodlands in this area also remain in good condition, and have potential for restoration. The floodplain west of the bend in the creek appears to be largely intact and may retain some potential for natural seasonal inundation, which would promote the natural regeneration of cottonwoods.

Whether upstream impoundments and the current flow regime would actually permit this to happen is uncertain.

### ***West of Miller Trailhead***

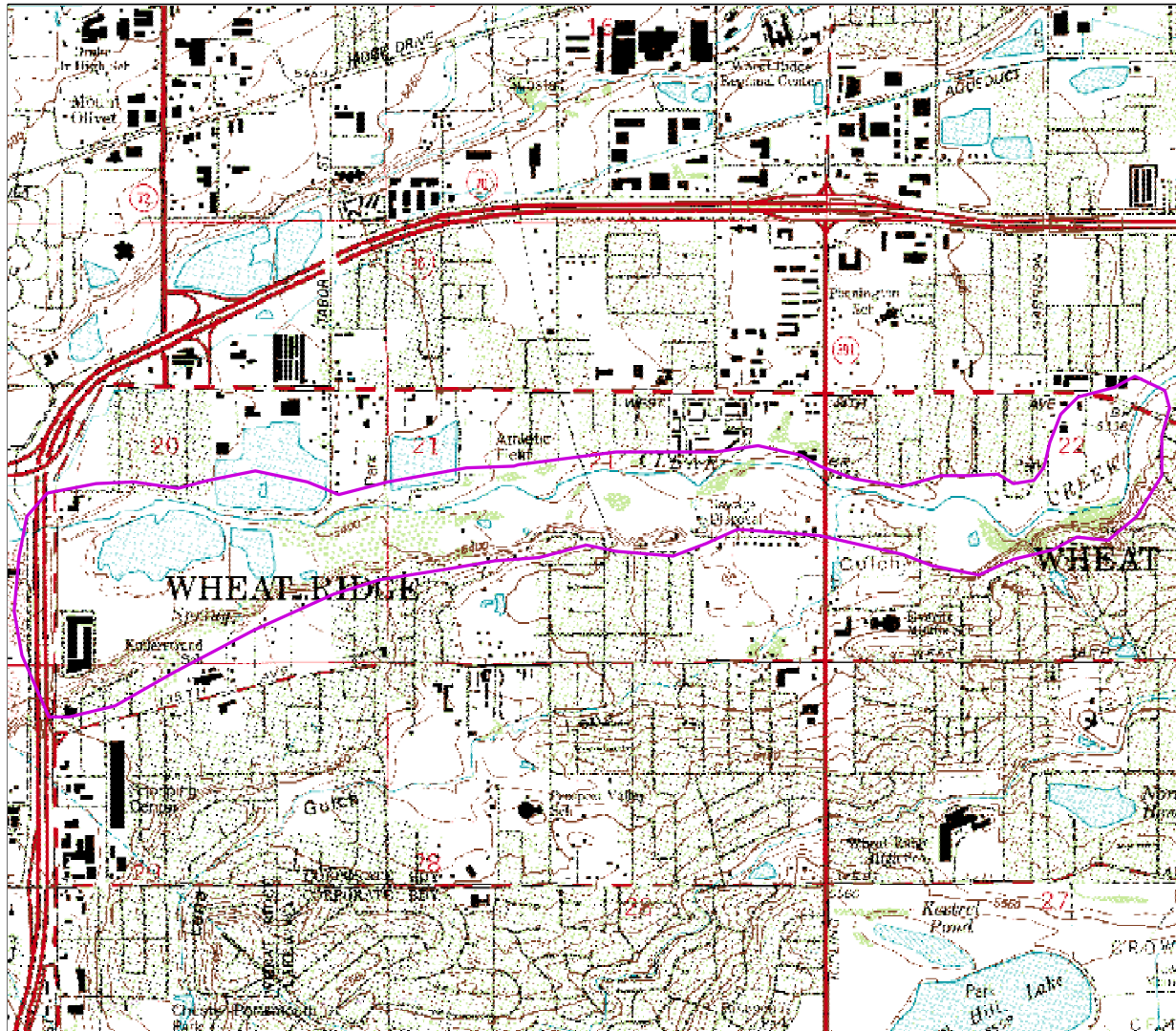
This area is noteworthy due to the presence of a species that is apparently new to science. It is a species of earth star (genus *Mycenastrum*), a type of puffball (kingdom Fungi). This species is currently undescribed, pending further observation and collection. To help insure the persistence of this species as this finding is being verified, it is suggested that weed management in the area involve minimal or no use of herbicides to reduce potential impacts on the earth star occurrence. Similarly, curtailing other vegetation treatments, vehicle use, and other intensive activities at this location that may harm the earth star will help ensure its persistence.



Ute ladies'-tresses (*Spiranthes diluvialis*) south of West Lake.



The occurrence of Ute ladies'-tresses (*Spiranthes diluvialis*) southwest of Bass Lake. Plants at this location are threatened by cutleaf teasel (*Dipsacus laciniatus*) and Canada thistle (*Breca arvensis*), both visible in the background.



Colorado Natural Heritage Program  
 Colorado State University - CNR  
 254 General Services Building  
 Fort Collins, CO 80523  
 map created 19 January 2001



**LEGEND**

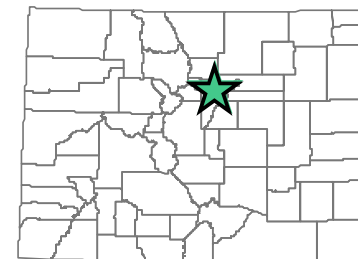
 PCA Boundary

Base Layer:

Arvada, 39105-G1  
 Golden, 39105-G2  
 7.5 Minute Series

Digital Raster Graphics produced by the U.S.  
 Geological Survey, 1996

**Location in Project Area**



*The accuracy of the data shown on this map is not guaranteed. The Colorado Natural Heritage Program is not responsible and shall not be liable to the user for incidental, consequential or special damages arising from data use or interpretation.*

*The absence of data for a particular area or habitat does not necessarily mean that the species does not occur on or adjacent to the project site, rather that our files do not currently contain information to document their presence.*

*Although every attempt is made to provide the most current and precise information possible, please be aware that some of our sources provide a higher level of accuracy than others, and some interpretation may be required. CNHP's data system is constantly updated and revised. Please contact CNHP for an update or assistance with interpretation of this natural heritage information.*

*Data are not appropriate for site level planning or evaluation.*

0.1 0 0.1 0.2 Miles



Projection: UTM, Zone13, NAD27

# Prospect Park Potential Conservation Area

## **Community Assemblages Mapped in the City of Wheat Ridge Open Space**

### 10 Grass and Forb Dominated Areas

- 11 Mixed Grass/Forb Meadows
- 12 Revegetated/Planted (a-irrigated, b-non irrigated, c-pond margins)
- 13 Disturbed/Weed Infested
- 14 Cattail Marsh

### 20 Shrub Dominated Areas

- 21 Willow Dominated (a -raised bank, b-floodplain, c-channel)
- 22 Mixed Shrub Floodplain
- 23 Rabbbitbrush with Mixed Herbaceous
- 24 Snowberry-Skunkbush Meadow with Sand Dropseed

### 30 Tree Dominated Areas

- 31 Mixed non-native Woodland
- 32 Native cottonwood/Willow/Mesic Grass Woodland
- 33 Mixed cottonwood /Mixed shrub/Mesic Grasses Woodland
- 34 Mixed cottonwood / Mesic Grasses Woodland
- 35 Bluffslope Woodland

### 40 Other Areas

- 41 Open Water
- 42 Bare Ground
- 43 Infrastructure

### **Formation 10: Grass - Forb Assemblages**

This formation includes areas that are dominated by a cover of grass and forb species. Although some individuals of tree and shrub species may be present, they are few in number and represent a very small proportion of the total cover. Many of these areas are previously disturbed areas that have been replanted with non-native meadow grasses.

### Assemblage 11 - Mixed Grass-Forb Meadows

**Description:** These are areas dominated by a mixed assemblage of grass and forb species. Some of these areas appear to have developed in response to disturbance and are composed primarily of non-native species which were most likely planted following disturbance. The dominant species in these areas are smooth brome (*Anisantha tectorum*), Kentucky blue grass (*Poa pratense*), Canada bluegrass (*P. compressa*) and various goosefoot (*Chenopodium* sp.) species. Native grass species observed in these areas include sand dropseed (*Sporobolus cryptandrus*) and blue grama grass (*Chondrosum gracile*). These areas are found on floodplain and elevated floodplain terraces.

**Locations within the Greenbelt:** Examples of this assemblage were identified south of West Bass Lake, west of Anderson Park, west of the Miller Trailhead, and at Lewis Meadows.

**Recommendations:** Areas of this assemblage would be improved by removal of non-native species and replacement by selected native species. Native species should be selected to suit the specific site conditions. Shubby species will tend to encroach on the meadows unless periodic management to control them is used.

#### Representative Photos:



**Assemblage 12:** Revegetated/Planted (a-irrigated, b-non irrigated, c-lake margins)

**General Description:** These are areas that have been actively planted or revegetated after recent disturbance. These areas may be: irrigated and maintained, such as the mowed lawns at Anderson Park; non-irrigated and un-maintained, such as the margins of the walking trails, parking areas, or revegetation areas such as the margins of former gravel excavation lakes.

**Locations within the Greenbelt:** Examples of this assemblage were identified at the west end of West Bass Lake, along the trail from West Bass Lake to Prospect Park, along the trail east of Kipling Street, at Anderson Park, east of 44<sup>th</sup> Avenue at Wadsworth Park, and along the trail east of Wadsworth Park.

**Recommendations:** Irrigated areas planted to turfgrasses and maintained for high intensity recreation need no improvement or modification. Non-irrigated, un-maintained areas, although typically planted with an appropriate mix of native species, often appear to have low cover and some proportion of weedy species. This may be due in part to the high amount of foot traffic many of these areas receive. Non-irrigated and un-maintained portions of this assemblage would be improved by increasing the cover of the planted native species and managing the areas to eliminate weedy species. Recently revegetation areas should be monitored to verify revegetation success.

**Representative Photo:**



**Assemblage 13:** Disturbed - Weedy

**General Description:** These are areas dominated primarily by non-native, weedy species. Most of these areas have received recent disturbance and revegetated naturally. The dominant species present in these areas are non-native pioneering species. Native species are almost entirely absent from most of these areas. The species commonly present in these areas include koshia (*Kochia scoparia*) and other goosefoot species, various non-native thistle species, and various non-native euphorbia species.

**Locations within the Greenbelt:** Examples of this assemblage were identified west of Kipling Street, south and west of West Bass Lake, the parking areas at the Miller Trailhead, and various other isolated sites where recent disturbance has occurred.

**Recommendations:** Areas of this assemblage would be improved by identifying an appropriate natural community assemblage for the specific sites and actively managing the area to cause a shift from the existing community to the desired natural community type. The appropriate community should be determined based on the specific site characteristics and management objectives for the area. Assemblages should include only native species and have a structure similar to the naturally occurring community.

Typically, obtaining this shift will require elimination of the non-native weedy species either using herbicides, manual removal, or in some cases prescribed burning. This is then followed by planting of the desired native species. Periodic maintenance to ensure survival of the native species and long-term elimination of the non-native species will likely be required for best success. Completely eliminating the non-native species may require intensive management of the area over several to many growing seasons.

**Representative Photo:**





#### **Assemblage 14: Cattail Marsh**

**General Description:** These are areas of shallow water dominated almost exclusively by emergent cattail (*Typha* spp.). Typically, the cattails form a mono-culture, excluding other emergent and aquatic plant species. Most of these areas are flooded for a majority of the growing season and are considered jurisdictional wetlands. The dominant species are broad-leaved cattail (*Typha latifolia*) and narrow-leaved cattail (*T. angustifolia*).

**Locations within the Greenbelt:** Examples of this assemblage were identified on the south side of Bass Lake, in a long meandering band extending east to west at the toe of the bluffslope south of the Bass Lakes, north of the Miller Trailhead, and at various isolated low areas where surface and/or groundwater accumulates for a majority of the growing season.

**Recommendations:** Since cattails grow in the same conditions conducive to the invasive non-native purple loosestrife (*Lythrium salicaria*), it is important to monitor areas where cattails are found to identify and eliminate any purple loosestrife that may be found there.

#### **Representative Photo:**



## **Formation 20: Shrub Dominated Assemblages**

This formation includes areas that are dominated by a cover of shrubby species. Grass and forb species may be present beneath the shrubby canopy. Scattered individual trees may also be present but do not account for a significant portion of the total cover.

**Assemblage 21:** Willow Dominated Shrublands (a-raised banks, b-floodplains, c-creek channel)

**General Description:** These are areas dominated almost entirely by the native willow shrubs (*Salix* spp.). These areas may support an understory of mesic grasses or may lack an herbaceous understory in stands with a dense shrub cover or areas with more frequent flooding. Typically, this assemblage is dominated entirely by sandbar willow (*Salix exigua*) and contains no other shrub species. Other willow species that may be present include bluestem willow (*Salix irrorata*) and yellow willow (*Salix lutea*). In those areas where other shrub species are present, the most common associates are river birch (*Betula fontinalis*) and chokecherry (*Padus virginiana*). Most of these areas occur in close proximity to the creek bed or other areas where inundation and saturated soil conditions occur frequently.

**Locations within the Greenbelt:** Examples of this assemblage were identified at various points all along the main channel of Clear Creek.

**Recommendations:** Areas of this assemblage might currently be limited in the Greenbelt by the altered hydrology of Clear Creek. Upstream water diversions and flood control efforts may be altering the water table height and scouring of the channel and floodplain such that the number of sites available for these pioneering species are limited.

**Representative Photo:**



## Assemblage 22: Mixed Shrub Floodplain

**General Description:** These are areas dominated by a diverse mix of native and non-native shrub and small tree species. Typically, these areas have dense cover and are difficult to travel through. The dominant species present include the native staghorn sumac (*Rhus typhina*), *Euonymus* sp, dogwood (*Cornus serotia*), shiny-leaved hawthorn (*Crataegus erythropoda*), and box elder (*Acer negundo*). Two woody non-native species, the buckthorn (*Rhamnus cathartica*) and the Siberian elm (*Ulmus pumila*) are common in this assemblage as well. The tree species present in these areas are small and have a shrub-like form (probably due to crowding and lack of resources).

**Locations within the Greenbelt:** Examples of this assemblage were identified at Anderson Park, east of Bass Lake, and east of the Charlie Brown Bridge.

**Recommendations:** Areas of this assemblage would be improved by removal of non-native species such as buckthorn and Siberian elm. No other management is necessary.

### Representative Photo:



**Assemblage 23:** Rabbitbrush dominated mixed herbaceous

**General Description:** These are areas dominated by the native shrub rabbitbrush (*Chrysothamnus nauseosus*) with an understory of mixed native and non-native herbaceous species. This assemblage occurs in areas that are typically elevated and drier than other portions of the floodplain. Because of the drier conditions these areas support a more xeric community of rabbitbrush and a variety of mixed grasses. Common grasses present include blue grama (*Chondrosium gracile*), sand dropseed (*Sporobolus cryptandrus*) cheatgrass (*Anisantha tectorum*), orchard grass (*Dactylis glomerata*), three-awn (*Aristida longiseta*), and others.

**Locations within the Greenbelt:** Examples of this assemblage were identified on the raised areas surrounding the west and south sides of West Bass Lake and west of Bass Lake.

**Recommendations:** Areas of this assemblage would be improved by elimination and control of weedy species such as cheatgrass and orchardgrass.

**Representative Photo:**



**Assemblage 24:** Snowberry – Skunkbush/ Sand Dropseed Meadows

**General Description:** This area is dominated by a mixed cover of the low shrub western snowberry (*Symphoricarpos occidentalis*) and skunkbush (*Rhus trilobata*), with a dense cover of grasses under the shrubs. The dominant grass species in this area is sand dropseed (*Sporobolus cryptandrus*). Other grasses present include smooth brome (*Bromopsis inermis*), cheatgrass (*Anisantha tectorum*) and quackgrass (*Agropyron repens*). It is possible that at one time this area may have been an opening in the adjacent cottonwood/snowberry riparian assemblage. However, given that the trees have been removed from much of the floodplain, this area now resembles more of a meadow than a portion of the adjacent woodland. The cottonwood/snowberry riparian assemblage is ranked G2G3 by the CNHP.

**Locations within the Greenbelt:** Only one example of this assemblage was identified on the Greenbelt. It is located on the south side of the creek east of Bass Lake and west of the native cottonwood /snowberry forest.

**Recommendations:** Areas of this assemblage would be improved by removing the non-native species that are present such as Canada thistle (*Breea arvensis*). Efforts to regenerate the native cottonwood stands within portions of this assemblage could be important in preserving the cottonwood/snowberry riparian assemblage over the long term.

**Representative Photo:**

### **Formation 30: Tree Dominated Assemblages**

This formation includes areas that are dominated by a cover of tree species. Often there is also an understory of woody shrub species and an herbaceous ground cover beneath the overlying tree canopy. Native and non-native cottonwood species are the most common tree assemblage found on the floodplain areas near the creek bed. On higher elevation sites with more mesic conditions, other species replace the cottonwoods as the most prevalent species. The cottonwood dominated areas may either be composed of large widely spaced older trees with a more or less open and grassy understory (gallery forest or open woodland), or may be dominated by a dense stand of younger-aged, smaller trees with almost no understory vegetation (riparian forest). Typically, the riparian stands with a dense cover of younger-aged trees are dominated by non-native willow tree species.

### **Assemblage 31: Mixed Non-native Woodlands**

**General Description:** These are areas dominated by a diverse mix of primarily non-native species of small trees. The species present may include Siberian elm (*Ulmus pumila*), buckthorn (*Rhamnus cathartica*), Russian olive (*Eleagnus angustifolia*). Other species that may be present are the native species boxelder (*Acer negundo*), hackberry (*Celtis occidentalis*), and staghorn sumac (*Rhus typhina*).

**Locations within the Greenbelt:** Examples of this assemblage were identified on the south edge of Anderson Park, south of West Bass Lake, at numerous points along the channel of Clear Creek, and south of the creek west of Kipling.

**Recommendations:** Areas of this assemblage would be improved by removal of the non-native species including buckthorn, Russian olive, Siberian elm, and weedy forbs such as leafy spurge (*Euphorbia esula*) and yellow toadflax (*Linaria vulgaris*).

#### **Representative Photo:**





**Assemblage 32: Native Cottonwood/Willow/Mesic Grass Woodlands**

**General Description:** These are areas typically dominated by an overstory of plains cottonwood (*Populus deltoides*) with a variable understory of shrubs or mesic grasses. In some areas, crack willow (*Salix fragilis*) and peachleaf willow (*Salix amygdaloides*) may occur as the sub-dominants to the native cottonwood species. Other native cottonwood species that may be present include narrowleaf cottonwood (*Populus angustifolia*) and lanceleaf cottonwood (*Populus x acuminata*). When an understory of shrubby species is present, it typically consists exclusively of sandbar willow (*Salix exigua*). On the older, more elevated floodplain terraces, shrubby willow species may be absent, and the understory is composed of a mix of mesic grasses dominated by smooth brome (*Bromopsis inermis*). Russian olive (*Eleagnus angustifolia*) has invaded this assemblage in many areas. This assemblage can occur on low floodplain terraces and elevated floodplain terraces.

**Locations within the Greenbelt:** Examples of this assemblage were identified west of Anderson Park, east of Anderson Park to Johnson Park, east of Bass Lake, and south of Prospect Park.

**Recommendations:** Areas of this assemblage would be improved by selectively removing non-native species to encourage the assemblage to revert toward a more natural state. Some species to target for eradication in this assemblage are Russian olive, common teasel (*Dipsacus fullonum*), cutleaf teasel (*D. laciniatus*), leafy spurge (*Euphorbia esula*), and yellow toadflax (*Linaria vulgaris*). Areas with minimal content of non-native species should be addressed first to eliminate the existing non-native components and ensure regeneration of only native species. Areas with a significant proportion of non-native species should be gradually treated over time to allow native species to assert dominance in the area after removal of the non-natives. Natural regeneration of this assemblage can be dependent upon inundation and scouring of the floodplain and distribution of seeds by flooding. Therefore, periodic flooding of the floodplains, or manual disturbance and planting can help to ensure regeneration and persistence of this type throughout the Greenbelt over time. Some areas of this assemblage include recently planted ornamental species that should be removed.

**Representative Photo:**



**Assemblage 33: Mixed Cottonwood/Mixed Shrub/Mesic Grass Woodlands**

**General Description:** These are areas dominated by a mix of native and non-native cottonwood species in the overstory with or without an understory of mixed shrubs. While some of these areas are dominated by the native plains cottonwood (*Populus deltoides*), other areas may be almost entirely dominated by crack willow (*Salix fragilis*). Most areas, however, are a more even mix of crack willow and plains cottonwood. Peachleaf willow (*Salix amygdaloides*) is almost always present to some degree. In areas with a dense canopy cover the understory may be lacking entirely or consist of a low cover of only of a few shrubby or herbaceous species. Other woody species present may include buckthorn (*Rhamnus cathartica*), Russian olive (*Eleagnus angustifolia*), shiny-leaved hawthorn (*Crataegus erythropoda*), chokecherry (*Padus virginiana*), snowberry (*Symphoricarpos occidentalis*) as well as young-aged trees of boxelder (*Acer negundo*), hackberry (*Celtis occidentalis*), and Siberian elm (*Ulmus pumila*). In areas where the canopy cover of the overstory vegetation is more open, the understory typically includes a mixed cover of mesic grass species, notably smooth brome (*Bromopsis inermis*). This assemblage includes two riparian community types tracked by the Colorado Natural Heritage Program: The Plains Cottonwood/Western Snowberry Riparian Woodland type (G2G3 S2), and the Plains Cottonwood/Chokecherry Riparian woodland type (G1Q S1Q).

**Locations within the Greenbelt:** Examples of this assemblage were identified NW of west Bass Lake, NE of Bass Lake, SW of Prospect Lake, in a large band south of the creek and east of Prospect Park foot bridge, on the north side of the river west of Prospect park, east of 44<sup>th</sup> street, and at several locations along the east end of the Greenbelt.

**Recommendations:** Areas of this assemblage would be improved by removing the non-native species such as Russian olive, buckthorn, crack willow, smooth brome, and yellow toadflax (*Linaria vulgaris*). The high density of the canopy may be impeding the development of a healthy understory.

**Representative Photo:**



(Photo of *Populus deltoides*/*Symphoricarpos occidentalis* community)



### **Assemblage 34: Mixed Cottonwood/ Mesic Grass Woodlands**

**General Description:** These are areas dominated by an overstory of mixed cottonwood species with an understory of mesic grasses. The understory typically lacks any significant amount of shrub cover. Often the overstory is dominated by large older plains cottonwood (*Populus deltoides*) individuals, although other species such as crack willow and peachleaf willow may also be present. Most of these areas have a fairly open canopy, particularly where plains cottonwood is the dominant tree. Grass cover is a mix of mesic species, most often dominated by smooth brome (*Bromopsis inermis*).

**Locations within the Greenbelt:** Examples of this assemblage were identified in three small strips adjacent to the creek in the areas south of Anderson Park, south of Prospect Park, and west of Kipling Street.

**Recommendations:** Areas of this assemblage would be improved by removing the non-native species such as crack willow. Numerous weedy forbs are also present in the understory in this assemblage (see accompanying maps). This area should also be managed to ensure that any disturbance to the grass understory does not allow invasive weedy species to become established.

#### **Representative Photo:**



**Assemblage 35: Mixed Bluffslope Woodlands**

**General Description:** These are areas dominated by a diverse mix of native and non-native tree and shrub species that occur on the bluffslope south of the creek. Often the cover in these areas is so dense that travel through the areas may not be possible. Rarely is there any herbaceous vegetation present beneath the dense shrub cover. Although few to several large old plains cottonwood trees (*Populus deltoides*) may be present in these areas, they are most often dominated by a diverse combination of Siberian elm (*Ulmus pumila*), buckthorn (*Rhamnus cathartica*), Russian olive (*Eleagnus angustifolia*), boxelder (*Acer negundo*), and chokecherry (*Padus virginiana*). Several areas along the bluffslope are watered by groundwater seeps that occur along the face of the slope. It is not known if these seeps are natural or are the result of modified water use on the top of the bluff.

**Locations within the Greenbelt:** Examples of this assemblage were identified all along the bluffslope that runs parallel with and south of the creek.

**Recommendations:** It is uncertain what the natural character of the bluffslope would have been and what management actions would improve it. However, as with all of the other areas on the Greenbelt, this area would also benefit if non-native species such as Siberian elm and Russian olive were removed.

**Representative Photo:**

**Formation 40: Other Landcover Types**

This formation consists of all areas of the Greenbelt that are not vegetated. This formation was included to identify areas where management for vegetated cover types would not be useful or applicable and to allow the cover types map to be comprehensive over the entire Greenbelt.

**Assemblage 41: Open Water**

**General Description:** These areas include the former gravel pits that are now Bass Lake, West Bass Lake, and the other Lakes on the Greenbelt. This category also includes some smaller ponds located at different points along the Greenbelt. Typically these areas are unvegetated, however, shallow areas of open water may become partially vegetated with cattails and willows. These areas also have the potential to become infested with the non-native species purple loosestrife.

**Locations within the Greenbelt:** Examples of this assemblage include Bass Lake, West Lake, Prospect Lake, Tabor Lake, a small pond south of Bass Lake, the main channel of Clear Creek, and several small ponds toward the east end of the Greenbelt.

**Recommendations:** Areas of this assemblage would be improved by ensuring that they do not become invaded by the noxious weed purple loosestrife. Park personal should perform inspection of these areas at least twice per growing season to search for purple loosestrife plants. Any plants identified should be eradicated immediately using accepted practices for eradication. Cutleaf teasel (*Dipsacus laciniatus*) has invaded the shorelines of all these lakes, most notably Bass Lake and West Lake.

**Representative Photo:**





**Assemblage 42: Bare Ground**

**General Description:** These are areas devoid of vegetation. The vegetation is typically lacking due to frequent use and trampling. These areas are typically located along the trail margins.

**Locations within the Greenbelt:** Examples of this landcover were identified primarily along the margin of the trail.

**Recommendations:** Revegetate with native species or harden as appropriate.

**Representative Photo:**



**Assemblage 43: Infrastructure**

**General Description:** These are areas devoted to use, maintenance, and operation of the Greenbelt. They include parking areas, the paved trail, and structures including buildings and bridges

**Locations within the Greenbelt:** Examples of this type were identified throughout the Greenbelt.

**Recommendations:** None.

**Representative Photo:**



## **Weeds**

Weeds are a formidable problem in the City of Wheat Ridge Open Space, and present the greatest challenge to managing the biological resources of the area. 118 species of weeds or weedy exotic species were present in the study area as of 2000, representing 34% of the floristic diversity (Table 7). Some of these species do not represent significant threats to the native species and habitats of the study area and can be expected to diminish somewhat as native, later seral vegetation takes hold. However, most will need to be addressed eventually in order to restore a quasi-natural, functional ecosystem in the area.

All species on the edited version of Ray Sperger's vascular plant species list for the Wheat Ridge Greenbelt (Appendix 1) are categorized to allow managers to make decisions on which species to encourage and which to manage or eradicate. The following categories were used and applied to all species on the species list, and are based on accounts in Colorado Flora: Eastern Slope (Weber and Wittmann 1996) and Manual of the Grasses of the United States, Second Edition (Hitchcock 1950).

### **Key to Plant Categories:**

- W** Exotic, weedy species; any non-native species that is particularly invasive, and either threatens native plant and animal habitat in the study area by its invasiveness (i.e. Canada thistle), or prevents the establishment of a more natural flora by virtue of its presence and competitive ability (i.e. orchard grass). Such species may be classified as noxious weeds but may also be species used in reclamation (i.e. smooth brome).
- E** Exotic, but not necessarily detrimental or particularly invasive. Includes species such as black walnut that are native to North America but introduced to Colorado, as well as escaped Eurasian ornamentals (i.e. common lilac).
- P** A plant species native to Colorado but out of its natural ecological context (i.e. blue spruce, pinyon pine) and was probably planted.
- N** A native Colorado species that is in its proper ecological context and probably resided in the area prior to human settlement (i.e. snakeweed).
- N!** A native Colorado species that is indicative of high quality natural habitat; not necessarily rare but worthy of efforts to promote its persistence; likely to diminish in the face of significant habitat degradation (i.e. tall marsh sunflower). This category is somewhat subjective.
- U** A species of unknown origin.

A floristic analysis based on these categories shows that a narrow majority of the species in the study area are natives (Table 7). Clearly, the transition to a more native flora in the study area must be done in a prioritized fashion and will require a significant investment of time and resources. Despite the difficulties, the transition to a predominantly native flora is quite possible, and the resulting success would be an excellent showcase for successful ecological restoration in an urban riparian corridor. The value of the area as animal habitat would also be greatly enhanced, and it would no longer be a source of weed propagules to the surrounding area.

Table 7. Relative species richness of weedy, exotic, planted, native, and unknown plant taxa in the City of Wheat Ridge Greenbelt and Lewis Meadows.

CATEGORY	NUMBER OF SPECIES	PERCENT OF FLORA
W	118	34%
E	35	10%
P	5	1%
N (including N!)	178	51%
U	14	4%
<b>SPECIES RICHNESS:</b>	<b>350</b>	

In terms of area of occupation, the most problematic weed species mapped in the study area are Russian olive and buckthorn, occupying 22.98 and 21.25 acres of the study area, respectively (Table 8). This represents a significant portion of the entire Greenbelt and Lewis Meadows. Due to the dominance and ecological impact of these species, managing them may represent a good first step in the ecological transformation of the Greenbelt and Lewis Meadows. The most widespread herbaceous weeds were, in order of coverage, Canada thistle, yellow toadflax, diffuse knapweed, leafy spurge, dalmatian toadflax, and cutleaf teasel. All of these species represent significant threats to the native flora of the Greenbelt, and are difficult to eradicate. Unfortunately, yellow toadflax is spread throughout quasinatural areas, and appears well entrenched in the Greenbelt. It is abundant in forested areas, along trails, and along Clear Creek. Canada thistle is also widespread and has infested all the meadow areas in the Greenbelt and Lewis Meadows. It is also frequently found among open cottonwood savannah areas. It is dense among snowberry (*Symphoricarpos occidentalis*), and frequent in stands of coyote willow (*Salix exigua*) where it will be very difficult to remove. Common teasel is also often hidden within dense stands of coyote willow, whereas cutleaf teasel is more often associated with cattails (*Typha* spp.) or arctic rush (*Juncus arcticus*) in slightly wetter sites. Although their area of occupation is not as great as other species, cutleaf teasel and purple loosestife are high priority species due to their tenacity and specificity to wet sites. Dalmatian toadflax, leafy spurge, musk thistle, and diffuse knapweed are predominantly weeds of drier, open sites, although leafy spurge was found in a diverse range of habitat types in the Greenbelt including heavily forested areas.

Table 8. Occupied area, Invasiveness, and Priority for management of selected weed species for the City of Wheat Ridge Greenbelt and Lewis Meadows. Due to overlap in the presence of the selected weed species, the total occupied area is less than the sum of the occupied area of the individual weed species.

Common Name	Scientific Name	Occupied area (acres)	Invasiveness	Suggested Priority for management
Russian Olive	<i>Eleagnus angustifolia</i>	22.98	High	High
Buckthorn	<i>Rhamnus cathartica</i>	21.25	Moderate	High
Canada Thistle	<i>Breca arvensis</i> (= <i>Cirsium arvense</i> )	12.77	High	High
Yellow Toadflax	<i>Linaria vulgaris</i>	11.64	High	High
Diffuse Knapweed	<i>Acosta diffusa</i>	9.85	High	High
Leafy Spurge	<i>Euphorbia esula</i>	5.67	High	High
Dalmatian Toadflax	<i>Linaria gennistifolia</i> ssp. <i>dalmatica</i>	4.88	High	High
Cutleaf Teasel	<i>Dipsacus laciniatus</i>	4.46	High	High
Poison Hemlock	<i>Conium maculatum</i>	2.57	Moderate	Moderate
Chinese Clematis	<i>Clematis orientalis</i>	1.16	High	High
Common Teasel	<i>Dipsacus fullonum</i>	0.68	High	High
Musk Thistle	<i>Carduus nutans</i>	0.47	High	Moderate
Scotch Thistle	<i>Onopordum acanthium</i>	0.35	High	Moderate
Purple Loosestrife	<i>Lythrum salicaria</i>	0.19	High	High
Bull Thistle	<i>Cirsium vulgare</i>	0.02	Moderate	Moderate
Tamarisk	<i>Tamarix ramosissima</i>	0.01	High	High
<b>TOTAL:</b>		<b>86.06</b>		

Chinese clematis, though currently not widespread, appears to be spreading rapidly in the Greenbelt, particularly in the eastern portion of the Greenbelt. It is abundant in sunny areas where it can climb on fences, trees, and shrubs. This species has attracted increased attention lately due to its noteworthy invasiveness. Chinese clematis is still sold by nurseries as an ornamental. Aggressive management of this species now in the Greenbelt may prevent a much greater problem in the future.

A single tamarisk was found in the Greenbelt, on a bench above Clear Creek in the eastern portion of the Greenbelt. This species is another extremely tenacious, invasive species. However, the potential threats from this species are not as great in Wheat Ridge as they are in southern portions of the state, as it prefers somewhat warmer climates.

Numerous weedy non-native species are present in the study area that weren't mapped during this survey. Some of these species are abundant and also represent significant management problems in the Greenbelt. One such species is cheatgrass (*Anisantha tectorum*), which is highly invasive and pernicious. Annual weeds such as kochia (*Bassia sieversiana*) and Russian thistle (*Salsola iberica*) are abundant and widespread throughout the study area. The area adjacent to Kipling to the west is a large, extremely weedy area that is dominated by these two species. Numerous other weeds are present in this area such as scotch thistle and poison hemlock.

Significant benefits to bird, mammal, and rare plant habitat could be gained by aggressively managing Russian olive in the study area with volunteer assistance. This species is the dominant forest tree in many areas and is the single greatest barrier to the establishment of a native forest canopy. It has very low value to wildlife species. Though it is quite tenacious, it can potentially be effectively managed by implementing an integrated pest management strategy. Cutting them and applying herbicide to the stump can yield favorable results. Continued attention to removing small individuals with a weed wrench could reduce the population significantly in a short time. Adolescents would be particularly effective for this work, as the use of a weed wrench is extremely exhilarating and cathartic, though physically strenuous.



Purple loosestrife (*Lythrum salicaria*) on the north bank of Clear Creek near Johnson Park. This species has destroyed wetlands and wildlife habitat throughout North America, though it is not yet widespread in Colorado.



Cutleaf Teasel (*Dipsacus laciniatus*) south of West Lake near an occurrence of Ute ladies'-tresses (*Spiranthes diluvialis*). This species poses a major threat to the Ute ladies'-tresses, and is extremely tenacious. Note the white flowers and opposite leaves that are united to form a cup around the stem, which distinguish it from the common teasel (*Dipsacus fullonum*).



Fruit, flower, and leaf of the attractive Chinese clematis (*Clematis orientalis*) on the north bank of Clear Creek west of Johnson Park. This climbing vine is not yet widespread in Colorado but is becoming increasingly problematic. It appears to be spreading rapidly in the greenbelt.



Leafy spurge (*Euphorbia esula*) is arguably one of the most problematic weed species in the West. It is currently common throughout the greenbelt.



The common buckthorn (*Rhamnus cathartica*), a species that has spread throughout the greenbelt and Lewis Meadows. It forms impenetrable thickets in which there is little or no understory.



Yellow toadflax (*Linaria vulgaris*) is inconspicuous most of the summer, but is easily seen when it blooms in late August and September. This species is extremely deleterious and spreads easily into undisturbed native plant habitat.



Russian olive (*Eleagnus angustifolia*) covers more of the Wheat Ridge Greenbelt than any other non-native species mapped in 2000.



## Animals

Small mammal trapping efforts in the Greenbelt yielded surprisingly few captures. During the 431 trapnight sampling effort for the Preble's meadow jumping mouse (*Zapus hudsonius preblei*) on August 22 through August 26, no individuals were captured. Only four Norway rats (*Rattus norvegicus*) and one house mouse (*Mus musculus*), both introduced species, were captured. During the 120 trapnights on August 18 and 19 intended to assess small mammal species richness in the Greenbelt, one house mouse and one Norway rat were captured.

The low numbers of animals trapped during this effort suggests that small mammal populations are very low in the Greenbelt. Species diversity also appears surprisingly low. In an area with such a diversity of habitats and forage for small mammals, high populations and at least some native species might be expected. Competitive exclusion of native small mammals by aggressive non-natives such as the house mouse and the Norway rat may be partially responsible, although populations of non-natives appear low as well. Table 10 lists small mammals and other mammal species that could be expected in the Greenbelt.

Red fox (*Vulpes vulpes*) populations in the Greenbelt appear unnaturally high, probably due to abundant food sources for them throughout the Greenbelt and a lack of natural predators. This species has adapted well to life in urban areas throughout the U.S. Greenbelt visitors and people in the surrounding residential area are known to offer food to red foxes, and the red foxes can scavenge trash throughout the study area from park areas and open trash receptacles. Red foxes may be responsible for the lack of native small mammals observed in the study area.

Near the pedestrian bridge north of the Miller Trailhead, a recently constructed beaver dam on a small stream has flooded approximately one acre of the floodplain adjacent to Clear Creek. Beaver activity, if managed closely, has the potential to assist with exotic and weedy tree removal. Wrapping steel mesh around desirable trees such as cottonwood (*Populus* spp.) while leaving Russian olive (*Eleagnus angustifolia*), crack willow (*Salix fragilis*), and buckthorn (*Rhamnus cathartica*) unwrapped in beaver forage areas can inexpensively achieve some of the exotic species management goals for the Greenbelt.

By far, birds represent the bulk of the vertebrate diversity in the study area. Numerous species have been observed in this survey (Table 9) and in other surveys (Sperger 1998). Many bird species noted by Sperger and by MDG & Associates (1995) were not seen in this study, but this is probably due to the short period of time spent in the field on this component of the study and does not infer a change in species composition.

Although it was documented previously in the Greenbelt by MDG and Associates (1995), the northern leopard frog (*Rana pipiens*) was not found. The only amphibians observed in the study area were bullfrogs (*Rana catesbiana*) in Bass Lake. Hammerson (1999) notes that bullfrogs have apparently displaced northern leopard frogs in many locations in

Colorado and elsewhere. Bullfrogs are aggressive, tolerant of high levels of water pollution, and are adapted to life in lakes and ponds such as those present on the Greenbelt. They can also be very difficult to remove.

Water pollution in Clear Creek is an issue with far reaching ramifications for the ecology of the Greenbelt. Evidence of polluted surface water runoff flowing into the creek was observed in the Greenbelt. The urban surroundings of the Greenbelt make the area vulnerable to impacts from non-point source pollution. A significant fish kill event along with a surge of water was observed on August 26 along the Greenbelt. Numerous species in the Greenbelt, particularly birds, depend on fish and aquatic invertebrates from the creek. Pollution in the creek negatively affects food quality and availability for these species.



Polluted storm water discharge from a culvert at the pedestrian underpass at Johnson Park. Note dead fish in the lower left of photo.

Table 9. List of reptiles, amphibians, birds, and mammals noted throughout the study area in August and September of 2000. Notes on species to eradicate, manage, or encourage are included.

Common Name	Scientific Name	Native/Exotic	Comments
REPTILES			
Plains Garter Snake	<i>Thamnophis radix</i>	N	
Six Lined Race Runner	<i>Cnemidophorus sexlineatus</i>	E	
AMPHIBIANS			
Bullfrog	<i>Rana catesbiana</i>	E	eradicate/manage
BIRDS			
Double Crested Cormorant	<i>Phalacrocorax auritus</i>	N	
Great Blue Heron	<i>Ardea herodias</i>	N	encourage
Canada Goose	<i>Branta canadensis</i>	N	
American Goldfinch	<i>Carduelis tristis</i>	N	
Lesser Goldfinch	<i>Carduelis psaltria</i>	N	
American Crow	<i>Corvus brachyrhynchos</i>	N	
Ring Billed Gull	<i>Larus canus</i>	N	
European Starling	<i>Sturnis vulgaris</i>	E	
Mallard	<i>Anas platyrhynchos</i>	N	
Black Crowned Night Heron	<i>Nycticorax nycticorax</i>	N	encourage
Northern Flicker	<i>Colaptes auratus</i>	N	encourage
Black Billed Magpie	<i>Pica pica</i>	N	
American Robin	<i>Turdus migratorius</i>	N	
Brewers Blackbird	<i>Euphagus cyanocephalus</i>	N	
Pine Siskin	<i>Carduelis pinus</i>	N	
Rock Dove	<i>Columba livia</i>	E	manage
Loggerhead Shrike	<i>Lanius ludovicianus</i>	N	
Mourning Dove	<i>Zenaida macroura</i>	N	
Red Tailed Hawk	<i>Buteo jamaicensis</i>	N	encourage
House Sparrow	<i>Passer domesticus</i>	N	
MAMMALS			
Eastern Cottontail	<i>Sylvilagus floridanus</i>	N	
Feral Cat	<i>Felis domesticus</i>	E	manage
House Mouse	<i>Mus musculus</i>	E	probably small populations
Norway Rat	<i>Rattus norvegicus</i>	E	probably small populations
Beaver	<i>Castor canadensis</i>	N	manage
Raccoon	<i>Procyon lotor</i>	N	may require management
Muskrat	<i>Ondontra zibethica</i>	N	
Red Fox	<i>Vulpes vulpes</i>	N	manage
Fox Squirrel	<i>Sciurus niger</i>	E	

Table 10. Native mammals that potentially reside in the study area.

Common Name	Scientific Name	Observed previously or during this survey
INSECTIVORES		
Masked Shrew	<i>Sorex cinereus</i>	
Merriam's Shrew	<i>Sorex merriami</i>	
BATS		
Western Small-Footed Myotis	<i>Myotis ciliolabrum</i>	
Little Brown Myotis	<i>Myotis lucifugus</i>	
Hoary Bat	<i>Lasiurus cinereus</i>	
Silver-Haired Bat	<i>Lasionycteris noctivagans</i>	
Big Brown Bat	<i>Eptesicus fuscus</i>	
LAGOMORPHS		
Desert Cottontail	<i>Sylvilagus audubonii</i>	
Eastern Cottontail	<i>Sylvilagus floridanus</i>	
Black-Tailed Jackrabbit	<i>Lepus californicus</i>	
White-Tailed Jackrabbit	<i>Lepus townsendii</i>	
RODENTS		
Golden-Mantled Ground Squirrel	<i>Spermophilus spilosoma</i>	
Thirteen-Lined Ground Squirrel	<i>Spermophilus tridecemlineatus</i>	
Rock Squirrel	<i>Spermophilus variegatus</i>	
Colorado Chipmunk	<i>Tamias quadrivittatus</i>	
Black-Tailed Prairie Dog	<i>Cynomys ludovicianus</i>	
Northern Pocket Gopher	<i>Thomomys talpoides</i>	x
Plains Pocket Gopher	<i>Geomys bursarius</i>	
Olive-Backed Pocket Mouse	<i>Perognathus fasciatus</i>	
Plains Pocket Mouse	<i>Perognathus flavescens</i>	
Hispid Pocket Mouse	<i>Chaetodipus hispidus</i>	
Deer Mouse	<i>Peromyscus maniculatus</i>	
Prebles Meadow Jumping Mouse	<i>Zapus hudsonius ssp. preblei</i>	
Long Tailed Vole	<i>Microtus longicaudus</i>	
Muskrat	<i>Ondatra zibethicus</i>	x
Beaver	<i>Castor canadensis</i>	x
Common Porcupine	<i>Erethizon dorsatum</i>	
CARNIVORES		
Mountain Lion	<i>Felis concolor</i>	x
Bobcat	<i>Felis rufus</i>	
Red Fox	<i>Vulpes vulpes</i>	x
Coyote	<i>Canis latrans</i>	x
Skunk	<i>Mephitis mephitis</i>	x
American Badger	<i>Taxidea taxus</i>	
Black Bear	<i>Ursus americanus</i>	
Long-Tailed Weasel	<i>Mustela frenata</i>	
Raccoon	<i>Procyon lotor</i>	x
Mink	<i>Mustela vison</i>	
ARTIODACTYLS		
White-Tailed Deer	<i>Odocoileus virginianus</i>	x
Mule Deer	<i>Odocoileus hemionus</i>	
Elk	<i>Cervus elaphus</i>	x

## **General Recommendations**

The City of Wheat Ridge Greenbelt is used for many purposes. While one purpose of the Greenbelt is to provide a place where citizens can gather for sporting events, picnics, exercise, and other organized recreation, another purpose is to provide the opportunity for citizens to experience and interact with the environment of the natural world. In areas not dedicated to other forms of recreation, the vegetation of the Greenbelt should be managed to maintain and encourage the composition, structure, and distribution of vegetation types that naturally occur in the area.

There are many riparian plant community types documented for small front range streams similar to Clear Creek. The community types that Greenbelt managers strive to maintain and/or encourage on the Greenbelt should be similar to the types known, or assumed, to be naturally occurring in the area. Community Characterization Abstracts (CCA's) for several naturally occurring riparian community types that may be appropriate on the Greenbelt are included in the appendix as examples.

A number of non-native or non-endemic species are present throughout the Greenbelt. Management efforts to remove these species from the Greenbelt would be valuable to returning the plant associations of the Greenbelt to a more natural state. At a minimum, non-native species should be removed. In removing the non-native and non-endemic species, managers may wish to consider what natural community type is desired for a given area and take effort to ensure that that is the type that develops following removal of the non-natives.

Greenbelt managers should use only native, endemic and appropriate species in all planting that occurs on the Greenbelt. Planting of native species should be in conjunction with some overall plan regarding the vegetation types desired for areas and should be based on the individual site characteristics of those areas.

The Greenbelt currently supports several remnant examples of naturally occurring riparian community types that should be managed to ensure long-term survival, and perhaps expansion, of the type on the Greenbelt. Two of these types are considered imperiled on a global scale by the Colorado Natural Heritage Program. These are the Plains Cottonwood/Chokecherry Riparian Woodland type (G1Q S1Q) and the Plains Cottonwood/Western Snowberry Riparian Woodland type (G2G3 S2). The former type occurs on the north side of the river, north of the Miller Trailhead area, while the later type occurs on the south side of the creek east of the Bass Lake. Other areas of vegetation with valuable qualities as remnants of the original native vegetation are the plains cottonwood forest west of the Anderson Park, and the cottonwood forest south of the creek south of Prospect Park.

## Specific Recommendations

1. **Incorporate the information included in this report in the review of proposed open space activities in or near the Potential Conservation Area (PCA) so that the activities do not adversely affect natural heritage elements.** The PCA presented contains natural heritage elements of statewide and global significance. Development activities in or near a PCA may adversely effect the elements present. Cumulative impacts from many small changes can have effects as profound and far-reaching as one large impact.
2. **Use native plants in restoration and revegetation efforts.** Native plants may be somewhat more difficult and costly to establish than non-natives in some cases, but will yield excellent long term results. They require very little water and maintenance once they are established. Using seeds and plants from local genestock will enhance the success of the plantings. There are many sources of such material in Colorado. Site specific suggestions for enhancing areas with regard to native plants are offered in Results - Community Assemblages.
3. **Encourage the proliferation of native plants and animals, and the development of an ecosystem with more natural ecological attributes.** See Appendix 1 for desirability rankings of all plant species present in the study area. Management and eradication of weedy plant and undesirable animal species will help promote desirable species. See Results- Animals for suggestions regarding animals. For general recommendations regarding plant assemblages in the area, see the preceding section (General Recommendations).
4. **Restore natural or seminatural hydrology to parts of the floodplain.** Encouraging or facilitating a flood regime that would allow for renewed silt deposition on the floodplain could help restore a functional riparian ecosystem to parts of the Greenbelt.
5. **Establish greater hydrologic connectivity between Clear Creek and the lakes in the Greenbelt.** Creating an inflow and outflow in West Lake, Bass Lake, and Prospect Lake using water from Clear Creek would create more natural lake conditions. The inundation by *Myriophyllum* and algae in the lakes may be moderated by water circulation.
6. **Increase public awareness of the benefits of protecting significant natural areas.** Natural lands are becoming ever more scarce, especially those near densely populated areas. Rare and imperiled species will continue to decline if not given appropriate protection. This will result not only in the loss of our natural heritage, but may also lead to additional conflicts between developers and natural resource managers. Increasing the public's knowledge of the remaining significant areas will build support for the programmatic initiatives necessary to protect them. Some visitor awareness activities to consider are natural heritage slideshows, talks ("fireside chats") by the Park Naturalist and guest speakers, and short nature walks. Natural

history educational signs could be installed along the main trail in the conservation area to promote visitor awareness of the ecology of the Greenbelt.

7. **Consider the construction of facilities on Bass Lake to reduce visitor use patterns away from Ute ladies'-tresses habitat.** Providing angler access infrastructure away from the north shore of the lake may help to minimize the impact on Ute ladies'-tresses in the area. Thus fishing access could be provided in less sensitive areas, enabling managers to more effectively protect habitat for the Ute ladies'-tresses on the north shore of Bass Lake.
8. **Develop a conservation action plan to ensure the protection of Ute ladies'-tresses (*Spiranthes diluvialis*) in the City of Wheat Ridge Greenbelt.** Without a concerted effort to protect this species in the Greenbelt, it could easily decline or be extirpated due to weed invasion, shading, trampling or other human impacts, or inappropriate development activities. Removal of Russian olives and other aggressive species that are shading plants in many places will help ensure the viability of the species in the Greenbelt. Continued monitoring of locations where the species has been documented will help assess long term population trends for the species in the area. Further surveys during good years may identify other locations for the species.
9. **Develop a targeted weed management and eradication strategy for the City of Wheat Ridge Open Space.** Targeted weed management and eradication efforts focused on the factors outlined in this report (see Results- Weeds) may offer the cheapest, most effective solutions. Encouraging continued involvement of local schools and organizations in weed management activities can enhance community buy-in and achieve low-cost results. Integrated pest management strategies employed within the Prospect Park PCA must take into account any potential negative impacts on the natural heritage elements present to maintain the biodiversity of the study area. Current management of weeds in the study area is laudable with regard to exemplary use of volunteers, involvement of the public and non-profits, and in successful removal of weeds in some areas. Continued efforts such as this have great potential. Eradicating particularly detrimental species such as Russian olive (*Eleagnus angustifolia*) would greatly enhance the value of the area to wildlife, promote a healthier, functioning ecosystem, and increase the amount of desirable wildlife species for open space visitors to enjoy.
10. **In beaver activity areas, leave undesirable trees and shrubs unprotected to allow them to be naturally culled.** Species that could be removed by beavers include crack willow (*Salix fragilis*), Russian olive (*Eleagnus angustifolia*), common buckthorn (*Rhamnus cathartica*), tamarisk (*Tamarix ramossisima*), and other exotic but not particularly invasive species. Placement of steel mesh on desirable trees such as plains cottonwood (*Populus deltoides ssp. monilifera*) and peach leafed willow (*Salix amygdaloides*) while leaving non-native species unprotected could facilitate species turnover to a more natural state at a very low cost.

11. **Work with other agencies and industry partners to reduce toxic water discharge and non-point source pollution in Clear Creek.** Frequent fish kill events on Clear Creek are indicative of toxic levels of pollutants or anoxic conditions unsuitable to fish and perhaps other species. Improving water quality is an important step in the restoration of the riverine ecosystem of the Greenbelt. Storm water runoff is also causing water contamination to some extent and steps to reduce the concentration of pollutants flowing directly into the creek could make a significant contribution to the quality of habitat for aquatic organisms. For many desirable species in the Greenbelt such as the black-crowned night heron, maintaining a functional riverine ecosystem is crucial to their survival.



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## Appendix 1: Updated Species List for the Wheat Ridge Greenbelt

The following list was created by Ray Sperger in 2000 for the City of Wheat Ridge Open Space. At each section of the Greenbelt, the following symbology is used to indicate abundance:

- x present
- xx abundant
- \* likely

CNHP botanists amended this list during the summer of 2000, adding several species and locations to this already very thorough list. All species were also categorized using the following alpha codes:

### Key to Plant Categories:

- W** Exotic, weedy species; any non-native species that is particularly invasive, and either threatens native plant and animal habitat in the study area by its invasiveness (i.e. Canada thistle), or prevents the establishment of a more natural flora by virtue of its presence and competitive ability (i.e. orchard grass). Such species may be classified as noxious weeds but may also be species used in reclamation (i.e. smooth brome).
- E** Exotic, but not necessarily detrimental or particularly invasive. Includes species such as black walnut that are native to North America but introduced to Colorado, as well as escaped Eurasian ornamentals (i.e. common lilac).
- P** A plant species native to Colorado but out of its natural ecological context (i.e. blue spruce, pinyon pine) and was probably planted.
- N** A native Colorado species that is in its proper ecological context and probably resided in the area prior to human settlement (i.e. snakeweed).
- N!** A native Colorado species that is indicative of high quality natural habitat; not necessarily rare but worthy of efforts to promote its persistence; likely to diminish in the face of significant habitat degradation (i.e. tall marsh sunflower). This category is somewhat subjective.
- U** A species of unknown origin.

CODE:		Youngfld to PedBridge S of Creek	Youngfld to PedBridge N of Creek	PedBridge to Kipling	PedBridge to Kipling	Lenna Gulch	Lenna Pond	Kipling to Independ	Independ to 44th	44th to CBBridge	CBBridge to Wads	Wads to I-70 East	I-70 East to Marshall	Marshall to Harlan
	TREES	A	B	C	D	E	F	G	H	I	J	K	L	M
	ACERACEAE: MAPLE FAMILY													
N	Box Elder	<i>Acer negundo</i>	x	x	x	xx	x	xx	xx		xx	xx		x
E	Silver Maple	<i>Acer saccharinum</i>		x			x	x		x	x	xx		
	BETULACEAE: BIRCH FAMILY													
E?	Paper Birch; Canoe Birch	<i>Betula papyrifera</i>		x					x					
	BIGNONIACEAE: FAMILY													
E	Common Catalpa	<i>Catalpa bignonioides</i>			x					x		x	x	
	ELAEAGNACEAE: OLEASTER FAMILY													
W	Russian Olive	<i>Elaeagnus angustifolia</i>	xx	xx	xx	xx	x	xx	xx	x	x	x	x	x
	FABACEAE: OAK FAMILY													
E	Bur Oak	<i>Quercus macrocarpa</i>							x					
	JUGLANDACEAE: WALNUT FAMILY													
E	Black Walnut	<i>Juglans nigra</i>	x	x							x	x		
	LEGUMINOSAE: PEA FAMILY													
E	Honey Locust	<i>Gleditsia triacanthos</i>												
W	Locust sp.	<i>Robinia sp.</i>	x		x	x		x	x		x	x	x	
	MORACEAE: MULBERRY FAMILY													
E	White Mulberry	<i>Morus alba</i>	x								x			
	OLEACEAE: OLIVE FAMILY													
E	Green Ash	<i>Fraxinus pennsylvanica</i>	x	x	x	x	x	x	x	x	xx	xx	x	x
	PINACEAE: PINE FAMILY													
P	Red Cedar	<i>Juniperus scopulorum</i>		x				x			x			
P	Blue Spruce	<i>Picea pungens</i>		x					x				x	
P	Pinon Pine	<i>Pinus edulis</i>		x					x				xx	
E?	Pine species	<i>Pinus sp.</i>			x				x					
	ROSACEAE: ROSE FAMILY													
E	Apple Tree	<i>Malus domestica</i>		x	x	x	x		x		x			
E	Crabapple	<i>Malus sp.</i>									x			
	SALICACEAE: WILLOW FAMILY													
N	Lanceleaf Cottonwood	<i>Populus acuminata</i>	x	x	x	x	x		x	x	xx			x
E	White Poplar	<i>Populus alba</i>							x					
N	Narrowleaf Cottonwood	<i>Populus angustifolius</i>	x	x	xx	x			xx	xx	x		x	
N	Plains Cottonwood	<i>Populus deltoides</i>	xx	xx	xx	xx	xx	x	xx	xx	xx	xx	xx	xx
P	Quaking Aspen	<i>Populus tremuloides</i>		x										
N	Peach-leafed Willow	<i>Salix amygdaloides</i>	x	x		x	xx		x	x	x		x	
W	Crack Willow	<i>Salix fragilis</i>	xx	xx	xx	xx	x	xx	xx	xx	xx	xx	x	x
E	Weeping Willow	<i>Salix babylonica</i>										x	x	
	TAMARICACEAE: TAMARISK F.													
W	Tamarisk; Salt Cedar	<i>Tamarix parviflora</i>								x				x
	ULMACEAE: ELM FAMILY													
E	Hackberry	<i>Celtis occidentalis</i>									xx	xx		x

CODE:		Youngfld to PedBridge S of Creek	Youngfld to PedBridge N of Creek	PedBridge to Kipling	PedBridge to Kipling	Lenna Gulch	Lenna Pond	Kipling to Independ	Independ to 44th	44th to CBBridge	CBBridge to Wads	Wads to I-70 East	I-70 East to Marshall	Marshall to Harlan	
		A	B	C	D	E	F	G	H	I	J	K	L	M	
N	Netleaf Hackberry		x												
E	American Elm				x						x	x	x		
W	Siberian Elm	xx	xx	xx	xx	xx		xx	xx	xx	xx	xx	xx	xx	
SHRUBS															
AGAVACEAE: AGAVE FAMILY															
N	Yucca, Spanish Bayonet				x								x	x	
ANACARDIACEAE: SUMAC FAMILY															
N	Three-leaved Sumac	x	x	x	x				x	x	xx			xx	
E	Staghorn Sumac	x		x					x	x		x	x	x	
ASTERACEAE: SUNFLOWER FAMILY															
N	Rabbitbrush	xx	xx		xx	x		x		x		x	x	xx	
N	Snakeweed												x	x	
BERBERIDACEAE: BARBERRY FAMILY															
E	Mahonia; Holly										x				
BETULACEAE: BIRCH FAMILY															
N	River Birch	x	xx	xx	xx			x	x		x	x	x		
E	Cutleaf White Birch										x		x		
N	Thinleaf Alder		x	x					x		x				
CAPRIFOLIACEAE: HONEYSUCKLE F.															
E	Tartarian Honeysuckle		x	x	x			x		x	x	x			
E	Elderberry	x	xx	x	x						x	xx	x		
N	Western Snowberry	x	xx	xx	xx	x			xx	x	xx	xx	x	xx	
E	Ornamental Cranberry				x	x					x	x	x		
E	Wayfaring Tree		x			x					x				
CORNACEAE: DOGWOOD FAMILY															
N	Red-twig Dogwood; Red Osier Dogwood	x	xx	xx	x				x		xx	x	x		
GROSSULARIACEAE: GOOSEBERRY F															
N	Golden Currant	x	xx	xx	x	x			x		xx	xx		xx	
N	Squaw Currant; Wax Currant				x										
LEGUMINOSAE: PEA FAMILY															
N	Lead Plant		x		x				x						
OLEACEAE: OLIVE FAMILY															
E	Common Lilac	x							x	x					
RHAMNACEAE: BUCKTHORN FAMILY															
W	Common Buckthorn	x	xx	x	xx	x		xx	xx	x	xx	xx		x	
E	Frangula										x				
ROSACEAE: ROSE FAMILY															
N	Mountain Mahogany	x													
N	Shiny-leaved Hawthorn	x	x	x	xx			x	xx		x			x	
E	Washington Hawthorn												x		
P	Shrubby Cinquefoil					x							x		

CODE:		Youngfld to PedBridge S of Creek	Youngfld to PedBridge N of Creek	PedBridge to Kipling	PedBridge to Kipling	Lenna Gulch	Lenna Pond	Kipling to Independ	Independ to 44th	44th to CBBridge	CBBridge to Wads	Wads to I-70 East	I-70 East to Marshall	Marshall to Harlan
		A	B	C	D	E	F	G	H	I	J	K	L	M
N	Wild Plum	<i>Prunus americana</i>		xx	xx	x			x					
N	Sand Cherry	<i>Prunus besseyi</i>				x								
N	Chokecherry	<i>Padus virginiana</i>		xx	xx	x		xx	xx	x	xx	xx		xx
N	Wood's Rose	<i>Rosa woodsii</i>		x	x	x			xx	x	x	x		x
N	Wild Raspberry	<i>Rubus idaeus melanolasius</i>		x	x				xx					
	SALICACEAE: WILLOW FAMILY													
N	Sandbar Willow	<i>Salix exigua</i>		xx	xx	xx		xx	xx	xx	xx	xx	xx	xx
N	Bluestem Willow	<i>Salix irrorata</i>										x	xx	
N	Yellow Willow	<i>Salix lutea</i>		x	xx		x		x	x	x	x	x	
	SOLANACEAE: NIGHTSHADE FAMILY													
E	Matrimony Vine, Wolfberry	<i>Lycium barbarum</i>		x	x						x			x
E	Euonymus	<i>Euonymus sp.</i>									x			x
W	Privet	<i>Ligustrum sp.</i>		x							x			x
	VINES													
	CUCURBOTACEAE: CUCUMBER FAMILY													
N	Mock Cucumber	<i>Echinocystis lobata</i>			x	x			x		x			
	MORACEAE: MULBERRY FAMILY													
N	Wild Hops	<i>Humulus lupulus</i>		x	x	x			x					x
	RANUNCULACEAE: BUTTERCUP FAMILY													
N	Western Virgins Bower	<i>Clematis ligustifolia</i>		x	x	x	x	x	x		xx	xx		xx
W	Oriental Clematis; Chinese Clematis	<i>Clematis orientalis</i>			x								x	x
	SOLANACEAE: NIGHTSHADE FAMILY													
W	Bitter Nightshade	<i>Solanum dulcamara</i>			xx	x	x				xx	xx	x	x
	VITACEAE: GRAPE FAMILY													
E	Virginia Creeper	<i>Parthenocissus inserta</i>		x	xx	xx	xx	x	xx	x	xx	xx	x	xx
N	Riparian Grape	<i>Vita riparia</i>			x									
	FORBS													
	ALLIACEAE: ONION FAMILY													
E	Wild Garlic	<i>Allium sativum</i>			x	x								x
	AMARANTHACEAE: AMARANTH FAMILY													
W	Prostrate Pigweed	<i>Amarathus graecizans</i>		x										
W	Rough Pigweed, C. Pigweed	<i>Amaranthus retroflexus</i>		x	x		x	x	x					x
U	Unknown Amaranth	<i>Amaranthus sp.</i>		x										
N	Cottonwool	<i>Froelichia gracilis</i>		x		x				x				
	ANACARDIACEAE: SUMAC FAMILY													
N	Poison Ivy	<i>Toxicodendron rydbergii</i>		xx	xx	xx	x	x	x	xx				
	APOCYNACEAE: DOGBANE FAMILY													
N	Dogbane, Indian Hemp	<i>Apocynum cannabinum</i>		xx	xx	xx	x	x	x	xx	xx	xx	xx	xx
E	Siberian Dogbane	<i>Apocynum sibiricum</i>		x	xx	xx			x					

CODE:		Youngfld to PedBridge S of Creek	Youngfld to PedBridge N of Creek	PedBridge to Kipling	PedBridge to Kipling	Lenna Gulch	Lenna Pond	Kipling to Independ	Independ to 44th	44th to CBBridge	CBBridge to Wads	Wads to I-70 East	I-70 East to Marshall	Marshall to Harlan
		A	B	C	D	E	F	G	H	I	J	K	L	M
	ASCLEPIADACEAE: MILKWEED FAMILY													
N	Showy Milkweed													
N	Swamp Milkweed													
N	Dwarf Milkweed													
	ASPARAGACEAE: ASPARAGUS FAMILY													
E	Wild Asparagus													
	ASTERACEAE: SUNFLOWER FAMILY													
N	Yarrow													
N	Western Ragweed													
W	Giant Ragweed													
N	Pearly Everlasting													
W	Burdock													
N	Common Sagewort													
N	Wild Tarragon													
N	Fringed Sage													
N	Prairie Sage													
N	Heather Aster													
N	Sickle-shaped Aster													
N	Western Aster													
N	New England Aster													
U	Unknown Aster													
N!	Bahia													
N	Nodding Beggar's Tick													
N	Beggar's Tick													
N	Threelaf Beggar's Tick													
W	Musk Thistle													
W	Cornflower													
W	Diffuse Knapweed													
W	Spotted Knapweed													
W	Pineapple Weed													
	Chrysanthemum leucanthemum													
W	Oxeye Daisy													
W	Chickory													
W	Bull Thistle													
W	Canada Thistle													
N	Horseweed													
N	Spreading Daisy													
N	Western Goldenrod													
N	Gaillardia; Blanket Flower													
N	Curlycup Gumweed													
N	Cutleaf Ironweed													
N	Common Sunflower													
N!	Tall Marsh Sunflower													
N	Prairie Sunflower													
N	Bush Sunflower													
N	Golden Aster													
N	Marsh Elder													
W	Compass Plant, Prickly Lettuce													
	Lactuca tatarica spp. pulchella													
W	Large-flowered Blue Lettuce													
W	Nipplewort													
N!	Gay Feather													
W	False Salsify													









CODE:		Youngfld to PedBridge S of Creek	Youngfld to PedBridge N of Creek	PedBridge to Kipling	PedBridge to Kipling	Lenna Gulch	Lenna Pond	Kipling to Independ	Independ to 44th	44th to CBBridge	CBBridge to Wads	Wads to I-70 East	I-70 East to Marshall	Marshall to Harlan	
		A	B	C	D	E	F	G	H	I	J	K	L	M	
	PAPAVERACEAE: POPPY FAMILY														
N	Prickly Poppy		x					x							
E	Unkown Red Poppy		x												
	PLANTANACEAE: PLANTAIN FAMILY														
W	English Plantain			xx	*	x	x	x	x	x	x		xx	x	
W	Common Plantain	x	x	xx	xx	x	x	x	xx	x	xx	xx	xx	x	
	POLYGONACEAE: BUCKWHEAT FAMILY														
N	Water Smartweed														
W	Black Bindweed	x	x												
N	Black Bindweed	I													
N	Scarlet Smartweed				x		x				x			xx	
W	Water Pepper	x			x						x	x			
W	Dock-leaved Smartweed	x													
W	Lady's Thumb				x		x			x					
N	Pennsylvania Smartweed						x								
W	Devil's Shoestring	xx	x	x	x	xx	xx		x		x	x		x	
W	Bushy Knotweed	xx							x		x				
N	Sheep Sorrel		x	x											
W	Curly Dock	xx	x	x	xx	xx	x	x	x		x	x	x	xx	
W	Bitter Dock										x				
N	Willow-leaved Dock		x		x	x	xx		x		x		x		
	PORTULACACEAE: PURSLANE FAMILY														
W	Common Purslane	x	x				xx						x	x	
N	Talinum			x	x										
	RANUNCULACEAE: BUTTERCUP F.														
N	Shore Buttercup		x				xx								
N	Water Crowfoot						x								
N	Macouny Butercup		x	x	x										
W	Creeping Buttercup					x				xx	x				
N!	Purple Meadow Rue		xx	xx					x						
	ROSACEAE: ROSE FAMILY														
N	Agrimony		x												
N	Yellow Avens	x	xx	x	x			x		x					
W	Soft Cinquefoil			x								x			
W	Sulfur Cinquefoil				x										
W	Norway Cinquefoil						x								
	RUBIACEAE: MADDER FAMILY														
N	False Cleavers				x										
	SCROPHULARIACEAE: FIGWORT F.														
N	Agalinis	x	x												
W	Dalmation Toadflax; Tall Butter-and Eggs	xx	x	x	x				x	xx		x	x		

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			A	B	C	D	E	F	G	H	I	J	K	L	M
W	Small Toadflax; Butter-and -Eggs	<i>Linaria vulgaris</i>	x	x	x	xx			x	xx	x	x		xx	xx
N!	Sidebells Penstemon	<i>Penstemon secundiflorus</i>		x											
N!	Tall One-sided Penstemon	<i>Penstemon virgatus</i> spp. <i>asa-grayi</i>	x	x	x					x	x		x		
W	Common Mullein	<i>Verbascum thapsus</i>	xx	x	xx	x	x	x	x	xx	xx	xx	xx	xx	xx
N	Water Speedwell	<i>Veronica anagallis-aquatica</i>	x	x	x		x	xx	xx				x		
	SOLANACEAE: POTATO FAMILY														
W	Buffalo Bur	<i>Solanum rostratum</i>													
W	Hairy Groundcherry	<i>Physalis heterophylla</i>	x	x		x				x					
	UMBELLIFERAE: PARSLEY FAMILY														
W	Poison Hemlock	<i>Conium maculatum</i>	x	xx	xx	xx	x		xx	x		xx	x	x	x
N	Water Hemlock	<i>Cicuta douglasii</i>		x											
		<i>Heracleum sphondylium</i> ssp. <i>mont.</i>		x	x				x						
N	Cow Parsnip														
	URTICACEAE: NETTLE FAMILY														
N	Stinging Nettle	<i>Urtica dioica</i>		x	x	x				x					
	VERBENACEAE: VERVAIN FAMILY														
W	Prostrate Vervain; Bracted Vervain	<i>Verbena bracteata</i>		x											
N!	Blue Vervain	<i>Verbena hastata</i>	x	x	x				x	xx	x	x	x	xx	x
	VIOLIACEAE: VIOLET FAMILY														
U	Unknown Violet	<i>Viola</i> sp.								x					x
	ZYGOPHYLLACEAE: CALTROP FAMILY														
W	Puncture Vine	<i>Tribulus terrestris</i>	x												
	GRASSES, SEDGES, RUSHES, ETC.														
	CYPERACEAE														
U	Sedge	<i>Carex</i> sp.	x	x	x	x	x		xx			xx	xx	xx	xx
N	Narrowleaf Sedge	<i>Carex eleocharis</i>	x	x											
N	Woolly Sedge	<i>Carex lanuginosa</i>	x	x	x	x			x	xx	xx	xx		x	
N	Wool - fruit Sedge	<i>Carex lasiocarpa</i>		x											
N	Pointed Broom Sedge	<i>Carex scoparia</i>	x	x	x				x	x					
N	Awl-fruit Sedge; Prickly Sedge	<i>Carex stipata</i>		x					x						
N	Fox Sedge	<i>Carex vulpinoidea</i>		x					x						
N	Nebraska Sedge	<i>Carex nebraskensis</i>	x	x				x							
N	Spikerush	<i>Eleocharis</i> sp.	x	xx		x		xx	x	x		xx	x		
N	Hardstem Bulrush	<i>Scirpus acutus</i>		x											
N	American Three Square	<i>Scirpus americana</i>	x	xx			x	xx				x			xx
N	Softstem Bulrush	<i>Scirpus validus</i>	x	x			x	x					x	x	x
N	Small Seed Bulrush	<i>Scirpus microcarpus</i>	x	x	x				x	x					
N	Pale Bulrush	<i>Scirpus pallidus</i>		x		x	x	xx	x				x		
	EQUISETACEAE: HORSETAIL FAMILY														

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		A	B	C	D	E	F	G	H	I	J	K	L	M
N	Field Horsetail	<i>Equisetum arvense</i>	x	x		x		x	x		x		x	
N	Tall Scouring Rush	<i>Hippochaete hyemalis</i>	x	x	x	x	x	x	xx				x	
N	Scouring Rush	<i>Hippochaete laevigata</i>		x	x									
JUNCACEAE: RUSH FAMILY														
N	Articulated Rush	<i>Juncus articulatus</i>		x			x							
N	Baltic Rush	<i>Juncus balticus</i>	x	xx	x	xx	xx		xx	x				x
N	Colorado Rush	<i>Juncus confusus</i>	x	x	x					x		x		
U	Unknown Rush #1													
U	Unknown Rush #2												x	
U	Unknown Rush #3											x		
N		<i>Juncus nodulus</i>		x							x			
POACEAE: GRASS FAMILY														
W	Jointed Goatgrass	<i>Aegilopus cylindrica</i>	x							x				
W	Crested Wheatgrass	<i>Agropyron cristatum</i>	xx	xx	x	xx	xx	xx	xx		x	xx	xx	xx
W	Intermediate Wheatgrass	<i>Agropyron intermedium</i>	x	x	x	xx	xx	*	xx	x	xx			x
W	Quackgrass	<i>Agropyron repens</i>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	x	x
N	Western Wheatgrass	<i>Agropyron smithii</i>		x	x			xx			x			x
N	Slender Wheatgrass	<i>Agropyron trachycaulum</i>												x
W	Redtop	<i>Agrostis gigantea</i>	x	x	x		x	xx	xx	xx	xx	xx	xx	xx
W	Meadow Foxtail	<i>Alopecurus pratensis</i>								x				
W	Cheat Grass	<i>Anisantha tectorum</i>	xx	xx	xx	xx	xx	x	xx	xx	xx	xx	xx	xx
N	Red Three Awn	<i>Aristida longiseta</i>	x											
W	Smooth Brome	<i>Bromopsis inermis</i>	xx	xx	xx	xx	xx	xx	?	?	xx	xx	xx	xx
W	Japanese Brome	<i>Bromus japonicus</i>	x	xx	x	xx		x	xx	x	xx		x	xx
N!	Buffalo Grass	<i>Buchloe dactyloides</i>	x	x	x								xx	
N!	Blue Grama Grass	<i>Chondrosium gracile</i>	x					x		x				x
N!	Hairy Grama	<i>Chondrosium hirsutum</i>						x						
W	Orchard Grass	<i>Dactylis glomerata</i>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx		x
N	Dichanthelium Grass	<i>Dichanthelium oligosanthes</i>		xx		xx	x		x	xx	xx			
N	Desert Saltgrass	<i>Distichlis spicata var. stricta</i>		x		x					xx			
N	Canada Wildrye	<i>Elymus canadensis</i>		x					x					
W	Stinkgrass	<i>Eragrostis ciliaris</i>	x											
W	Carolina Lovegrass	<i>Eragrostis pectinacea</i>	x											
U	Unknown Lovegrass	<i>Eragrostis sp.</i>	x											
W	Tall Fescue	<i>Festuca arundinacea</i>	x	xx	xx	xx	x		x	x	x	x	xx	x
N	Red Fescue	<i>Festuca rubra</i>			x									x
U	Unknown Bluebunch Fescue	<i>Festuca sp.</i>					x		x	x	x			
		<i>Glyceria maxima spp.</i>												
N!	American Mannagrass	<i>Grandis</i>	x	x				x	x					
N!	Fowl Mannagrass	<i>Glyceria striata</i>				x								
W	Foxtail Barley	<i>Hordeum jubatum</i>	xx	xx		x	x	xx		x	x			
W	Dissarticulating Barley	<i>Hordeum glaucum</i>	xx	xx	x	xx	xx							
W	Perennial Ryegrass	<i>Lolium perenne</i>	x						x		x			x
N	Alkali Muhly	<i>Muhlenbergia asperifolia</i>												x
N	Green Needle Grass	<i>Nasella viridula</i>			x	x								x
N	Witchgrass	<i>Panicum capillare</i>	x											
N	Switchgrass	<i>Panicum virgatum</i>	x	x							x			
N	Reed Canary Grass	<i>Phalaris arundinacea</i>	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
W	Timothy	<i>Phleum pratense</i>	x	x	x		x		x	x			x	
N	Giant Reed Grass	<i>Phragmites australis</i>		x	x	x			x	x		x	xx	
N	Canada Bluegrass	<i>Poa compressa</i>	x	xx	xx		x		x	x				



## **Appendix 2: Community Characterization Abstracts**

Community Characterization Abstracts (CCAs) are reference documents in which community types are described. The following CCAs are included to assist the City of Anderson Park Naturalist and other land managers in restoration and management. The first two are for communities that were documented in the Greenbelt during this survey. The others are included as examples of other communities that historically may have been present in the Greenbelt or Lewis Meadows. These communities may serve as goals to strive towards during restoration activities in the Greenbelt and Lewis Meadows.



**Colorado Natural Heritage Program  
Community Characterization Abstract**

**Global Scientific Name:** *Populus deltoides* ssp. *monilifera*/*Prunus virginiana*

**Global Common Name:** plains cottonwood/chokecherry

**State Scientific Name:** *Populus deltoides* ssp. *monilifera*/*Prunus virginiana*

**State Common Name:** plains cottonwood/chokecherry

**Global Rank:** G1Q

**Global Rank Comments:** Known from only one degraded occurrence on a foothill tributary to the South Platte River in Colorado. The taxonomy is tentative.

**State Rank:** S1Q

**State Rank Comments:** Known from only one degraded occurrence on a foothill tributary to the South Platte River in Colorado. The taxonomy is tentative.

**Regional Element Code:**

**State Element Code:**

**State:** CO

**Wetland System Type:** Palustrine

**USNVC:** *Populus deltoides* ssp. *monilifera* Mainly Cold-Deciduous Forests Without Evergreen Trees

**General Description and Comments:** This is a mature plains cottonwood (*Populus deltoides*) association with large trees that form an open to closed canopy. Open meadows dotted with small, thick pockets of *Prunus virginiana* (chokecherry) shrubs characterize the understory.

**Related Literature and Synonyms:** This association has been described in the literature, if not given quite the same name. Knopf (1985) describes a riparian woodland of “*Populus sargentii*, scattered willows, and *Prunus virginiana* (chokecherry)” as part of a riparian bird study. The *Populus deltoides*/*Bromopsis inermis* (plains cottonwood/smooth brome) plant association (Cooper and Cottrell 1990) has some *Prunus virginiana*. The *Prunus virginiana* Dominance Type (Hansen *et al.* 1988) can have an overstory layer of *Populus deltoides* in some stands. *Populus sargentii* is a synonym for *Populus deltoides* ssp. *monilifera* (plains cottonwood) and *Bromopsis inermis* is a synonym for *Bromus inermis* (smooth brome) (Kartesz 1994).

**Regional Distribution:** This association occurs in Montana (Hansen *et al.* 1988) and Colorado (Colorado Natural Heritage Program 1997).

**Distribution in Colorado:** This plant association only occurs in northeastern Colorado (Cooper and Cottrell 1990, Knopf 1985, Kittel *et al.* 1996).

*The following information is based on three quantitative plots (95LS16, 95GK16, 95GK17) from the South Platte River Basin (Colorado Natural Heritage Program 1996).*

**Elevation Range in Colorado:** 5600 ft (1700 m).

**Site Geomorphology:** This plant association occurs on upper terraces and elevated stream banks. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). The stream channel is narrow and braided with shifting islands and point bars (Rosgen's Channel Type: D5).

**Soil:** The soils consist of deep 28-32+ inches (70-80 cm) loamy sands alternating with layers of coarse sands and silty clays having high organic content.

**Vegetation:** This plant association is characterized by an open to closed canopy of 20-80% cover of tall, mature *Populus deltoides* ssp. *monilifera* (plains cottonwood). The shrub canopy includes *Prunus virginiana* (chokecherry) (30-35% cover), *Symphoricarpos occidentalis* (western snowberry) (5-45% cover), and *Celtis laevigata* (hackberry) (10%). A low-stature shrub canopy of about 0.3 meters (1.5 feet) consisting of *Symphoricarpos occidentalis* (western snowberry) (1-13%) can occur underneath the taller shrubs. The shrub canopy is discontinuous and occurs in patches that are interspersed with meadows of mostly non-native grasses including: *Elymus canadensis* (Canada wildrye) (5-25%), of *Bromus inermis* (smooth brome) (5-25% cover), *Elytrigia intermedia* (intermediate wheatgrass) (25%).

**Successional and Ecological Processes:**

Other plant associations found in Montana such as *Fraxinus pennsylvanica*/*Prunus virginiana* (green ash/chokecherry) and *Acer negundo*/*Prunus virginiana* (box-elder/chokecherry), indicate that the *Populus deltoides*/*Prunus virginiana* (plains cottonwood/chokecherry) plant association in Colorado may be a southern extension of one of the *Prunus virginiana* associations. The location of this association on terraces above the current stream channel and the large size of the trees indicate that it is a late-seral association.

Landowners and managers should understand that cottonwood woodlands grow within a continually changing alluvial environment due to the ebb and flow of the river. Riparian vegetation is constantly being “re-set” by flooding disturbance. Cottonwood communities are early, mid- or late seral, depending on the age class of the trees and the associated species of the stand. Cottonwoods, however, do not reach a climax stage as defined by Daubenmire (1952). Mature cottonwood stands do not regenerate in place, but regenerate by “moving” up and down a river reach. Over time, a healthy riparian area supports all stages of cottonwood communities.

The process of cottonwood regeneration is dependent on flooding disturbance. Periodic flooding allows cottonwood seedlings to germinate and become established on newly deposited, moist sandbars. If not damaged by floods in subsequent years, seedlings trap sediment as they grow larger. Each year the surface accumulates a little bit more flood born sediments, and the sandbar rises. The young forest community becomes increasingly stable as it grows older.

If not damaged by a large flood, excessive browsing from wildlife or livestock (including beaver), fire, or channel modifications (such as channel straightening or bank revetment), the young shrubby cottonwoods may grow into a mature riparian forest. At the same time, natural river processes of bank erosion, deposition and channel migration continue, creating fresh, new surfaces for cottonwood establishment. This results in a dynamic patchwork of different age classes, plant associations and habitats (The Nature Conservancy 1996).

As cottonwoods mature, other tree species may become established. If the land surface is subject to reworking by the river, the successional processes will start over with erosion and subsequent flooding deposition. If the land surface is not subject to alluvial processes, for example, a high terrace, the cottonwoods will be replaced by upland shrub and/or tree species that may comprise the climatic climax plant association for that area.

**Adjacent Riparian Vegetation:** Open stands of *Populus deltoides*/*Bromus inermis* (plains cottonwood/smooth brome) and the introduced *Salix fragilis* (crack willow) occupy upper terraces along with the *Populus deltoides*/*Prunus virginiana* (plains cottonwood/chokecherry) association. Closer to the stream are stands of *Salix exigua* (coyote willow) and open dry meadows of *Pascopyrum smithii* (western wheatgrass), *Dactylis glomerata* (orchardgrass), and other introduced grasses.

**Adjacent Upland Vegetation:** Surrounding uplands consist of rolling hills of *Quercus gambelii* (Gambel oak) shrublands and open, dry grasslands

**Management:** Because the regeneration and establishment of new stands of cottonwood is dependent upon flooding events, any alterations to the natural flow regime of a river can affect the cottonwood ecosystem. Upstream dams stabilize stream flows and reduce flooding frequency and magnitude. This results in fewer flood events that would allow for cottonwood stand regeneration. Without periodic disturbance by flooding, riparian areas become dominated by late-seral communities. These late-seral communities are dominated by more upland species, such as conifers in montane areas or other, more drought tolerant species in the foothill and plains environments.

Riparian forage productivity can be high and very palatable to livestock. Cottonwood seedlings and saplings are frequently browsed by cattle. Excessive grazing and browsing will reduce plant vigor and allow non-native plant species to gain a competitive advantage. Cottonwood dominated riparian areas in Colorado are best grazed moderately for short periods during the growing season or solely during the winter season. This maintains high forage quality and quantity.

Thick stands of *Prunus virginiana* (chokecherry) may preclude use by livestock (Hansen *et al.* 1989), while open stands may provide adequate grazing opportunities. However, season-long grazing may allow other shrubs to establish (Hansen *et al.* 1988) and increase the abundance and vigor of non-native grasses. With excessive browsing, shrub densities may be reduced altogether. *Prunus virginiana* (chokecherry) provides low

quality forage for livestock and eating excessive amounts of the leaves can be fatal (Hansen *et al.* 1995). Normally, livestock do not eat fatal quantities, except when other forage is scarce (Wasser 1982, Johnson and Nichols 1982).

*Prunus virginiana* (chokecherry) is a relatively fire resistant shrub and will vigorously sprout from surviving root crowns after a fire. This shrub can also be used in controlling erosion along streams (Hansen *et al.* 1995).

Date: 1998-06-02.

Authors: Kittel, G., E. VanWie, E., M. Damm.

**Colorado Natural Heritage Program  
Community Characterization Abstract**

**Global Scientific Name:** *Populus angustifolia/Prunus virginiana*

**Global Common Name:** narrowleaf cottonwood/chokecherry

**State Scientific Name:** *Populus angustifolia/Prunus virginiana*

**State Common Name:** narrowleaf cottonwood/chokecherry

**Global Rank:** G2

**Global Rank Comments:** This community is known from Colorado and Wyoming.

**State Rank:** S2

**State Rank Comments:** This association has been documented from just a couple of locations in Colorado. A total of five to ten stands are estimated to occur in the state. Additional inventory information (site locations, stand tables, etc.) is requested. This community is threatened by development and stream flow alterations.

**Regional Element Code:**

**State Element Code:** CRFEPOAN5A

**State:** CO

**Wetland System Type:** Palustrine

**USNVC:** *Populus angustifolia* Mainly Cold-Deciduous Forest Without Evergreen Trees

**General Description and Comments:** The *Populus angustifolia/Prunus virginiana* (narrowleaf cottonwood/chokecherry) plant association occurs only along low elevation, foothill streams. It is characterized by a thick growth of *Prunus virginiana* with an open overstory of *Populus angustifolia* and occasionally *Populus x acuminata* (lanceleaf cottonwood) or *Populus deltoides* (plains cottonwood). *Prunus virginiana* is considered a non-obligate riparian species because it grows on the outer edge of the riparian area.

**Related Literature and Synonyms:** The *Populus angustifolia/Prunus virginiana* (narrowleaf cottonwood/chokecherry) community type (Wyoming Natural Diversity Database 1989) is synonymous with the Colorado *Populus angustifolia/Prunus virginiana* plant association. A closely related community, *Acer negundo/Prunus virginiana* (boxelder/chokecherry), plant association (Kittel *et al.* 1994) includes stands that contain some *Populus angustifolia*.

Other closely related communities have *Populus deltoides* subsp. *monilifera* (plains cottonwood) in the overstory instead of *Populus angustifolia*. These communities include: the *Populus deltoides/Bromopsis inermis* (plains cottonwood/smooth brome) plant association which includes minimal cover of *Prunus virginiana* (Cooper and Cottrell 1990), stands of *Populus sargentii* (a synonym for *P. deltoides* subsp. *monilifera*) and *Prunus virginiana* near Livermore, Colorado (Knopf 1986), and the *Prunus virginiana* Dominance Type (Hansen *et al.* 1988) which can include *Populus deltoides* as an overstory component.

**Regional Distribution:** This plant association is reported from southeastern Wyoming (Wyoming Natural Diversity Database 1989) and Colorado (Colorado Natural Heritage Program 1997).

**Colorado Distribution:** This association is documented along the Colorado Front Range (Colorado Natural Heritage Program 1997).

*The following information is based on a total of three quantitative plots: two from the South Platte River Basin (96GK18, 98LS05), and one from the Arkansas River drainage (95RR15) (Colorado Natural Heritage Program 1997).*

**Elevation Range in Colorado:** 5600-8100 ft. (1700-2500 m).

**Site Geomorphology:** This plant association occurs on narrow, elevated, or steeply sloping stream banks and benches in narrow to moderately broad valleys, 100-400 feet (30-120 m) wide. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are broad, low gradient, and slightly sinuous (Rosgen's Stream Type: B3).

**Soils:** Soils are shallow sandy clay loams with many fine layers from fluvial deposition. Soils become skeletal at a depth of approximately 8 inches (20 cm).

**Vegetation:** This plant association is characteristic of ephemeral streams of the Front Range foothills and of lower elevation western slope streams. The overstory is dominated by *Populus angustifolia* (narrowleaf cottonwood) (7-49%) and *Populus x acuminata* (lanceleaf cottonwood) (31%). The shrub layer is thick with *Prunus virginiana* (chokecherry) (3-40%), *Symphoricarpos occidentalis* (snowberry) (25%), *Alnus incana* (thinleaf alder) (7%), and *Clematis ligusticifolia* (white virgin's-bower) (3%). The herbaceous undergrowth is diverse, depending on local site conditions and amount of past disturbance. Herbaceous species include: *Poa pratensis* (Kentucky bluegrass) (1-39%), *Bromus tectorum* (cheat grass) (32%), *Solidago canadensis* (25%), *Agrostis stolonifera* (13%), and *Carex lanuginosa* (wooly sedge) (8%).

**Successional and Ecological Processes:** Cottonwood woodlands grow within an alluvial environment that is continually changing due to the ebb and flow of the river. Riparian vegetation is constantly being "re-set" by flooding disturbance. Cottonwood communities are early, mid- or late-seral, depending on the age class of the trees and the associated species of the stand. Cottonwoods, however, do not reach a climax stage as defined by Daubenmire (1952). Mature cottonwood stands do not regenerate in place, but regenerate by "moving" up and down a river reach. Over time, a healthy riparian area supports all stages of cottonwood communities.

The process of cottonwood regeneration is well documented. Periodic flooding events can leave sandbars of bare, mineral substrate. Cottonwood seedlings germinate and become established on newly-deposited, moist sandbars. In the absence of large floods in

subsequent years, seedlings begin to trap sediment. In time, the sediment accumulates and the sandbar rises. The young forest community is then above the annual flood zone of the river channel.

In this newly elevated position, with an absence of excessive browsing, fire, and agricultural conversion, this cottonwood community can grow into a mature riparian forest. At the same time, the river channel continually erodes stream banks and creates fresh, new surfaces for cottonwood establishment. This results in a dynamic patchwork of different age classes, plant associations and habitats (The Nature Conservancy 1996).

As cottonwoods mature, other tree species may become established. If the landsurface is subject to reworking by the river, the successional processes will start over with erosion and subsequent flooding deposition. If the land surface is not subject to alluvial processes, for example a high terrace, the cottonwoods will be replaced by upland shrub or tree species that may comprise the climax plant association for that area.

The *Populus angustifolia/Prunus virginiana* plant association is a late-seral community. With time, the *Populus angustifolia* die, leaving patches of *Prunus virginiana*, which will persist as long as water reaches its tap roots.

**Adjacent Riparian Vegetation:** Adjacent riparian communities include *Populus angustifolia* (narrowleaf cottonwood) woodlands, *Salix exigua* (coyote willow) shrublands, and irrigated hay meadows.

**Adjacent Upslope Vegetation:** Neighboring hill slopes are vegetated with *Cercocarpus montanus* (mountain mahogany) and *Pinus edulis-Juniperus osteosperma* (pinyon pine-Utah juniper) woodlands.

**Management:** Because the regeneration and establishment of new stands of cottonwood is dependent upon flooding events, any alteration to the natural flow regime of a river can affect the cottonwood ecosystem. Upstream dams stabilize stream flows and reduce flooding frequency and magnitude. This results in fewer flood events that provide conditions for cottonwood stand regeneration. Without periodic disturbance by flooding, riparian areas become dominated by late-seral communities. These late-seral communities are dominated by more upland species, such as conifers in montane areas or other, more drought tolerant species in the foothill and plains environments.

Cottonwood seedlings and saplings are frequently browsed by cattle. However, thick stands of *Prunus virginiana* may preclude use by livestock (Hansen *et al.* 1989). Open stands may provide grazing opportunities, but season-long grazing in open stands increases the abundance and vigor of non-native grasses and, with excessive browsing, may reduce shrub densities. *Prunus virginiana* (common chokecherry) is low to fair in forage quality for livestock, but good for deer and elk (Wasser 1982, Johnson and Nichols 1982, as cited in Hansen *et al.* 1995). Eating excessive amounts of *Prunus virginiana* leaves can be poisonous to livestock (Hansen *et al.* 1995). However, livestock will not normally eat

fatal quantities, except when other forage is scarce (Wasser 1982, Johnson and Nichols 1982).

This plant association provides thermal cover for fish, livestock, large mammals and upland birds as well as providing fruit for birds and mammals. *Prunus virginiana* (common chokecherry) is tolerant of fire and will usually sprout after fires and grow into even denser stands. The dense growth habit of this shrub species and its ability to propagate by rhizomes make them useful for stream bank stabilization (Hansen *et al.* 1995).

Cottonwood dominated riparian areas in Colorado are best grazed moderately for short periods during the growing season or solely during the winter season. This maintains high forage quality and quantity (Hansen *et al.* 1995).

Date: 1998-01-10

Authors: Kittel, G., E. VanWie, M. Damm



**Colorado Natural Heritage Program  
Community Characterization Abstract**

**Global Scientific Name:** *Populus deltoides* ssp. *monilifera*/*Symphoricarpos occidentalis*

**Global Common Name:** plains cottonwood/western snowberry

**State Scientific Name:** *Populus deltoides* ssp. *monilifera*/*Symphoricarpos occidentalis*

**State Common Name:** plains cottonwood/western snowberry

**Global Rank:** G2/G3

**Global Rank Comments:** Only a few poor to fair quality occurrences are left. Known from eastern Montana, Wyoming and Colorado.

**State Rank:** S2

**State Rank Comments:** Known only from the South Platte and Arkansas Rivers in eastern Colorado.

**Regional Element Code:** CEG000660

**State Element Code:** CPFAPODE3D

**State:** CO

**Wetland System Type:** Palustrine

**USNVC:** *Populus deltoides* Temporarily Flooded Woodland

**General Description and Comments:** This is a mature *Populus deltoides* (plains cottonwood) plant association with widely-spaced, large trees and low-stature thickets 2-3 feet high (0.5-1 m) of *Symphoricarpos occidentalis* (snowberry) underneath the cottonwood canopy. Open areas of dry, weedy grasses occur between clumps of shrubs. Dips and swales of the floodplain may hold other wet plant associations such as stands of *Salix exigua* (coyote willow) or *Carex lanuginosa* (wooly sedge).

**Related Literature and Synonyms:** The *Populus deltoides* ssp. *monilifera*/*Symphoricarpos occidentalis* plant association (Hansen *et al.* 1995 and Jones and Walford 1995) is synonymous with the Colorado *Populus deltoides* ssp. *monilifera*/*Symphoricarpos occidentalis* plant association .

**Similar Communities:** Closely related communities include: the *Populus sargentii*/*Symphoricarpos occidentalis*/*Leymus cinereus* (plains cottonwood/western snowberry/giant wild rye) plant association (Johnston 1987) which has a more diverse woody overstory and *Leymus cinereus* (giant wild rye), the *Populus deltoides* (plains cottonwood), *Symphoricarpos occidentalis* (western snowberry) and *Salix exigua* (coyote willow) has been described in a riparian bird study along the South Platte River (Knopf 1985).

*Populus sargentii* is a synonym for *Populus deltoides* ssp. *monilifera*.

**Regional Distribution:** This plant association occurs in eastern Montana (Hansen *et al.* 1989), Wyoming (Jones and Walford 1995) and Colorado (Colorado Natural Heritage Program 1997).

**Distribution in Colorado:** This plant association occurs along the South Platte River floodplain (Christy 1973 and Kittel *et al.* 1996).

*The following information is based on fifteen quantitative plots: twelve from the South Platte River Basin (95LS29, 95LS30, 95LS35, 95LS36, 95LS39, 95LS43, 95LS44, 95GK38, 95GK39, 95GK49, 95GK53, 95GK58, 96AM86) and two from the Arkansas River watershed (98GK27, 95AM57) (Colorado Natural Heritage Program 1998).*

**Elevation Range in Colorado:** 3600-4200 ft (1000-1300 m).

**Site Geomorphology:** This plant association occupies elevated ridges and flat areas of the floodplain that are well-drained and slightly higher than most of the other surfaces. These sites tend to be further from the main channel. Due to the anastomosing (unionizing of stream branches) character of the South Platte River, this association can also occur close to the active channel, but is always on an elevated surface. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). The stream channel is broad and braided (Rosgen's Channel Type: D5).

**Soil:** Soils of this plant association show the most development of all the low elevation floodplain vegetation types. Typically, the profile is highly stratified, but with distinct soil development (B) layers. Soil textures range from silty clays to loamy sands. Following flooding in this plant association, there may be fresh sediment on the surface and mottling down to 15 inches (40 cm) in depth. A thin clay lens in each layer indicates that floods can reach heights up to 7 feet (2m) above the active channel.

**Vegetation:** This plant association has 30-90% cover of mature, widely spaced *Populus deltoides* ssp. *monilifera* (plains cottonwood). *Salix amygdaloides* (peach-leaved willow) is usually present, although sometime so widely spaces it can easily be missed (1-15% cover). Other trees that may be present include: *Fraxinus pennsylvanica* (green ash) (4-16%), *Ulmus pumila* (Siberian elm) (1-23%), *Salix fragilis* (crack willow) (79%), and *Acer negundo* (box elder) (84%). The shrub canopy is low-stature, with 3-65% cover of *Symphoricarpos occidentalis* (western snowberry). Other shrubs species that may be present include: *Toxicodendron rydbergii* (poison ivy) (2-13%). The herbaceous cover is low in undisturbed stands, and thick with introduced species in disturbed stands. Herbaceous species include: *Spartina pectinata* (prairie cordgrass) (6-41%), *Elymus lanceolatus* (thickspike wheatgrass) (1-38%), *Poa pratensis* (Kentucky bluegrass) (1-26%), *Bromus inermis* (smooth brome) (1-14%), and *Agrostis stolonifera* (red top) (32%).

**Successional and Ecological Processes:** The *Populus deltoides* spp. *monilifera*/*Symphoricarpos occidentalis* (plains cottonwood/western snowberry) plant association appears to be one of the last stages of cottonwood dominance on the

floodplain. The trees are large and widely spaced. As they topple and die, *Symphoricarpos occidentalis* (western snowberry) becomes the remaining dominant woody species. This late-seral plant association is located on the highest surfaces within the floodplain. Its lateral position varies greatly. Presumably, as islands throughout the wide braided channel become more stable and vegetated, thereby aggregating more sediments and experiencing fewer floods, succession advances to this late stage.

Landowners and managers should understand that cottonwood woodlands grow within a continually changing alluvial environment due to the ebb and flow of the river. Riparian vegetation is constantly being “re-set” by flooding disturbance. Cottonwood communities are early, mid- or late seral, depending on the age class of the trees and the associated species of the stand. Cottonwoods, however, do not reach a climax stage as defined by Daubenmire (1952). Mature cottonwood stands do not regenerate in place, but regenerate by “moving” up and down a river reach. Over time, a healthy riparian area supports all stages of cottonwood communities.

The process of cottonwood regeneration is dependent on flooding disturbance. Periodic flooding allows cottonwood seedlings to germinate and become established on newly deposited, moist sandbars. If not damaged by floods in subsequent years, seedlings trap sediment as they grow larger. Each year the surface accumulates a little bit more flood born sediments, and the sandbar rises. The young forest community becomes increasingly stable as it grows older.

If not damaged by a large flood, excessive browsing from wildlife or livestock (including beaver), fire, or channel modifications (such as channel straightening or bank revetment), the young shrubby cottonwoods may grow into a mature riparian forest. At the same time, natural river processes of bank erosion, deposition and channel migration continue, creating fresh, new surfaces for cottonwood establishment. This results in a dynamic patchwork of different age classes, plant associations and habitats (The Nature Conservancy 1996).

As cottonwoods mature, other tree species may become established. If the land surface is subject to reworking by the river, the successional processes will start over with erosion and subsequent flooding deposition. If the land surface is not subject to alluvial processes, for example, a high terrace, the cottonwoods will be replaced by upland shrub and/or tree species that may comprise the climatic climax plant association for that area.

Along the South Platte River, however, the removal of frequent flooding and ice-flows has encouraged riparian woody growth. Historically the South Platte River was a wide, shallow braided channel. It experienced significant floods every spring due to spring snow-melt runoff. In addition, the shallow waters of the S. Platte would freeze in the winter. These shallow sheets of ice would breakup and flow downstream in the early spring, damaging any plant life in its path. Finally, in late summer, the S. Platte would slow to barely a trickle, dropping the water table well below the ground surface of the well-drained, sandy bed material (USFWS 1994). This combination of flood, ice-flows and drought kept the S. Platte River bed clear of woody vegetation for ninety-percent of

the braided channel and stream banks. The present-day expanse of woody riparian growth along the S. Platte River is due to human-caused changes to the hydrologic character of the river.

In addition, it is possible that the increase in woody canopy is a one-time event. Initial hydrological changes that have caused an increase in woody growth will also result in their decline. Continued flood control, especially to the degree below the confluence with the North Platte River, has limited further cottonwood regeneration. With time the riparian forest will narrow as the outer-most trees die and channel becomes more entrenched, reducing the extent and diversity of habitats within the riparian vegetation mosaic (Friedman et al. 1997, Scott et al. 1996).

**Adjacent Riparian Vegetation:** Adjacent overflow channels have *Salix exigua*/mesic graminoid (coyote willow/mesic graminoid) stands or open meadows of *Spartina pectinata* (prairie cordgrass).

**Adjacent Upland Vegetation:** Adjacent upland communities include *Salix geyeriana* (Geyer willow) on rolling hills of sand, native short-grass prairie, or agricultural fields.

**Management:** Because the regeneration and establishment of new stands of cottonwood is dependent upon flooding events, any alterations to the natural flow regime of a river can affect the cottonwood ecosystem. Upstream dams stabilize stream flows and reduce flooding frequency and magnitude. This results in fewer flood events that would allow for cottonwood stand regeneration. Without periodic disturbance by flooding, riparian areas become dominated by late-seral communities. These late-seral communities are dominated by more upland species, such as conifers in montane areas or other, more drought tolerant species in the foothill and plains environments.

Riparian forage productivity can be high and very palatable to livestock. Cottonwood seedlings and saplings are frequently browsed by cattle. Excessive grazing and browsing will reduce plant vigor and allow non-native plant species to gain a competitive advantage. Cottonwood dominated riparian areas in Colorado are best grazed moderately for short periods during the growing season or solely during the winter season. This maintains high forage quality and quantity.

*Symphoricarpos occidentalis* (western snowberry) occurs on the floodplain of the South Platte River under a light to no grazing management regime. In Wyoming, it has been noted that *Symphoricarpos* (snowberry) becomes abundant in ungrazed areas (Thilenius and Brown 1990, as cited in Jones 1995). In Montana, *Symphoricarpos* (snowberry) understories are thought to be grazing induced phases of wetter riparian woodland community types (Hansen et al. 1991).

The palatability of *Symphoricarpos occidentalis* (western snowberry) for livestock is considered to be low to fair, but good for deer and elk (Wasser 1982, Johnson and Nichols 1982, as cited in Hansen et al. 1995). *Symphoricarpos occidentalis* is also considered to be excellent for streambank stabilization due to its formation of dense

stands and its spreading rhizomes. *Symphoricarpos occidentalis* (western snowberry) is tolerant of fire and will usually sprout afterwards and grow into an even denser stand (Hansen *et al.* 1995).

Date: 1999-06-02.

Authors: Kittel, G., E. VanWie, M. Damm.

**Colorado Natural Heritage Program  
Community Characterization Abstract**

**Global Scientific Name:** *Populus angustifolia/Salix exigua*

**Global Common Name:** narrowleaf cottonwood/coyote willow

**State Scientific Name:** *Populus angustifolia/Salix exigua*

**State Common Name:** narrowleaf cottonwood/coyote willow

**Global Rank:** G4

**Global Rank Comments:** This is a common, early-seral stage of most *Populus angustifolia* dominated associations. It occurs in New Mexico and Colorado, and is expected to occur in Wyoming and Montana.

**State Rank:** S4

**State Rank Comments:** This association is widespread with >100 estimated stands. It is an important indicator of fluvial process and riparian health. It is an early-seral stage of other *Populus angustifolia* communities, many of which are imperiled or vulnerable. Many streams and rivers support this stage of cottonwood regeneration, however, channelization and flood control has curtailed cottonwood growth and stand development beyond this stage.

**Regional Element Code:** CEG000654

**State Element Code:** CWFDP0AN3C

**State:** CO

**Wetland System Type:** Palustrine

**USNVC:** *Populus angustifolia* Mainly Cold-Deciduous Forest Without Evergreen Trees

**General Description and Comments:** This is a very common plant association of young seedling and sapling *Populus angustifolia* (narrowleaf cottonwood) intermixed with *Salix exigua* (coyote willow). The association occupies point bars, gravel bars, benches and low areas that are flooded annually.

**Related Literature and Synonyms:** The *Populus angustifolia/Salix exigua* plant association described by Durkin *et al.* (1994 and 1995) is synonymous with the Colorado *Populus angustifolia/Salix exigua* plant association. A closely related community, *Populus angustifolia*/recent alluvial bar (Jones 1990, Hansen *et al.* 1995), is not considered synonymous because many stands do not have *Salix exigua* (coyote willow) present. Three Colorado plots fit this description (93RR22, 94JB39, and 95RG01).

**Similar Communities:** Other closely related communities include: the *Populus angustifolia/Salix exigua* Habitat Type (Hess 1981, Baker 1984) which has significant *Betula occidentalis* present, and the *Populus angustifolia/Salix exigua-Betula fontinalis* (narrowleaf cottonwood/coyote willow-river birch) plant association (Johnston 1987).

**Regional Distribution:** The *Populus angustifolia/Salix exigua* plant association occurs in New Mexico and Colorado (Durkin *et al.* 1994, 1995, Colorado Natural Heritage Program 1997).

**Distribution in Colorado:** This plant association occurs in the Yampa, White, Gunnison, Rio Grande and Arkansas River Basins, and the San Juan and Rio Grande National Forests (Kittel and Lederer 1993, Kittel *et al.* 1994, Kittel *et al.* 1996, Johnston 1987, Richard *et al.* 1996, Kittel *et al.* 1999).

*The following information is based on a total of eighteen quantitative plots: two from the Yampa River Basin (90MR63, 90MR108), three from the White River Basin (92GK13, 92NL41, 92NL25), one from the Rio Grande Basin (97MD24), five from the Upper Arkansas River Basin (95AM08, 95AM10, 95AM49, 95AM16, 95GK70), two from the South Platte River Basin (95LS21, 95RR06), two from the San Juan National Forest (93C111, 94DR14), and three from the lower San Juan River Basin (98BG43, 98BG44, 98DZ10) (Colorado Natural Heritage Program 1998).*

**Elevation Range in Colorado:** 6300-7500 ft. (1900-2300 m).

**Site Geomorphology:** This plant association occurs on recently flooded point bars, low terraces, and stream benches. It is usually well within the active channel and immediate floodplain of the stream and does not occur more than 3-6 feet (1-2 m) above the high-water mark. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are wide and slightly sinuous (Rosgen's Channel Type: B3, B4) or wide and moderately sinuous (Rosgen's Channel Type: C3, C4).

**Soil:** Soils are skeletal (40% gravel and 10-20% cobbles) and shallow, 15 inches (35 cm) deep, sands, sandy loams, sandy clay loams, or silty clays over coarse alluvial material.

**Vegetation:** This plant association represents the early, successional stage of nearly all *Populus angustifolia* (narrowleaf cottonwood) dominated plant associations, and is characterized by an open to dense stand *Populus angustifolia* (narrowleaf cottonwood) young trees (> 12 cm dbh) (20-76% cover), seedlings (< 1.5 m in height) (1-3% cover), and saplings (< 12 cm in diameter) (10-44% cover) with *Salix exigua* (coyote willow) (3-64%). *Populus x acuminata* (lance-leaf cottonwood) may also be present in similar age classes (8-10%). Other, more widely scattered trees may also be present, occurring in less than 20% of sampled stands, and include: *Abies lasiocarpa* (subalpine fir) (1-2%), *Picea engelmannii* (Engelmann spruce) (3%), *Pinus ponderosa* (ponderosa pine) (15%), and *Picea pungens* (Colorado blue spruce) (6-12%).

The shrub canopy is typically at the same height of the seedling and sapling cottonwood trees, although older, transitional, stands will have taller, more mature trees with *Salix exigua* as an understory. *Salix exigua* (coyote willow) is always present with 3-64% cover. Other shrubs that may be present include: *Alnus incana* (thin-leaf alder) (3-70%), *Salix lasiandra* var. *caudata* (Pacific willow) (1-20%), *Salix eriocephala* var. *ligulifolia* (strap-leaf willow) (1-3%), *Salix boothii* (Booth willow) (1-60%), *Salix drummondiana* (Drummond willow) (3-10%), *Salix bebbiana* (Bebb willow) (10%), and *Salix lasiandra* var. *lasiandra* (whiplash willow) (10%).

The herbaceous undergrowth is generally weedy (non-native) and sparse from frequent flooding disturbance. Weedy species include: *Poa pratensis* (Kentucky bluegrass) (1-20%), *Trifolium repens* (white clover) (1-40%), *Agrostis stolonifera* (redtop) (1%), *Linaria vulgaris* (butter-and-eggs) (14%), *Taraxacum officinale* (1-20%), *Medicago lupulina* (1-20%), *Juncus balticus* (wire grass) (1-10%), *Phleum pratense* (1-10%), *Melilotus officinalis* (sweet clover) (1-30%), *Dactylis glomerata* (orchard grass) (1-10%), and *Elytrigia repens* (quack grass) (1-10%). Native herbaceous species that can be present include: *Equisetum arvense* (field scouring rush) (1-33%), *Achillea millefolium* (yarrow) (1-3%), *Rudbeckia laciniata* (lack-eyed Susan) (1-3%), *Carex microptera* (big head sedge) (1%), *Carex lanuginosa* (wooly sedge) (1-5%), and *Mentha arvensis* (field mint) (1-3%).

Three plots (93RR22, 94JB39, 95RG01, 96AM14) have abundant *Populus angustifolia* seedlings and little to no *Salix exigua* (coyote willow) present. These can be considered part of the *Populus angustifolia*/Recent Alluvial Bar association described by George Jones in Wyoming (bar (Jones 1990, Hansen *et al.* 1995). See comments under the Related Literature and Synonyms section

**Successional and Ecological Processes:** *Populus angustifolia*/*Salix exigua* (narrowleaf cottonwood/coyote willow) is one of the earliest successional stages of a cottonwood-dominated plant association. *Populus angustifolia* and *Salix exigua* seeds often germinate together on freshly deposited sandbars. If the site becomes more stable and less frequently flooded (i.e., the stream channel migrates away from the site), the *Populus angustifolia* saplings mature, but the *Salix exigua* population eventually declines. The association can become one of several mid- or late-seral floodplain types including *Populus angustifolia*/*Alnus incana* (narrowleaf cottonwood/thinleaf alder) and *Populus angustifolia*/*Cornus sericea* (narrowleaf cottonwood/red-osier dogwood).

Landowners and managers should understand that cottonwood woodlands grow within a continually changing alluvial environment due to the ebb and flow of the river. Riparian vegetation is constantly being “re-set” by flooding disturbance. Cottonwood communities are early, mid- or late-seral, depending on the age class of the trees and the associated species of the stand. Cottonwoods, however, do not reach a climax stage as defined by Daubenmire (1952). Mature cottonwood stands do not regenerate in place, but regenerate by “moving” up and down a river reach. Over time, a healthy riparian area supports all stages of cottonwood communities.

The process of cottonwood regeneration is dependent on flooding disturbance. Periodic flooding allows cottonwood seedlings to germinate and become established on newly deposited, moist sandbars. If not damaged by floods in subsequent years, seedlings trap sediment as they grow larger. Each year the surface accumulates a little bit more flood born sediments, and the sandbar rises. The young forest community becomes increasingly stable as it grows older.

If not damaged by a large flood, excessive browsing from wildlife or livestock (including beaver), fire, or channel modifications (such as channel straightening or bank revetment), the young shrubby cottonwoods may grow into a mature riparian forest. At the same



time, natural river processes of bank erosion, deposition and channel migration continue, creating fresh, new surfaces for cottonwood establishment. This results in a dynamic patchwork of different age classes, plant associations and habitats (The Nature Conservancy 1996).

As cottonwoods mature, other tree species may become established. If the land surface is subject to reworking by the river, the successional processes will start over with erosion and subsequent flooding deposition. If the land surface is not subject to alluvial processes, for example, a high terrace, the cottonwoods will be replaced by upland shrub and/or tree species that may comprise the climatic climax plant association for that area.

**Adjacent Riparian Vegetation:** Thick stands of *Salix exigua* (coyote willow) or *Alnus incana* (thinleaf alder) shrublands often occur within the same reach as *Populus angustifolia*/*Salix exigua*. *Populus angustifolia*/*Cornus sericea* (narrowleaf cottonwood/red-osier dogwood) and *Populus angustifolia*/*Amelanchier* spp. (narrowleaf cottonwood/serviceberry) forests occur on higher terraces.

**Adjacent Upland Vegetation:** *Pinus ponderosa* (ponderosa pine) forests, *Pinus edulis*-*Juniperus monosperma* (pinyon pine-one-seed juniper) woodlands, *Quercus gambelii* (Gambel oak) scrub, and *Artemisia tridentata* (big sagebrush) shrublands occur on adjacent rocky valley slopes.

**Management:** Because the regeneration and establishment of new stands of cottonwood is dependent upon flooding events, any alteration to the natural flow regime of a river can affect the cottonwood ecosystem. Upstream dams stabilize stream flows and reduce flooding frequency and magnitude. This results in fewer flood events that provide conditions for cottonwood stand regeneration. Without periodic disturbance by flooding, riparian areas become dominated by late-seral communities. These late-seral communities are dominated by upland species, such as conifers in montane areas or other, more drought tolerant species in the foothill and plains environments.

Forage productivity for this plant association can be high and very palatable to livestock. Cottonwood and willow seedlings and saplings are frequently browsed by cattle. Excessive grazing and browsing will reduce plant vigor and allow non-native plant species to gain a competitive advantage. Cottonwood-dominated riparian areas in Colorado are best grazed moderately for short periods during the growing season or solely during the winter season. This maintains high forage quality and quantity (Hansen *et al.* 1995).

*Salix exigua* (coyote willow) is an excellent stream bank stabilizer that can be planted as stems or wattles for restoration purposes. However, cattle may browse the young shoots in the winter and kill newly planted poles.

Date: 1999-06-01.

Authors: Kittel., G. E. VanWie, M. Damm.

**Colorado Natural Heritage Program  
Community Characterization Abstract**

**Global Scientific Name:** *Populus deltoides*-(*Salix amygdaloides*)/*Salix exigua*

**Global Common Name:** broad-leaf cottonwood-(peach leaf willow)/coyote willow

**State Scientific Name:** *Populus deltoides*/*Salix exigua*

**State Common Name:** broad-leaf cottonwood/coyote willow

**Global Rank:** G4

**Global Rank Comments:** This and similar associations are located throughout the western Great Plains, and on larger, low elevation rivers on the western slope. It was once a patchy type scattered along the South Platte and Platte Rivers. Today it may be more abundant than historically due to the altered hydrologic character of the river. It may decline as the Platte becomes more narrow and entrenched. Also, while this early seral stage of cottonwoods is common, the later-seral, older cottonwood stands that occur as a result of channel migration, are becoming very rare due to hydrologic manipulation of stream flows. The presence of this early seral association may be an indication of some resemblance to natural stream flow, but stands must be monitored if all stages of cottonwood riparian communities are to be protected along river corridors.

**State Rank:** S4

**State Rank Comments:** Same as Global comments.

**Regional Element Code:** CEGL000659

**State Element Code:** CPFAPODE3A

**State:** CO

**Wetland System Type:** Palustrine

**USNVC:** *Populus deltoides* Mainly Cold Deciduous Forest Without Evergreen Tree

**General Description and Comments:** This is an early seral association with a mix of sapling and pole sized *Populus deltoides* (broad-leaf cottonwood, either subspecies *monilifera* (plains cottonwood) or subspecies *wislizenii* (Rio Grande cottonwood)) intermixed with *Salix exigua* (coyote willow). It is recognized as the younger stage of older plains cottonwood associations that have more widely spaced trees. This association is often located on low stream banks and islands, but can also occur on overflow channels away from the main stream channel. It typically has a fairly dense tree canopy with little herbaceous ground cover.

**Related Literature and Synonyms:** This association used to be separated into two types: *Populus deltoides* ssp. *wislizenii*/*Salix exigua* and *Populus deltoides* ssp. *monilifera*-(*Salix amygdaloides*)/*Salix exigua*. They are hereby lumped into one name: *Populus deltoides*/*Salix exigua* Plant Association in Colorado. The following four community names are considered synonymous with the Colorado *Populus deltoides*/*Salix exigua* Plant Association: 1) *Populus deltoides* ssp. *monilifera*-(*Salix amygdaloides*)/*Salix exigua* described by Jones and Walford (1995), 2) the “mixed community” consisting of *Populus sargentii*, *Salix amygdaloides*, and *Salix interior* (coyote willow) described by Christy (1973), 3) the *Populus sargentii*/*Salix* spp. plant association described by

Johnston (1987), and 4) the *Populus deltoides* ssp. *wislizenii*/*Salix exigua* community type described from New Mexico by Durkin *et al.* (1995).

**Similar Communities:** Closely related communities include the *Populus fremontii*/*Salix amygdaloides* (plains cottonwood/peach-leaved willow)/mesic shrub/mesic graminoid-forb plant association (Dick-Peddie 1993) which has similar co-dominant species and environmental setting, but is dominated by a different species of cottonwood, and the *Populus deltoides*/*Salix amygdaloides*-*Salix nigra* (plains cottonwood/peach-leaved willow) (Midwestern Heritage Task Force 1994) and the *Salix amygdaloides*-*Salix exigua*-*Salix lucida* ssp. *caudata* (peach-leaved willow-coyote willow-Pacific willow) plant associations (Bourgeron and Engelking 1994), which have different *Salix* (willow) species in the understory.

Note that *Populus sargentii* is a synonym for *Populus deltoides* ssp. *monilifera* (Kartesz 1994).

**Regional Distribution:** This association occurs in Wyoming (Jones and Walford 1995), New Mexico, and Colorado (Colorado Natural Heritage Program 1998). It is expected to occur in Oklahoma, Texas, South Dakota, and Kansas (Midwest Conservation Science 1996).

**Distribution in Colorado:** In Colorado this plant association occurs along streams and rivers at the base of the Front Range foothills east to the Nebraska state line (Christy 1973, Johnston 1987, Kittel *et al.* 1996) and along the Colorado and San Juan Rivers and their tributaries west to the Utah and New Mexico state lines (Colorado Natural Heritage Program 1998).

*The following information is based on fifteen quantitative plots: nine from the lower South Platte River Basin (95LS06, 95LS11, 95LS31, 95LS41, 95LS42, 95GK07, 95GK43, 95GK50, 95GK52, 96AM18), two from the Comanche National Grassland (95MM37, 95MM64), two from the San Miguel/Dolores River Basin (91NL01, 91NL02), and from the (98BG31) (Colorado Natural Heritage Program 1998).*

**Elevation Range in Colorado:** 3500-6500 ft (1000-2000 m)

**Site Geomorphology:** This plant association occurs on young, alluvial surfaces such as point bars, low stream banks, and overflow areas. It occurs on immediate stream banks and low overflow areas near the main river channel, and on the floodplain of meandering, low to moderate gradient (0.5-3.0%) streams with silt and sand stream beds. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Channels are broad and braided (Rosgen's Channel Type: C5, D5). Along smaller washes and incised reaches (e.g. Kiowa and West Bijou Creeks), the plant association occurs on higher terraces, where periodic summer flash floods disturb the entire floodplain. The washes have flat-bottomed, sandy beds (Rosgen's Channel Type: F5).

**Soil:** Soils are typically fresh, alluvial material with little soil development. Textures are predominately loose, friable sands interspersed with narrow bands of clay loams and sandy clays.

**Vegetation:** This association is characterized by seedling, sapling and pole-sized *Populus deltoides* (broad-leaf cottonwood, either ssp. *monilifera* “plains” or ssp. *wislizenii* “Rio Grande”) mixed with *Salix exigua* (coyote willow) on sand bars, point bars, and other low, frequently flooded areas. *Populus deltoides* (cottonwood) canopy cover ranges from 1 to 45% and *Salix exigua* (coyote willow) canopy cover ranges from 10% to 52%. The total height of this association is often under 1.5 m (4 ft), but a few stands have near-mature sized cottonwood trees, and represent the last transition to older, cottonwood types as the *Salix exigua* (coyote willow) is shaded out by the overstory canopy of cottonwoods. Other sapling and seedling tree species may be present; on the eastern slope, these include: *Salix amygdaloides* (peach-leaf willow) (2-27%), *Fraxinus pennsylvanica* (green ash) (5-19%), and *Ulmus pumila* (Siberian Elm) (32%). Other shrubs that may be present include: *Salix eriocephala* var. *ligulifolia* (strap leaf willow) (1%), and *Vitis riparia* (wild grape) (8%).

The herbaceous understory is relatively sparse with *Xanthium strumarium* (cocklebur) (1-10%), *Melilotus officinalis* (sweet clover) (1-26%), *Poa pratensis* (Kentucky bluegrass) (1-19%), *Bromus inermis* (smooth brome) (14-16%), *Bromus tectorum* (cheat grass) (2-19%), *Scirpus pungens* (leafy bulrush) (1%), and *Eleocharis palustris* (creeping spikerush) (1%). If the stand is very moist, *Carex lanuginosa* (wooly sedge) may be abundant with 25% cover.

**Successional and Ecological Processes:** The *Populus deltoides*/*Salix exigua* (broad-leaf cottonwood/coyote willow) plant association is an early to mid-seral stage. With time and tree growth, *Salix exigua* (coyote willow) is shaded by taller cottonwoods, and becomes less important. Christy (1973) suggests that this vegetation type may be transitional between an all *Salix exigua* (coyote willow) dominated association and an all *Populus deltoides* (cottonwood) dominated association. However, he considers this plant association to be a response to intermediate environmental conditions, namely intermediate soil moisture where *Salix exigua* dominates the wettest soils and *Populus deltoides* dominates the driest.

*Salix amygdaloides* (peach-leaved willow), commonly present in eastern slope occurrences of this association, also requires stream flooding for regenerations. *Salix amygdaloides* is a pioneer species that needs moist, sparsely-vegetated alluvium to become established from seed (Johnson, 1992, as cited by Jones and Walford 1995).

Landowners and managers should understand that cottonwood woodlands grow within a continually changing alluvial environment due to the ebb and flow of the river. Riparian vegetation is constantly being “re-set” by flooding disturbance. Cottonwood communities are early, mid- or late seral, depending on the age class of the trees and the associated species of the stand. Cottonwoods, however, do not reach a climax stage as defined by Daubenmire (1952). Mature cottonwood stands do not regenerate in place,

but regenerate by “moving” up and down a river reach. Over time, a healthy riparian area supports all stages of cottonwood communities.

The process of cottonwood regeneration is dependent on flooding disturbance. Periodic flooding allows cottonwood seedlings to germinate and become established on newly deposited, moist sandbars. If not damaged by floods in subsequent years, seedlings trap sediment as they grow larger. Each year the surface accumulates a little bit more flood born sediments, and the sandbar rises. The young forest community becomes increasingly stable as it grows older.

If not damaged by a large flood, excessive browsing from wildlife or livestock (including beaver), fire, or channel modifications (such as channel straightening or bank revetment), the young shrubby cottonwoods may grow into a mature riparian forest. At the same time, natural river processes of bank erosion, deposition and channel migration continue, creating fresh, new surfaces for cottonwood establishment. This results in a dynamic patchwork of different age classes, plant associations and habitats (The Nature Conservancy 1996).

As cottonwoods mature, other tree species may become established. If the land surface is subject to reworking by the river, the successional processes will start over with erosion and subsequent flooding deposition. If the land surface is not subject to alluvial processes, for example, a high terrace, the cottonwoods will be replaced by upland shrub and/or tree species that may comprise the climatic climax plant association for that area.

**Adjacent Riparian Vegetation:** Older stands of *Populus deltoides* (plains cottonwood) often occur on higher terraces, while pure stands of other *Salix* (willow) and *Carex* (sedge) species occur within the riparian mosaic of the channel and floodplain. Along the San Miguel River on the western slope, mature stands of older *Populus deltoides* ssp. *wislizenii* (Rio Grande cottonwoods) occur with *Rhus trilobata* (skunk brush) in the understory.

**Adjacent Upland Vegetation:** Foothill streams often have stands of *Pinus ponderosa* (ponderosa pine) or *Quercus gambelii* (Gambel oak) shrublands on outcrops. The mainstem of the South Platte River has sand sage, grasslands on adjacent rolling hills, and agricultural fields. Along the San Miguel River on the western slope, uplands have *Artemisia* spp. (sagebrush) and *Chrysothamnus* (rabbitbrush) shrublands and *Pinus edulis-Juniperus* spp. (pinyon pine and juniper) woodlands

**Management:** Because the regeneration and establishment of new stands of *Populus deltoides* (cottonwood) are dependent upon flooding events, any alterations to the natural flow regime of a river can affect the cottonwood ecosystem. Upstream dams stabilize stream flows and reduce flooding frequency and magnitude. This results in fewer flood events that would allow for *Populus deltoides* stand regeneration. Without periodic disturbance by flooding, riparian areas become dominated by late-seral communities. These late-seral communities are dominated by more upland species, such as conifers in montane areas or other, more drought tolerant species in the foothill and plains environments.

Along the South Platte River, however, the removal of frequent flooding and ice-flows has encouraged riparian woody growth. Historically the South Platte River was a wide, shallow braided channel. It experienced significant floods every spring due to spring snow-melt runoff. In addition, the shallow waters of the S. Platte would freeze in the winter. These shallow sheets of ice would breakup and flow downstream in the early spring, damaging any plant life it its path. Finally, in late summer, the S. Platte would slow to barely a trickle, dropping the water table well below the ground surface of the well-drained, sandy bed material (USFWS 1994). This combination of flood, ice-flows and drought kept the S. Platte River bed clear of woody vegetation for ninety-percent of the braided channel and stream banks. The present-day expanse of woody riparian growth along the S. Platte River is due to human-caused changes to the hydrologic character of the river.

In addition, it is possible that the increase in woody canopy is a one-time event. Initial hydrological changes that have caused an increase in woody growth will also result in their decline. Continued flood control, especially to the degree below the confluence with the North Platte River, has limited further cottonwood regeneration. With time the riparian forest will narrow as the outer-most trees die and channel becomes more entrenched, reducing the extent and diversity of habitats within the riparian vegetation mosaic (Friedman et al.1997, Scott et al. 1996).

Along the Colorado River, the early seral cottonwood community has become disproportionately more abundant than older cottonwood stands. The Colorado is so regulated today, it is become entrenched and is much less dynamic. Older, mature cottonwood stands on upper terraces will not be replaced as they die out.

Riparian forage productivity can be high and very palatable to livestock. Cottonwood seedlings and saplings are frequently browsed by cattle. However, thick willow stands of this plant association may actually prevent livestock use. Excessive grazing and browsing will reduce plant vigor and allow non-native plant species to gain a competitive advantage. Cottonwood dominated riparian areas in Colorado are best grazed moderately for short periods during the growing season or solely during the winter season. This maintains high forage quality and quantity.

Once established, *Salix amygdaloides* is a very good streambank stabilizer and should be protected by managers (Hansen *et al.* 1995). *Salix exigua* is also very useful in streambank stabilization in that it can rapidly colonize and spread on disturbed areas (Hansen *et al.* 1995). It is believed that fire in this type will result in the willow species vigorously sprouting afterward.

Date: 1999-06-02.

Authors: Kittel, G., E. VanWie, M. Damm.

**Colorado Natural Heritage Program  
Community Characterization Abstract**

**Global Scientific Name:** *Populus angustifolia/Symphoricarpos alba*

**Global Common Name:** narrowleaf cottonwood/snowberry

**State Scientific Name:** *Populus angustifolia/Symphoricarpos spp.*

**State Common Name:** narrowleaf cottonwood/snowberry

**Global Rank:** G3

**Global Rank Comments:** This plant association is documented from seven locations, some east of the Continental Divide, some on the west.

**State Rank:** S3

**State Rank Comments:** This association is known from five stands on the Cache la Poudre River, and two from the South west corner of the state, in the San Juan River watershed. More occurrences are likely to be found within its elevation range. More than 20 stands are estimated to occur in the state. Additional inventory information (site locations, stand tables, etc.) is needed to verify this rank.

**Regional Element Code:** C EGL002648

**State Element Code:** CWFSACNE2A

**State:** CO

**Wetland System Type:** Palustrine

**USNVC:** *Populus angustifolia* Mainly Cold-Deciduous Forest Without Evergreen Trees

**General Description and Comments:** The *Populus angustifolia/Symphoricarpos alba* (narrowleaf cottonwood/snowberry) plant association is limited to small patches in Front Range canyons, and along narrow streams on the western slope. In Colorado, we include stands dominated by other *Symphoricarpos* species within this community.

**Related Literature and Synonyms:** Two closely related communities, *Populus angustifolia/Rosa woodsii* (narrowleaf cottonwood/woods rose) community type (Padgett *et al.* 1989) and *Populus angustifolia/Poa pratensis* (narrowleaf cottonwood/Kentucky bluegrass) (Padgett *et al.* 1989, Youngblood *et al.* 1985), include some stands with *Symphoricarpos* (snowberry). However, these communities appear to occur in drier environments and may be disturbance-induced from livestock grazing and recreational use, unlike the Colorado *Populus angustifolia/Symphoricarpos alba* plant association.

**Regional Distribution:** This plant association occurs in Colorado (Colorado Natural Heritage Program 1997).

**Distribution in Colorado:** This association has been documented from the Cache la Poudre River in the foothills of northern Colorado (Kittel 1994), and along streams of the San Juan National Forest and San Juan River watershed (Colorado Natural Heritage Program 1998).

The following information is based on a total of seven quantitative plots: five from the Cache la Poudre River (Kittel 1994), one from the San Juan National Forest (94DR02) and one from the lower San Juan River Watershed (98DZ08).

**Elevation Range in Colorado:** 5500-7650 ft. (1700-2200 m).

**Site Geomorphology:** This plant association occurs on upper terraces and outer edges of floodplains in medium to wide valleys, 500-1800 feet (150-550 m). This association generally occurs 5-30 feet (1.5-6 m) above the channel bankfull level. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). The stream channel is wide and shallow and slightly meandering (Rosgen's Channel Type: B4, A6).

**Soils:** Soils are deep sandy loams and clay loams, highly stratified, and with little coarse material present.

**Vegetation:** The overstory of this plant association is characterized by 40-75% cover of mature *Populus angustifolia* (narrowleaf cottonwood) and 8-20% cover of *Juniperus scopulorum* (Rocky Mountain juniper). The shrub layer in mesic stands is dominated by 20-90% cover of *Symphoricarpos albus* (white snowberry) on the eastern slope, and by *Symphoricarpos rotundifolia* (snowberry) on the western slope. Other shrub species, which may or may not be present include: *Prunus virginiana* (common chokecherry) (1-5%), *Quercus gambelli* (Gambles oak) (13-15%), *Ribes lacustre* (swamp black gooseberry) (1-3%), *Ribes cereum* (wax currant) (1-3%), *Alnus incana* (thinleaf alder) (1-5%), *Betula occidentalis* (river birch) (1-5%), and *Salix bebbiana* (Bebb willow) (1-10%). Xeric stands are less diverse and have a higher abundance of *Symphoricarpos* spp. (80-95% cover) and may represent older, more mature stands.

Graminoid cover is mostly non-native grasses including 25% cover of *Poa pratensis* (Kentucky bluegrass) and 5% cover of *Agrostis stolonifera* (redtop). Forb cover is sparse, but diverse and includes 5% cover each of *Aster laevis* (smooth aster) and *Maianthemum stellatum* (false Solomon's seal). Other forbs with <1% cover each include *Achellia lanulosa* (yarrow), *Anemone cylindrica* (cutleaf anemone), and *Fragaria* spp. (strawberry).

**Successional and Ecological Processes:** The *Populus angustifolia*/*Symphoricarpos* spp. (narrowleaf cottonwood/snowberry) plant association is a late-seral cottonwood community that will not regenerate in place as it occurs on elevated toe-slopes. *Symphoricarpos* will persist after the mature cottonwoods die and fall over. Sexual reproduction of cottonwoods is unlikely on older, elevated surfaces not subject to active flooding (Boggs 1984, as cited in Kittel 1994).

Landowners and managers should understand that cottonwood woodlands grow within a continually changing alluvial environment due to the ebb and flow of the river. Riparian vegetation is constantly being "re-set" by flooding disturbance. Cottonwood communities are early, mid- or late seral, depending on the age class of the trees and the



associated species of the stand. Cottonwoods, however, do not reach a climax stage as defined by Daubenmire (1952). Mature cottonwood stands do not regenerate in place, but regenerate by “moving” up and down a river reach. Over time, a healthy riparian area supports all stages of cottonwood communities.

The process of cottonwood regeneration is dependent on flooding disturbance. Periodic flooding allows cottonwood seedlings to germinate and become established on newly deposited, moist sandbars. If not damaged by floods in subsequent years, seedlings trap sediment as they grow larger. Each year the surface accumulates a little bit more flood born sediments, and the sandbar rises. The young forest community becomes increasingly stable as it grows older.

If not damaged by a large flood, excessive browsing from wildlife or livestock (including beaver), fire, or channel modifications (such as channel straightening or bank revetment), the young shrubby cottonwoods may grow into a mature riparian forest. At the same time, natural river processes of bank erosion, deposition and channel migration continue, creating fresh, new surfaces for cottonwood establishment. This results in a dynamic patchwork of different age classes, plant associations and habitats (The Nature Conservancy 1996).

As cottonwoods mature, other tree species may become established. If the land surface is subject to reworking by the river, the successional processes will start over with erosion and subsequent flooding deposition. If the land surface is not subject to alluvial processes, for example, a high terrace, the cottonwoods will be replaced by upland shrub and/or tree species that may comprise the climatic climax plant association for that area.

**Adjacent Riparian Vegetation:** *Populus tremuloides* (quaking aspen) occurred on adjacent stream banks on the western slope stands.

**Adjacent Upland Vegetation:** *Quercus gambelii* (Gambel oak) and *Symphoricarpos* spp.(snowberry) thickets and *Pinus ponderosa* (Ponderosa pine) woodlands occurred on the adjacent uplands of western slope stands.

**Management:** Because the regeneration and establishment of new stands of cottonwood is dependent upon flooding events, any alteration to the natural flow regime of a river can affect the cottonwood ecosystem. Upstream dams stabilize stream flows and reduce flooding frequency and magnitude. This results in fewer flood events that provide conditions for cottonwood stand regeneration. Without periodic disturbance by flooding, riparian areas become dominated by late-seral communities. These late-seral communities are dominated by upland species, such as conifers in montane areas or other, more drought tolerant species in the foothill and plains environments.

Forage productivity for this plant association is high and very palatable to livestock. Cottonwood seedlings and saplings are frequently browsed by cattle. Excessive grazing and browsing will reduce plant vigor and allow non-native plant species to gain a competitive advantage. Cottonwood dominated riparian areas in Colorado are best grazed moderately

for short periods during the growing season or solely during the winter season. This maintains high forage quality and quantity (Hansen *et al.* 1995).

Date: 1999-06-02.

Authors: Kittel, G., E. VanWie, M. Damm

**Colorado Natural Heritage Program  
Community Characterization Abstract**

**Global Scientific Name:** *Populus deltoides* ssp. *wislizenii*/*Rhus trilobata*

**Global Common Name:** Rio Grande cottonwood/skunkbrush

**State Scientific Name:** *Populus deltoides* ssp. *wislizenii*/*Rhus*

**State Common Name:** Rio Grande cottonwood/skunkbrush

**Global Rank:** G2

**Global Rank Comments:** This association has only been documented from river floodplains of the lower Colorado, Yampa, and San Miguel rivers in extreme western Colorado (Keammerer 1974, Kittel and Lederer 1993), it has also been reported to occur in degraded stands along the Rio Grande in northern New Mexico (Durkin 1997, personal communication). Nearly all the existing stands are considered to be in decline due to altered hydrology from upstream impoundments and the long-term effects of livestock grazing. Sexual regeneration is poor at all sites, and tamarisk (*Tamarix ramosissima*) is invading stands of this type on the

**State Rank:** S2

**State Rank Comments:** See Global comments.

**Regional Element Code:**

**State Element Code:** CWFDPDEWA

**State:** CO

**Wetland System Type:** Palustrine

**USNVC:** *Populus deltoides* ssp. *wislizenii* Mainly Cold Deciduous Forest Without Evergreen Trees

**General Description and Comments:** The *Populus deltoides* ssp. *wislizenii*/*Rhus trilobata* (Rio Grande cottonwood/skunkbrush) woodland is documented from western Colorado in the Colorado, Yampa, and San Miguel/Dolores River Basins below 5500 ft. in elevation. An ecologically similar association with a different subspecies of cottonwood, *Populus deltoides* ssp. *monilifera* (plains cottonwood), is known from southeastern Colorado. Both of these associations represent a late-seral stage of maturing cottonwoods. The trees are usually large and widely-spaced with thick patches of *Rhus trilobata* (skunkbrush) in-between and underneath the overstory canopy. The following discussion is for the Western Slope occurrences.

**Related Literature and Synonyms:** The *Populus deltoides* ssp. *wislizenii*/*Rhus trilobata* (Rio Grande cottonwood/skunkbrush) plant association (Baker 1984, Keammerer 1974) and the "River Woodland" (USDI Bureau of Reclamation 1976) are synonymous with the Colorado *Populus deltoides* ssp. *wislizenii*/*Rhus trilobata* plant association.

Closely related communities include the *Populus deltoides* ssp. *monilifera*/*Rhus trilobata* (plains cottonwood/skunkbrush) plant association (Culver *et al.* 1996) which has the same associated species and environmental setting, but is dominated by a different subspecies of cottonwood..

*Rhus trilobata* is a synonym for *Rhus aromatica* var. *trilobata* (Weber and Wittmann 1992).

**Regional Distribution:** This association occurs in Colorado (Colorado Natural Heritage Program 19997).

**Distribution in Colorado:** This plant association has been found in the Grand and Parachute Creek Valleys on the Colorado western slope (Reid and Bourgeron 1991). It also occurs along the San Miguel River between Vancorum and Uravan and the Yampa River near the confluence with the Green River (Kittel and Lederer 1993). A similar plant association occurs in the Comanche National Grasslands in southeastern Colorado (Culver *et al.* 1996).

*The following information is based on a total of eleven quantitative plots: six from the Colorado River Basin (92GK21, 92GK22, 92NL18, 92NL19, 92NL21, 92NL68), four from the Yampa River Basin (90MR01, 90MR12, 90MR14, 90MR54), and one from the San Miguel/Dolores River Basin (92NL29) (Colorado Natural Heritage Program 1997).*

**Elevation Range in Colorado:** 4800-5300 ft (1400-1600 m).

**Site Geomorphology:** The *Populus deltoides* spp. *wislizenii*/*Rhus trilobata* (Rio Grande cottonwood/skunkbrush) plant association is found on immediate stream banks and the upper terraces of wide alluvial floodplains. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). The stream channels are highly sinuous, low gradient. (Rosgen's Channel Type: C4), and less sinuous, lightly steeper gradient streams (Rosgen's Channel Type: B4). **Soil:** Soils are deep, stratified clay loams to sandy loams with fresh, alluvial sand and gravels on point bars.

**Vegetation:** This association has large, spreading *Populus deltoides* spp. *wislizenii* (Rio Grande cottonwood) trees with 10-50% cover, and an open shrub canopy of *Rhus trilobata* (skunkbrush) (1-50% cover). Other trees that may be present include: *Populus x acuminata* (lanceleaf cottonwood) (20%), *Picea pungens* (Colorado blue spruce) (3%), and *Acer negundo* (box negundo) (1%). Other shrubs that may be present include: *Shepherdia argentea* (silver berry) (1-20%), *Tamarix ramosissima* (salt-cedar) (1-3%), *Betula occidentalis* (river birch) (60%), *Alnus incana* (thinleaf alder) (3-10%), *Lonicera involucrata* (honeysuckle) (3-10%), *Symphoricarpos occidentalis* (snowberry) (30%), *Berberis fendleri* (barberry) (10%), *Salix lasiandra* var. *lasiandra* (pacific willow) (3%), and *Salix exigua* (coyote willow) (1%).

The herbaceous understory is usually sparse and consists mainly of *Elytrigia repens* (quackgrass) (1-50%), *Solidago canadensis* (goldenrod) (1-10%), *Maianthemum stellatum* (false Solomon's seal) (1-40%), *Bromus tectorum* (cheat grass) (1-30%), *Carex aquatilis* (aquatic sedge) (40%), *Cirsium arvense* (thistle) (1-3%), *Asclepias speciosa*

(showy milkweed) (1%), *Melilotus alba* (sweetclover), *Poa pratensis* (Kentucky bluegrass) (1-30%), and *Bromus inermis* (smooth brome) (1-20%).

**Succession and Ecological Processes:** As *Populus deltoides* spp. *wislizenii* mature and grow large, *Rhus trilobata* shrubs first become more abundant and then more widely spaced. The presence of *Artemisia tridentata* (sagebrush) indicates that *Populus deltoides/Rhus trilobata* (Rio Grande cottonwood/skunkbrush) on higher terraces may be a successional stage to an upland shrub or woodland community dominated by *Artemisia tridentata*. A similar successional trend has been observed in the *Populus angustifolia/Rhus aromatica* var. *trilobata* (narrowleaf cottonwood/skunkbrush) community type in Utah (Padgett *et al.* 1989).

Landowners and managers should understand that cottonwood woodlands grow within a continually changing alluvial environment due to the ebb and flow of the river. Riparian vegetation is constantly being “re-set” by flooding disturbance. Cottonwood communities are early, mid- or late seral, depending on the age class of the trees and the associated species of the stand. Cottonwoods, however, do not reach a climax stage as defined by Daubenmire (1952). Mature cottonwood stands do not regenerate in place, but regenerate by “moving” up and down a river reach. Over time, a healthy riparian area supports all stages of cottonwood communities.

The process of cottonwood regeneration is dependent on flooding disturbance. Periodic flooding allows cottonwood seedlings to germinate and become established on newly deposited, moist sandbars. If not damaged by floods in subsequent years, seedlings trap sediment as they grow larger. Each year the surface accumulates a little bit more flood born sediments, and the sandbar rises. The young forest community becomes increasingly stable as it grows older.

If not damaged by a large flood, excessive browsing from wildlife or livestock (including beaver), fire, or channel modifications (such as channel straightening or bank revetment), the young shrubby cottonwoods may grow into a mature riparian forest. At the same time, natural river processes of bank erosion, deposition and channel migration continue, creating fresh, new surfaces for cottonwood establishment. This results in a dynamic patchwork of different age classes, plant associations and habitats (The Nature Conservancy 1996).

As cottonwoods mature, other tree species may become established. If the land surface is subject to reworking by the river, the successional processes will start over with erosion and subsequent flooding deposition. If the land surface is not subject to alluvial processes, for example, a high terrace, the cottonwoods will be replaced by upland shrub and/or tree species that may comprise the climatic climax plant association for that area.

**Adjacent Riparian Vegetation:** *Typha* spp. (cattail) wetlands, *Populus deltoides* spp. *wislizenii/ Salix exigua* (Rio Grande cottonwood/coyote willow) forests, and *Salix exigua* (coyote willow) shrublands occur along nearby stretches of the river.

**Adjacent Upslope Vegetation:** *Pinus edulis-Juniperus osteosperma* (Piñon pine -Utah juniper) woodlands and *Sarcobatus vermiculatus* (greasewood) scrub are found on adjacent uplands.

**Management:** In order to maintain cottonwood riparian forests, recognition of the early seral stage of this plant association is important for long-term management. Activities such as bank stabilization (rip-rap) and channelization restrict channel migration, and may reduce the maturation of seedling/sapling stands into mature cottonwood riparian forests. Because the regeneration and establishment of new stands of cottonwood is dependent upon flooding events, any alterations to the natural flow regime of a river can affect the cottonwood ecosystem. Upstream dams stabilize stream flows and reduce flooding frequency and magnitude. This results in fewer flood events that would allow for cottonwood stand regeneration. Without periodic disturbance by flooding, riparian areas become dominated by late-seral communities. These late-seral communities are dominated by more upland species, such as conifers in montane areas or other, more drought tolerant species in the foothill and plains environments.

Riparian forage productivity can be high and very palatable to livestock. Cottonwood seedlings and saplings are frequently browsed by cattle. Excessive grazing and browsing will reduce plant vigor and allow non-native plant species to gain a competitive advantage. Cottonwood dominated riparian areas in Colorado are best grazed moderately for short periods during the growing season or solely during the winter season. This maintains high forage quality and quantity.

Date: 1998-06-02.

Authors: Kittel, G., E. VanWie, M. Damm

## Maps of the City of Wheat Ridge Greenbelt and Lewis Meadows

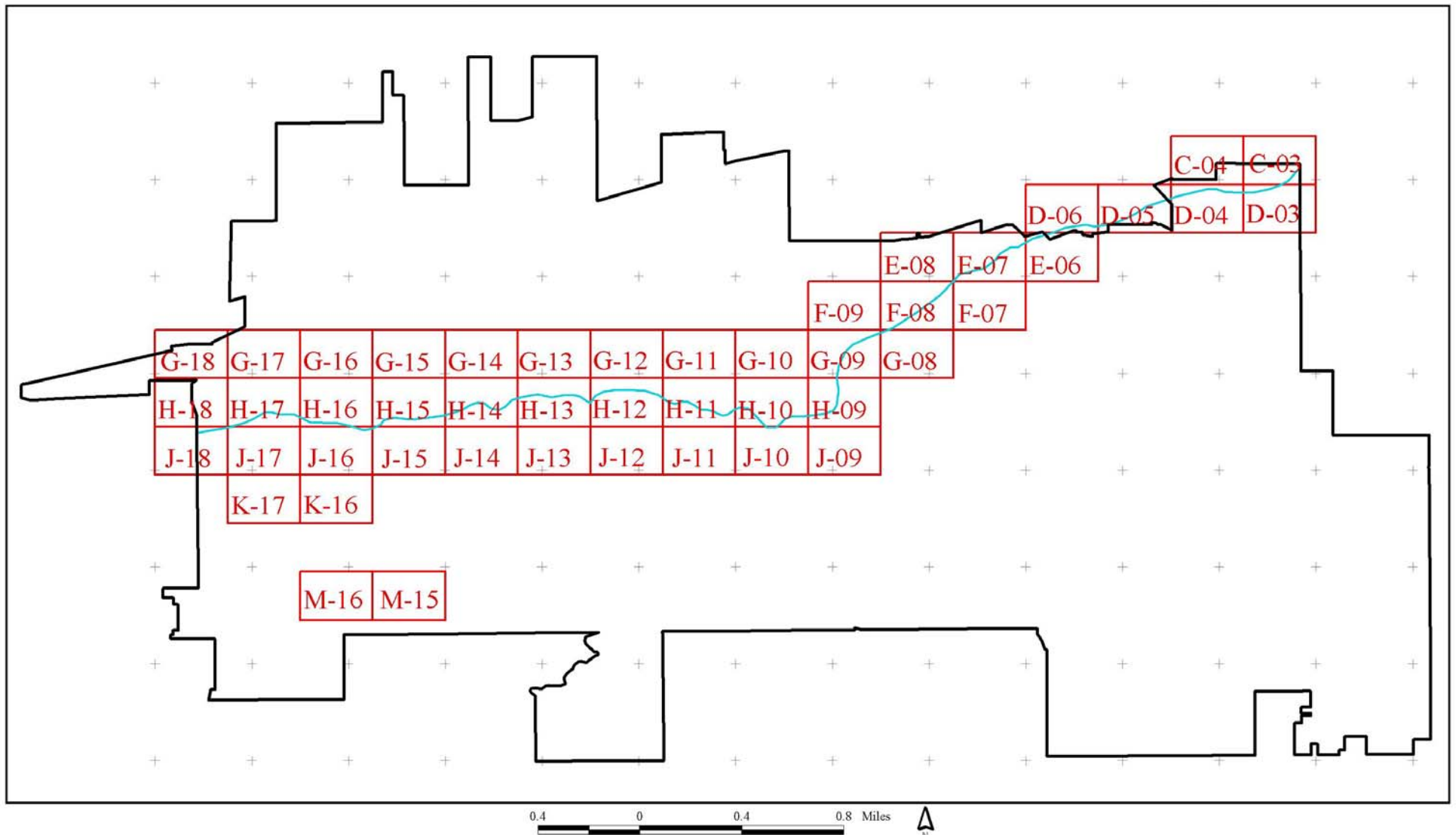
The following maps include:






- Selected Weed Species
- Plant Community Assemblages
- Ute Ladie's-Tresses Occurrences
- Traplines
- Vertebrate Occurrences

Key to Numbered Points of Animal Occurrences:

Number	Scientific Name	Common Name
1	<i>Carduelis tristis</i>	American Goldfinch
2	<i>Turdus migratorius</i>	American Robin
3	<i>Castor canadensis</i>	Beaver
4	<i>Pica pica</i>	Black Billed Magpie
5	<i>Nycticorax nycticorax</i>	Black Crowned Night Heron
6	<i>Euphagus cyanocephalus</i>	Brewers Blackbird
7	<i>Rana catesbiana</i>	Bullfrog
8	<i>Branta canadensis</i>	Canada Goose
9	<i>Phalacrocorax auritus</i>	Double Crested Cormorant
10	<i>Sylvilagus floridanus</i>	Eastern Cottontail
11	<i>Felis domesticus</i>	Feral Cat
12	<i>Sciurus niger</i>	Fox Squirrel
13	<i>Ardea herodias</i>	Great Blue Heron
14	<i>Mus musculus</i>	House Mouse
15	<i>Passer domesticus</i>	House Sparrow
16	<i>Carduelis psaltria</i>	Lesser Goldfinch
17	<i>Lanius ludovicianus</i>	Loggerhead Shrike
18	<i>Anas platyrhynchos</i>	Mallard
19	<i>Zenaida macroura</i>	Mourning Dove
20	<i>Ondontra zibethica</i>	Muskrat
21	<i>Colaptes auratus</i>	Northern Flicker
22	<i>Thomomys talpoides</i>	Northern Pocket Gopher
23	<i>Rattus norvegicus</i>	Norway Rat
24	<i>Carduelis pinus</i>	Pine Siskin
25	<i>Thamnophis radix</i>	Plains Garter Snake
26	<i>Procyon lotor</i>	Raccoon
27	<i>Vulpes vulpes</i>	Red Fox
28	<i>Buteo jamaicensis</i>	Red Tailed Hawk
29	<i>Larus canus</i>	Ring Billed Gull
30	<i>Columba livia</i>	Rock Dove
31	<i>Cnemidophorus sexlineatus</i>	Six Lined Race Runner

# City of Wheat Ridge Greenbelt and Lewis Meadows Study Area

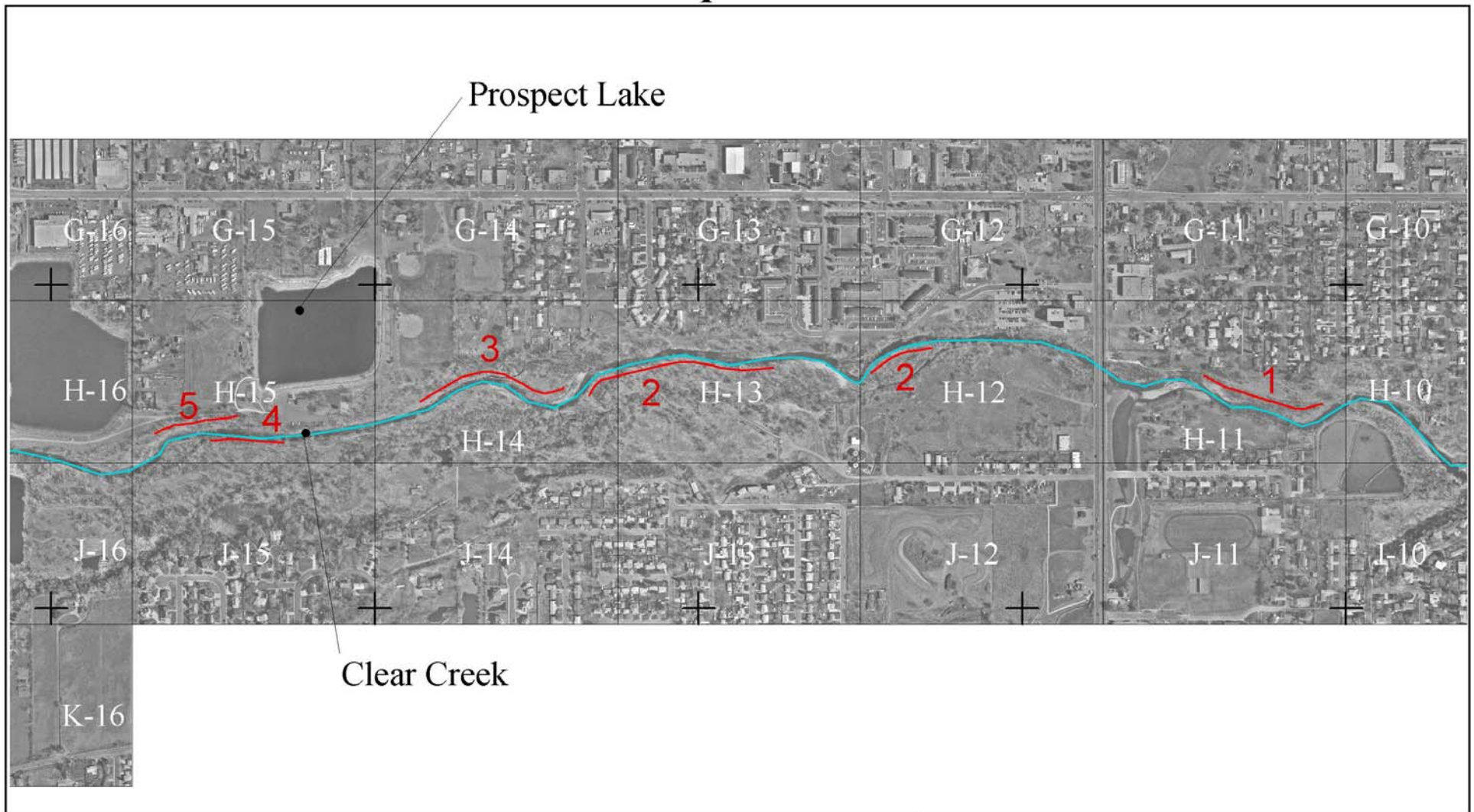


<p><b>The Colorado Natural Heritage Program</b>          Colorado State University          254 General Services Bldg          Fort Collins, CO 80523          Fax (970) 491-3349</p>  <p>Map Date: 28 March 2001          GIS Dept: ael</p> <p>Images provided by the          City of Wheat Ridge</p> <p>Requests for Information (970) 491-7331</p>	<p style="text-align: center;">Legend</p> <ul style="list-style-type: none"> <li> Wheat Ridge Boundary</li> <li> Clear Creek</li> <li> Image Boundaries</li> <li> Tic Marks</li> </ul>	<p style="text-align: center;"><b>Disclaimer</b></p> <p>The data contained herein are provided on an as-is, as-available basis without warranties of any kind, expressed or implied, including (but not limited to) warranties of merchantability, fitness for a particular purpose, and non-infringement. CNHP, Colorado State University and the State of Colorado further expressly disclaim any warranty that the data are error-free or current as of the date supplied.</p>
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# City of Wheat Ridge Greenbelt and Lewis Meadows Study Area

## *Trap Lines*



<p><b>The Colorado Natural Heritage Program</b>          Colorado State University          254 General Services Bldg          Fort Collins, CO 80523          Fax (970) 491-3349</p>  <p style="text-align: right; font-size: small;">Map Date: 13 April 2001          GIS Dept: db          Images provided by the          City of Wheat Ridge</p> <p style="font-weight: bold; margin-top: 10px;">Requests for Information (970) 491-7331</p>	<p><b>Legend</b></p> <ul style="list-style-type: none"> <li><span style="color: red; font-size: 1.2em;">~</span> Trap Lines</li> <li><span style="color: black; font-size: 1.2em;">~</span> Tic Marks</li> <li><span style="color: cyan; font-size: 1.2em;">~</span> Clear Creek</li> </ul>	<p style="text-align: center; color: red; font-weight: bold; margin: 0;"><b>Disclaimer</b></p> <p style="font-size: small; margin: 5px 0 0 0;">The data contained herein are provided on an as-is, as-available basis without warranties of any kind, expressed or implied, including (but not limited to) warranties of merchantability, fitness for a particular purpose, and non-infringement. CNHP, Colorado State University and the State of Colorado further expressly disclaim any warranty that the data are error-free or current as of the date supplied.</p>
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# City of Wheat Ridge Greenbelt and Lewis Meadows

## Vegetation Types, Rare Plants and Vertebrates

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 Colorado State University  
 254 General Services Bldg  
 Fort Collins, CO 80523  
 Fax (970) 491-3349



Requests for Information (970) 491-7331

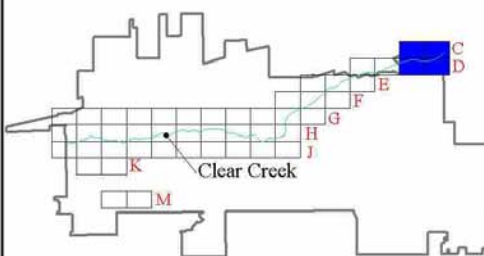
Map Date: 28 March 2001  
 GIS Dept:db

### Vegetation Types

- Mixed Grass/Forb Meadows
- Revegetated/Planted - Pond Margins
- Revegetated/Planted - Irrigated
- Revegetated/Planted - Non-irrigated
- Disturbed/Weedy
- Cattail Marsh
- Willow - Raised Bank
- Willow - Floodplain
- Willow - Channel
- Mixed Shrub Floodplain
- Rabbitbrush Mixed Herbaceous
- Snowberry/Skunkbush Meadows
- Mixed Non-Native Woodland
- Mixed Cottonwood/Mesic Grasses
- Mixed Cottonwood/Mixed Shrub/Mesic Grasses
- Native Cottonwood/Willow/Mesic Grasses
- Mixed Bluff Slope Woodlands
- Bare Ground
- Infrastructure
- Open Water
- Vertebrates

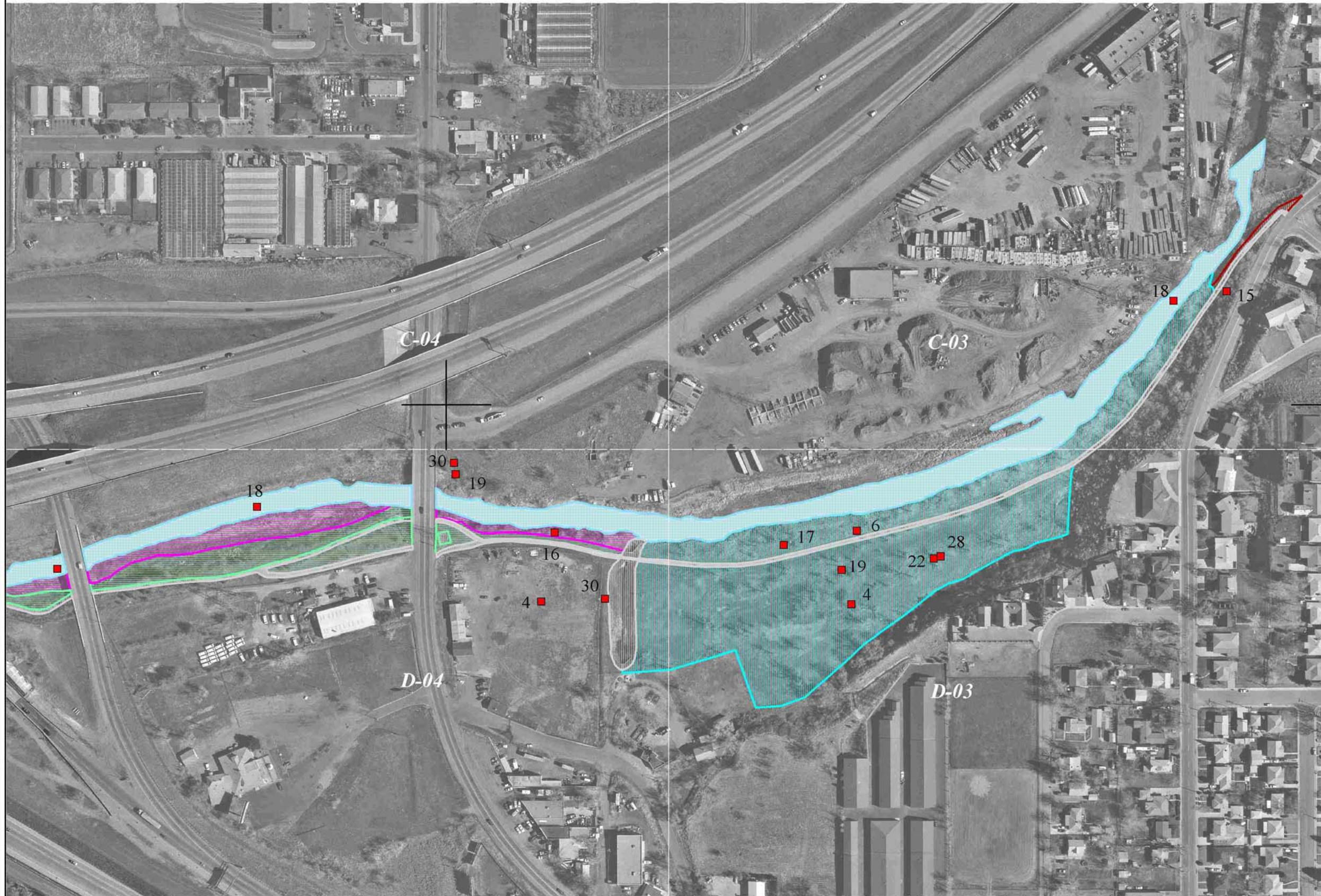
Tic Marks

### Location in Wheat Ridge



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# City of Wheat Ridge Greenbelt and Lewis Meadows

## Selected Weeds

The Colorado Natural Heritage Program  
 Colorado State University  
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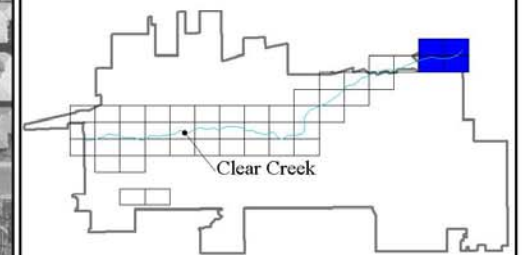
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Map Date: 28 March 2001  
 GIS Dept: db

### Weeds

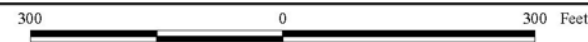
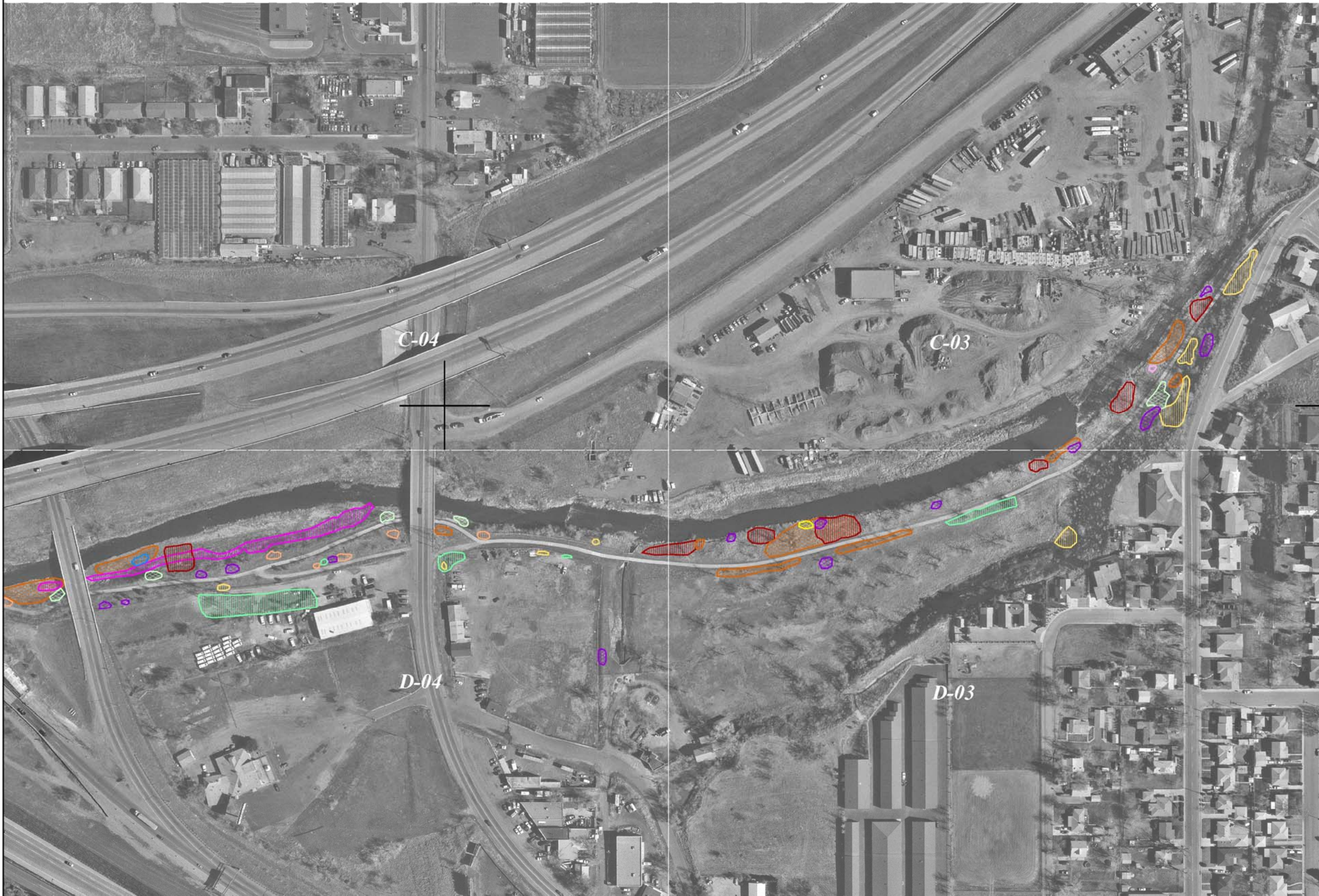
-  Dalmatian Toadflax
-  Canada Thistle
-  Diffuse Knapweed
-  Bull Thistle
-  Scotch Thistle
-  Poison Hemlock
-  Cutleaf Teasel
-  Russian Olive
-  Musk Thistle
-  Tamarisk
-  Chinese Clematis
-  Yellow Toadflax
-  Common Teasel
-  Buckthorn
-  Poison Ivy
-  Purple Loosestrife
-  Leafy Spurge
-  Tie Marks

### Location in Wheat Ridge



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# City of Wheat Ridge Greenbelt and Lewis Meadows

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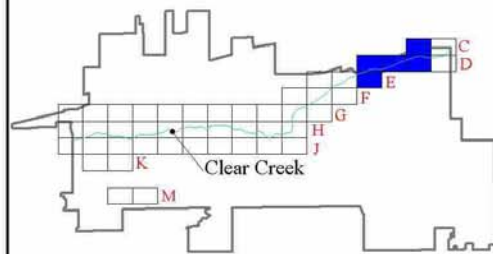
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- Bare Ground
- Infrastructure
- Open Water

Vertebrates

Tic Marks

### Location in Wheat Ridge



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300      0      300 Feet



# City of Wheat Ridge Greenbelt and Lewis Meadows

## Selected Weeds



















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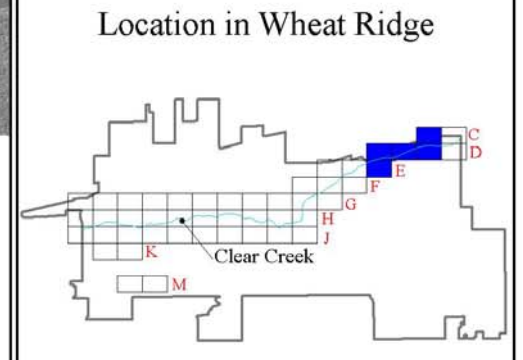


Requests for Information (970) 491-7331

Map Date: 28 March 2001  
 GIS Dept: db



- Weeds**
-  Dalmatian Toadflax
  -  Canada Thistle
  -  Diffuse Knapweed
  -  Bull Thistle
  -  Scotch Thistle
  -  Poison Hemlock
  -  Cutleaf Teasel
  -  Russian Olive
  -  Musk Thistle
  -  Tamarisk
  -  Chinese Clematis
  -  Yellow Toadflax
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# City of Wheat Ridge Greenbelt and Lewis Meadows

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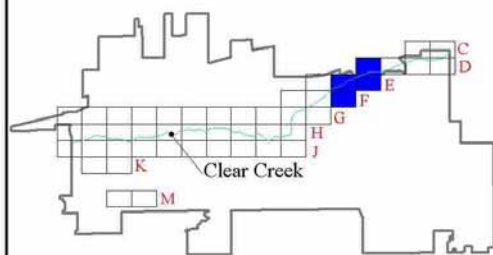
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  - Disturbed/Weedy
  - Cattail Marsh
  - Willow - Raised Bank
  - Willow - Floodplain
  - Willow - Channel
  - Mixed Shrub Floodplain
  - Rabbitbrush Mixed Herbaceous
  - Snowberry/Skunkbush Meadows
  - Mixed Non-Native Woodland
  - Mixed Cottonwood/Mesic Grasses
  - Mixed Cottonwood/Mixed Shrub/Mesic Grasses
  - Native Cottonwood/Willow/Mesic Grasses
  - Mixed Bluff Slope Woodlands
  - Bare Ground
  - Infrastructure
  - Open Water
- Vertebrates

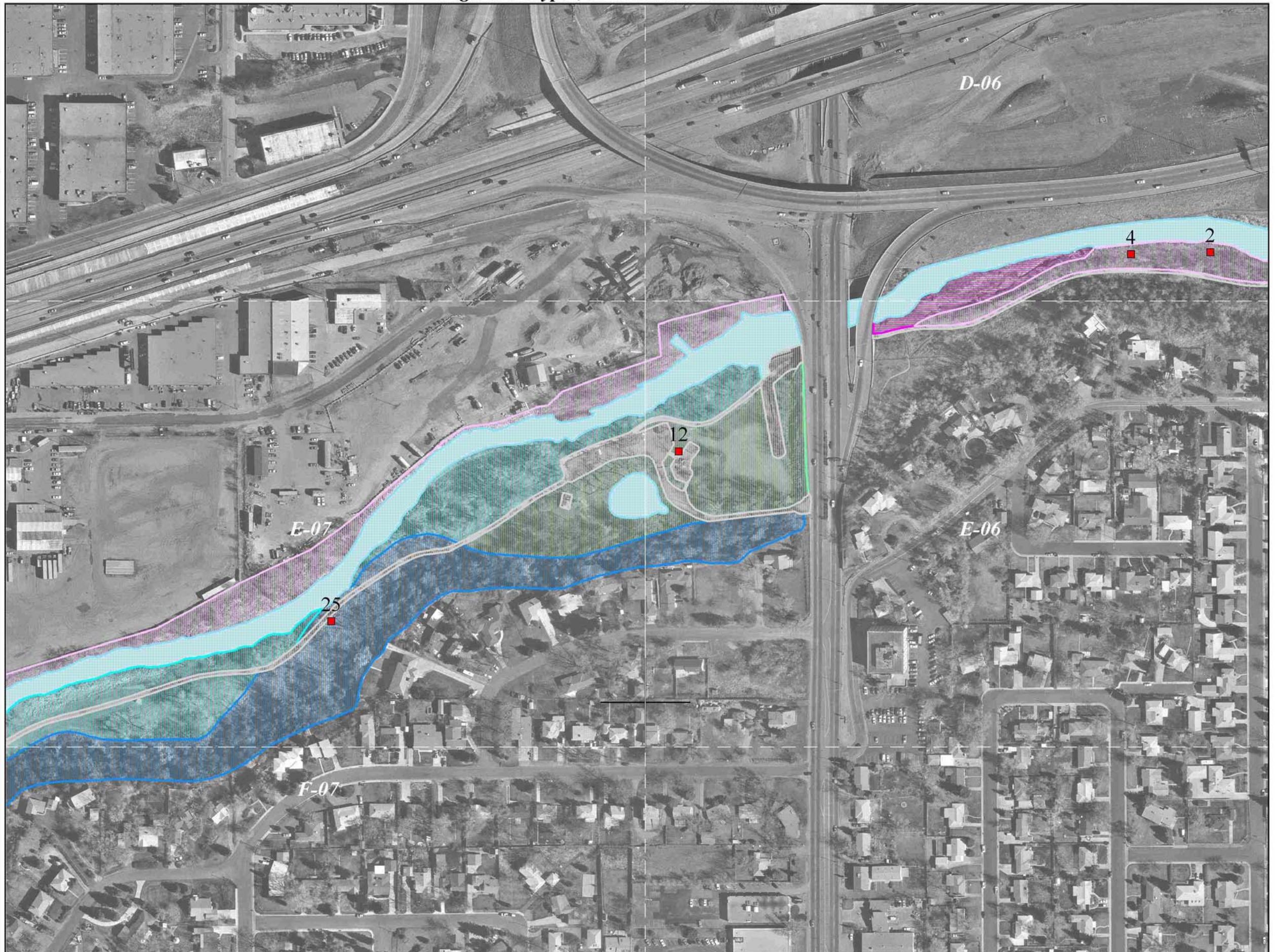
Tic Marks

### Location in Wheat Ridge



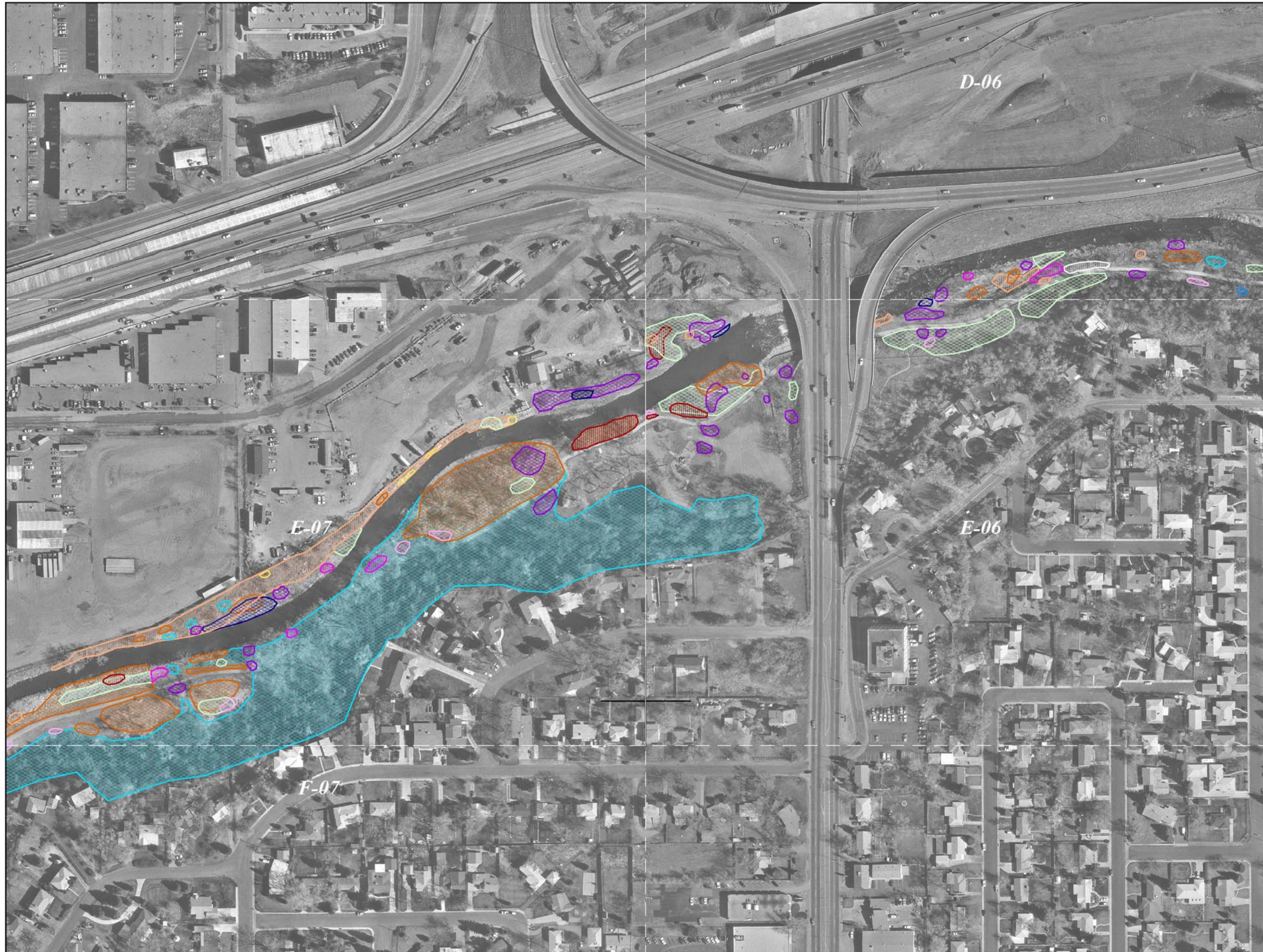
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# City of Wheat Ridge Greenbelt and Lewis Meadows

## Selected Weeds



















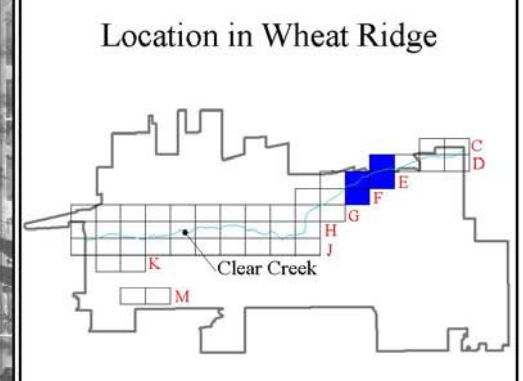
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 Colorado State University  
 254 General Services Bldg  
 Fort Collins, CO 80523  
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Map Date: 28 March 2001  
 GIS Dept: db

- ### Weeds
-  Dalmatian Toadflax
  -  Canada Thistle
  -  Diffuse Knapweed
  -  Bull Thistle
  -  Scotch Thistle
  -  Poison Hemlock
  -  Cutleaf Teasel
  -  Russian Olive
  -  Musk Thistle
  -  Tamarisk
  -  Chinese Clematis
  -  Yellow Toadflax
  -  Common Teasel
  -  Buckthorn
  -  Poison Ivy
  -  Purple Loosestrife
  -  Leafy Spurge
  -  Tic Marks



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# City of Wheat Ridge Greenbelt and Lewis Meadows

## Vegetation Types, Rare Plants and Vertebrates

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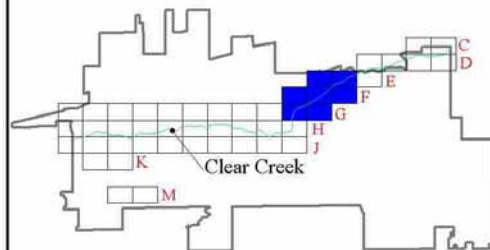
### Vegetation Types

- Mixed Grass/Forb Meadows
- Revegetated/Planted - Pond Margins
- Revegetated/Planted - Irrigated
- Revegetated/Planted - Non-irrigated
- Disturbed/Weedy
- Cattail Marsh
- Willow - Raised Bank
- Willow - Floodplain
- Willow - Channel
- Mixed Shrub Floodplain
- Rabbitbrush Mixed Herbaceous
- Snowberry/Skunkbush Meadows
- Mixed Non-Native Woodland
- Mixed Cottonwood/Mesic Grasses
- Mixed Cottonwood/Mixed Shrub/Mesic Grasses
- Native Cottonwood/Willow/Mesic Grasses
- Mixed Bluff Slope Woodlands
- Bare Ground
- Infrastructure
- Open Water

Vertebrates

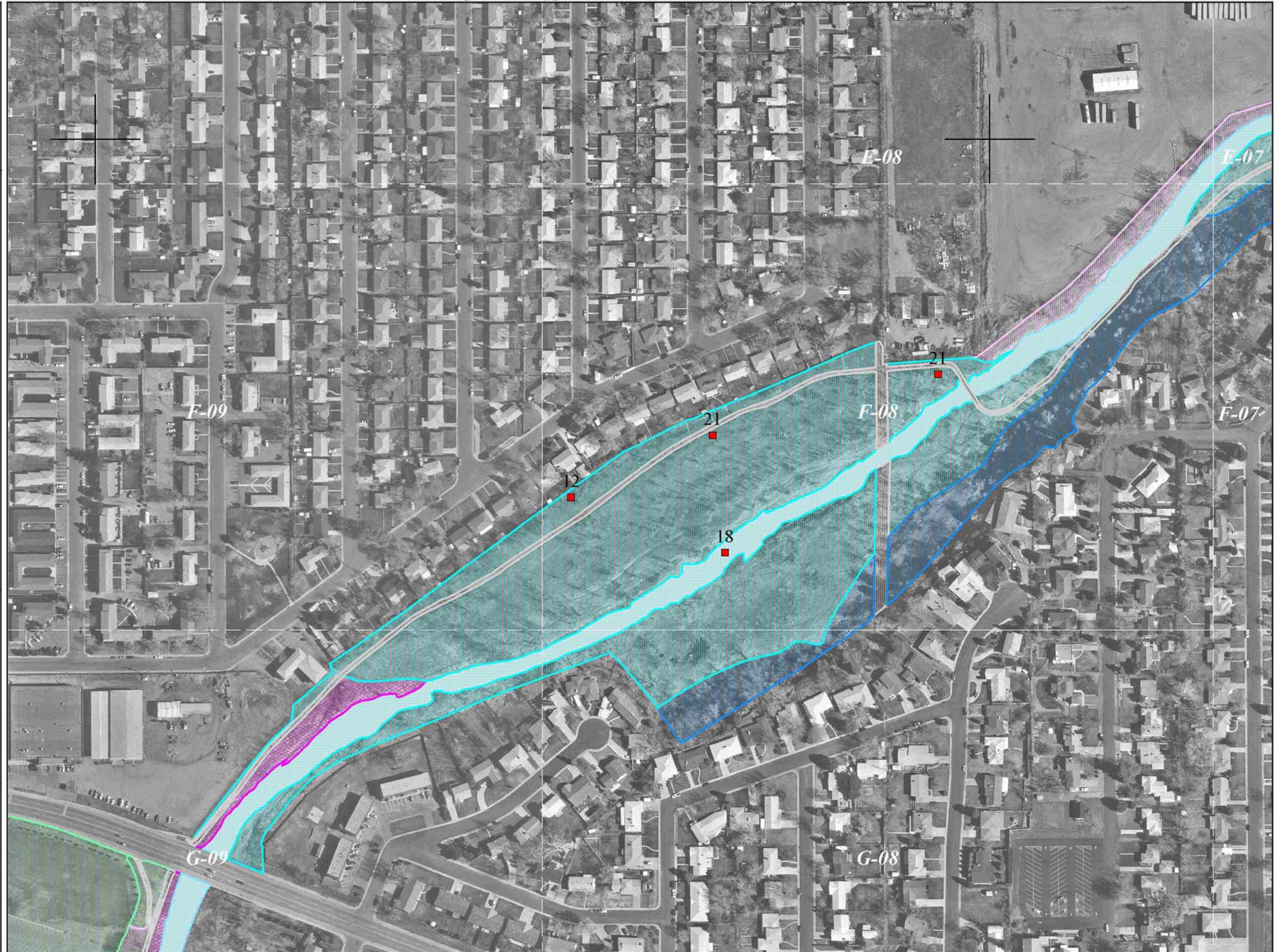
Tie Marks

### Location in Wheat Ridge



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300 0 300 Feet





# City of Wheat Ridge Greenbelt and Lewis Meadows

## Selected Weeds


















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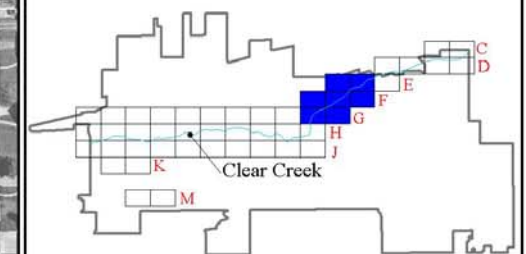
Map Date: 28 March 2001  
 GIS Dept: db

### Weeds

-  Dalmatian Toadflax
-  Canada Thistle
-  Diffuse Knapweed
-  Bull Thistle
-  Scotch Thistle
-  Poison Hemlock
-  Cutleaf Teasel
-  Russian Olive
-  Musk Thistle
-  Tamarisk
-  Chinese Clematis
-  Yellow Toadflax
-  Common Teasel
-  Buckthorn
-  Poison Ivy
-  Purple Loosestrife
-  Leafy Spurge

 Tic Marks

### Location in Wheat Ridge



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300 0 300 Feet



Map 9 is not available

# City of Wheat Ridge Greenbelt and Lewis Meadows

## Selected Weeds

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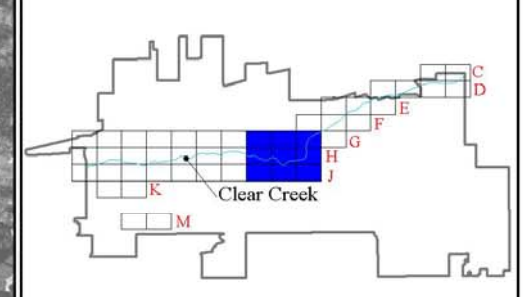
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### Weeds

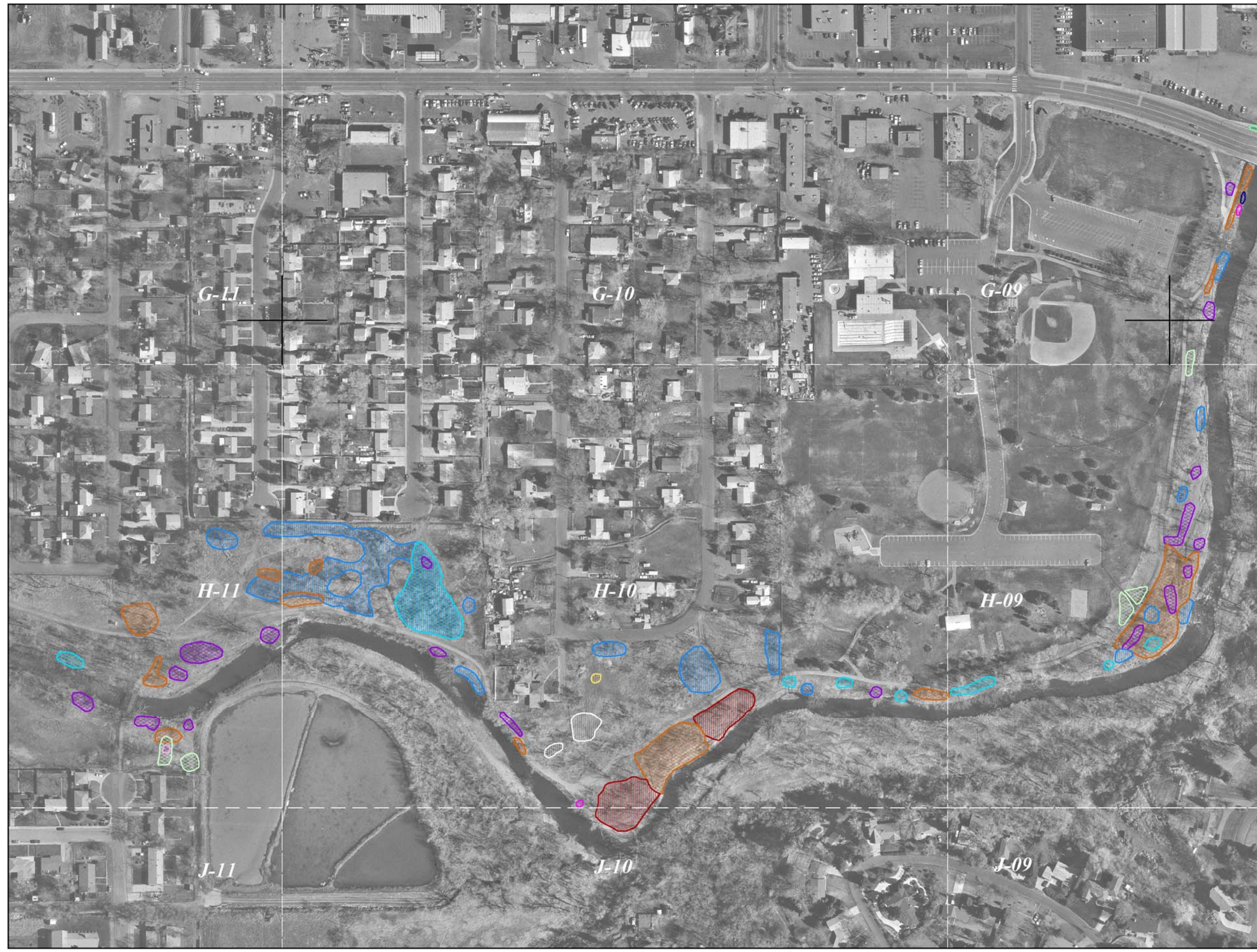
-  Dalmatian Toadflax
-  Canada Thistle
-  Diffuse Knapweed
-  Bull Thistle
-  Scotch Thistle
-  Poison Hemlock
-  Cutleaf Teasel
-  Russian Olive
-  Musk Thistle
-  Tamarisk
-  Chinese Clematis
-  Yellow Toadflax
-  Common Teasel
-  Buckthorn
-  Poison Ivy
-  Purple Loosestrife
-  Leafy Spurge
-  Tic Marks

### Location in Wheat Ridge



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# City of Wheat Ridge Greenbelt and Lewis Meadows

## Vegetation Types, Rare Plants and Vertebrates

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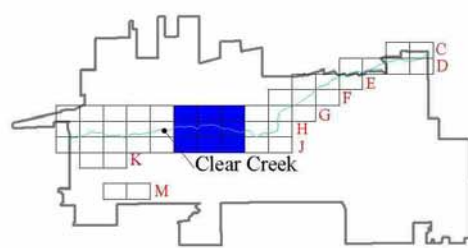
Map Date: 30 March 2001  
 GIS Dept:db

### Vegetation Types

- Mixed Grass/Forb Meadows
  - Revegetated/Planted - Pond Margins
  - Revegetated/Planted - Irrigated
  - Revegetated/Planted - Non-irrigated
  - Disturbed/Weedy
  - Cattail Marsh
  - Willow - Raised Bank
  - Willow - Floodplain
  - Willow - Channel
  - Mixed Shrub Floodplain
  - Rabbitbrush Mixed Herbaceous
  - Snowberry/Skunkbush Meadows
  - Mixed Non-Native Woodland
  - Mixed Cottonwood/Mesic Grasses
  - Mixed Cottonwood/Mixed Shrub/Mesic Grasses
  - Native Cottonwood/Willow/Mesic Grasses
  - Native Cottonwood/Choke Cherry/Mesic Grasses
  - Mixed Bluff Slope Woodlands
  - Bare Ground
  - Municipal Park Land
  - Infrastructure
  - Open Water
- *Mycenastrum species nova*  
 ■ Vertebrates

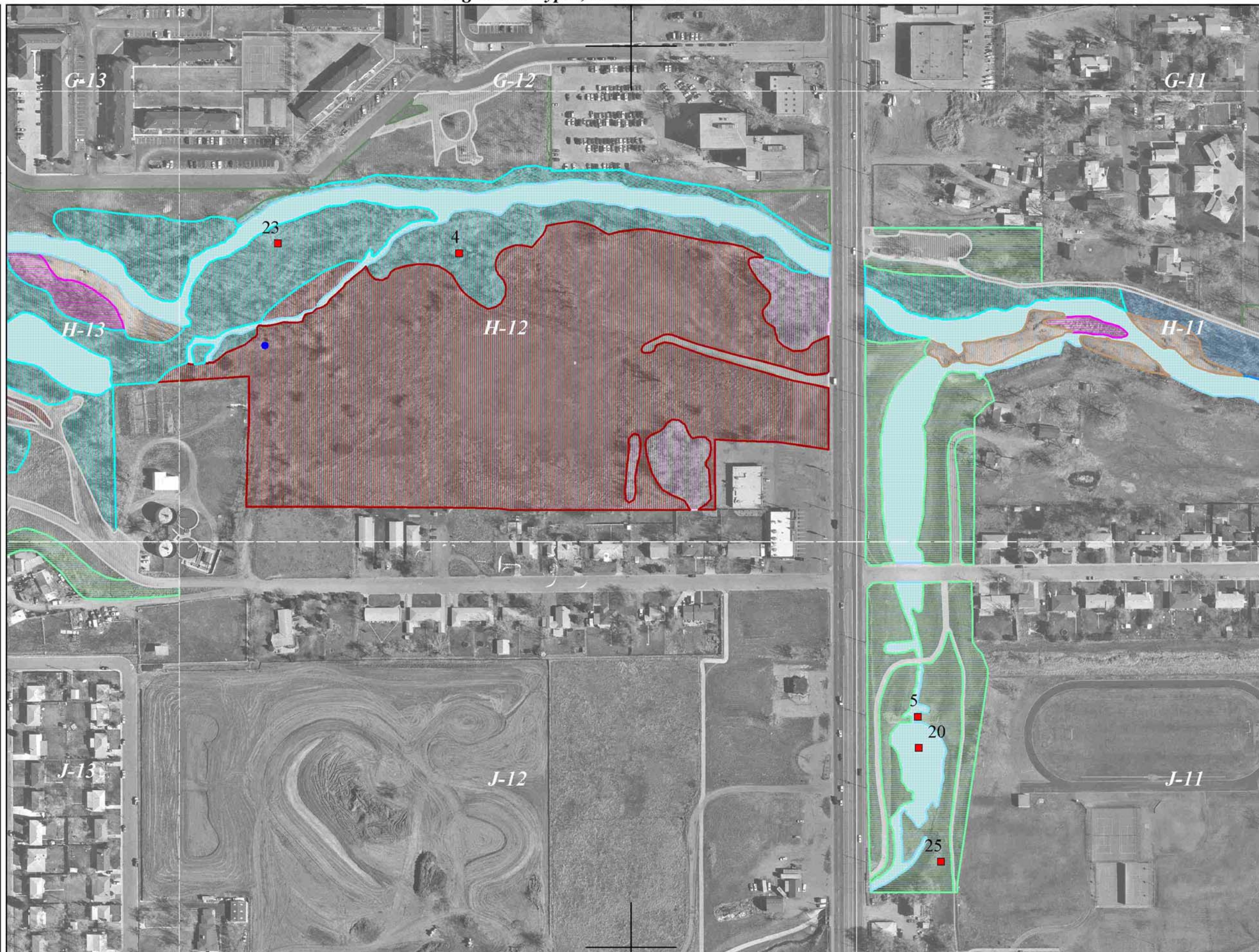
Tic Marks

### Location in Wheat Ridge



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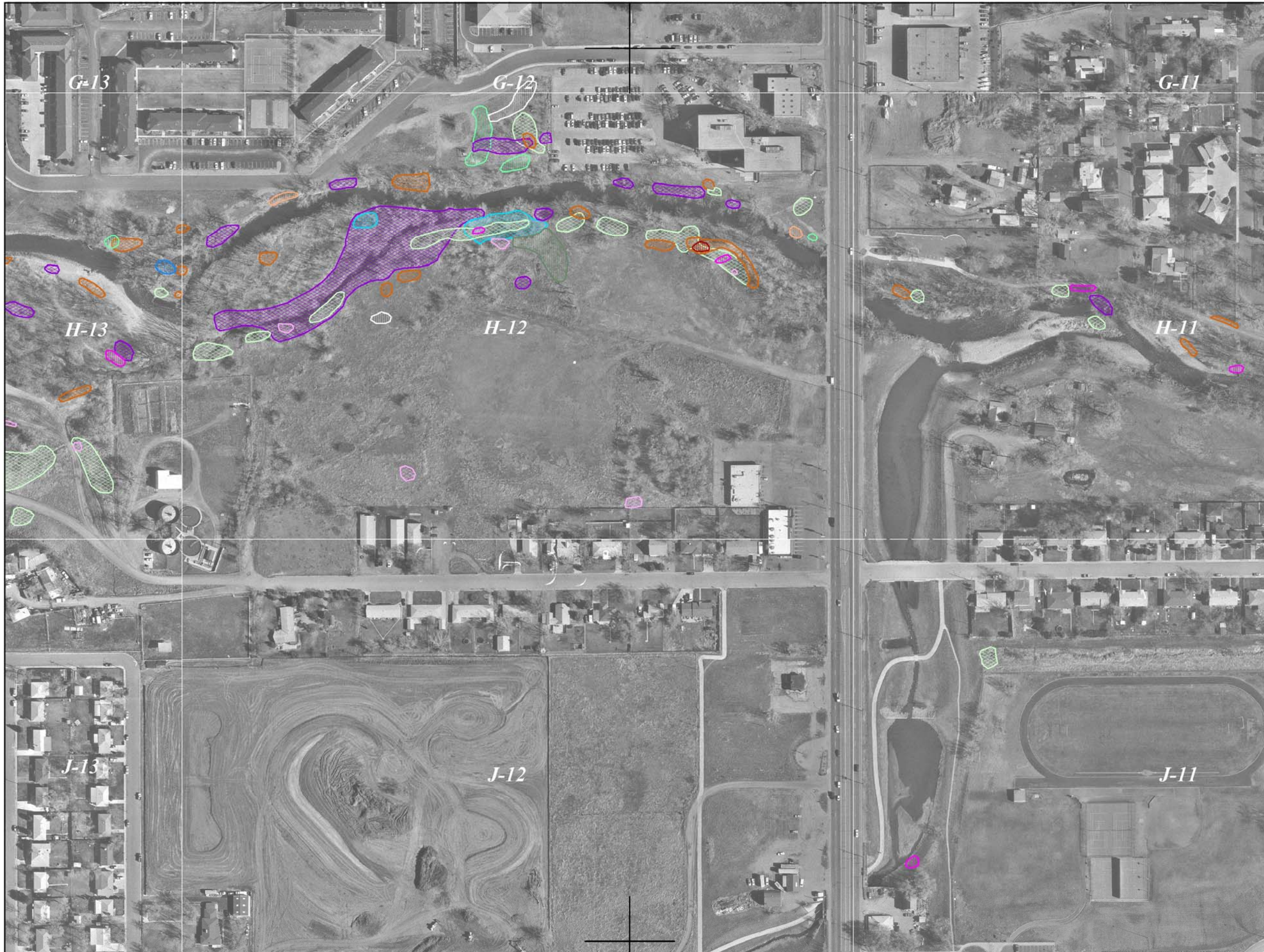


300 0 300 Feet



# City of Wheat Ridge Greenbelt and Lewis Meadows

## Selected Weeds



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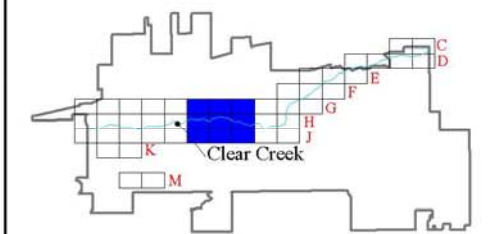
Map Date: 28 March 2001  
 GIS Dept: db

### Weeds

- Dalmatian Toadflax
- Canada Thistle
- Diffuse Knapweed
- Bull Thistle
- Scotch Thistle
- Poison Hemlock
- Cutleaf Teasel
- Russian Olive
- Musk Thistle
- Tamarisk
- Chinese Clematis
- Yellow Toadflax
- Common Teasel
- Buckthorn
- Poison Ivy
- Purple Loosestrife
- Leafy Spurge

Tic Marks

### Location in Wheat Ridge



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Map 13 is not available

# City of Wheat Ridge Greenbelt and Lewis Meadows

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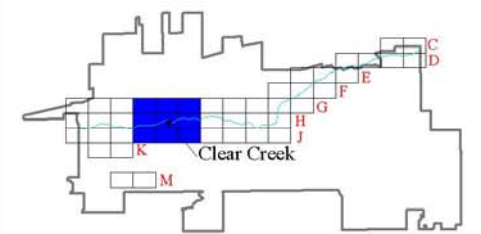
Requests for Information (970) 491-7331

Map Date: 30 March 2001  
 GIS Dept: db

### Weeds

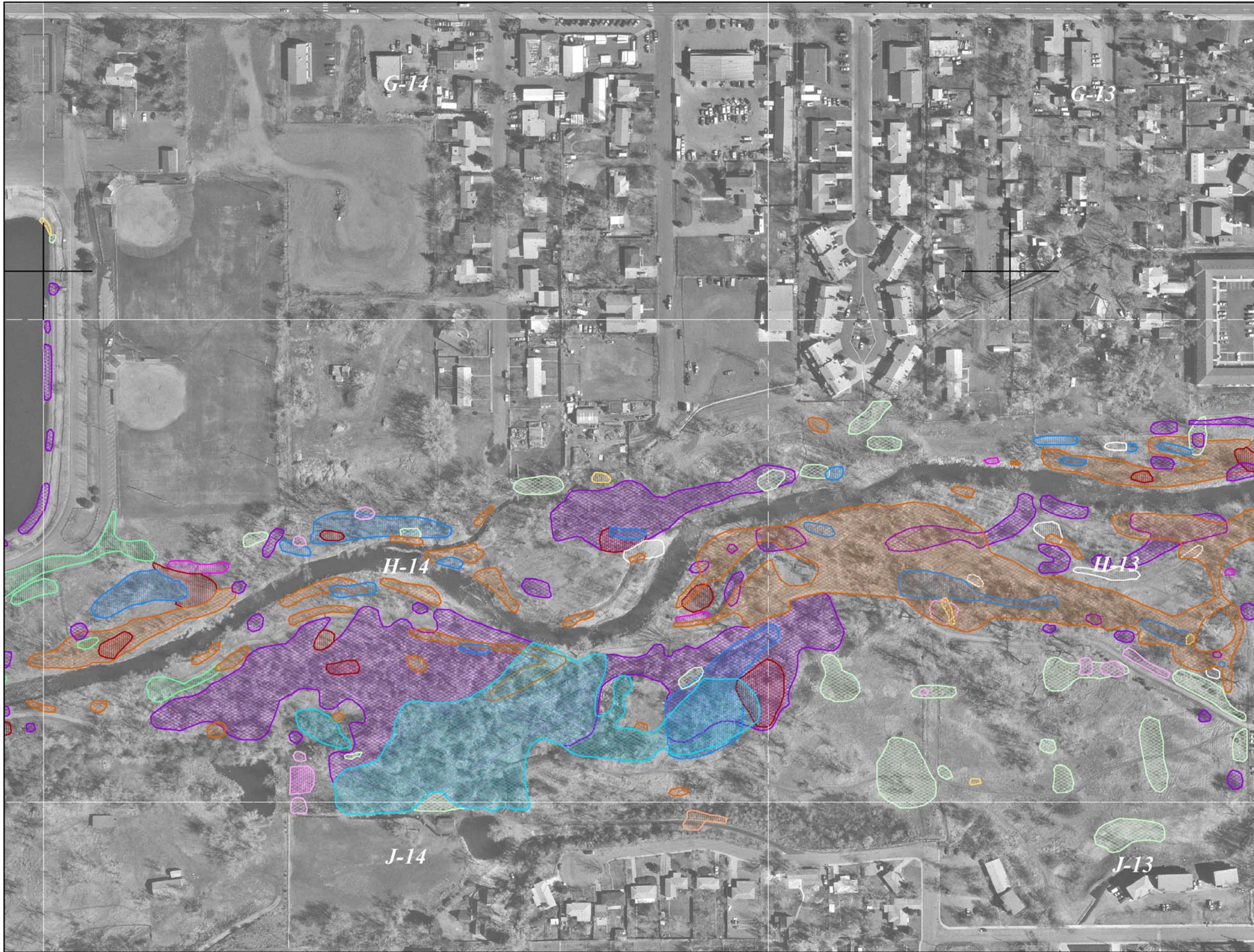
- Dalmatian Toadflax
- Canada Thistle
- Diffuse Knapweed
- Bull Thistle
- Scotch Thistle
- Poison Hemlock
- Cutleaf Teasel
- Russian Olive
- Musk Thistle
- Tamarisk
- Chinese Clematis
- Yellow Toadflax
- Common Teasel
- Buckthorn
- Poison Ivy
- Purple Loosestrife
- Leafy Spurge
- Tic Marks

### Location in Wheat Ridge



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300 0 300 Feet



Map 15 is not available



# City of Wheat Ridge Greenbelt and Lewis Meadows

## Selected Weeds


















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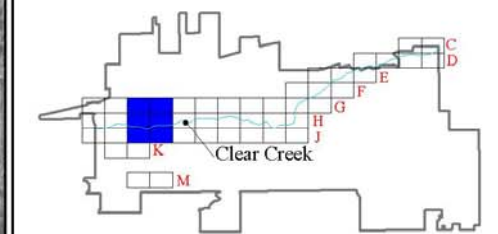
Map Date: 30 March 2001  
 GIS Dept: db

### Weeds

-  Dalmatian Toadflax
-  Canada Thistle
-  Diffuse Knapweed
-  Bull Thistle
-  Scotch Thistle
-  Poison Hemlock
-  Cutleaf Teasel
-  Russian Olive
-  Musk Thistle
-  Tamarisk
-  Chinese Clematis
-  Yellow Toadflax
-  Common Teasel
-  Buckthorn
-  Poison Ivy
-  Purple Loosestrife
-  Leafy Spurge

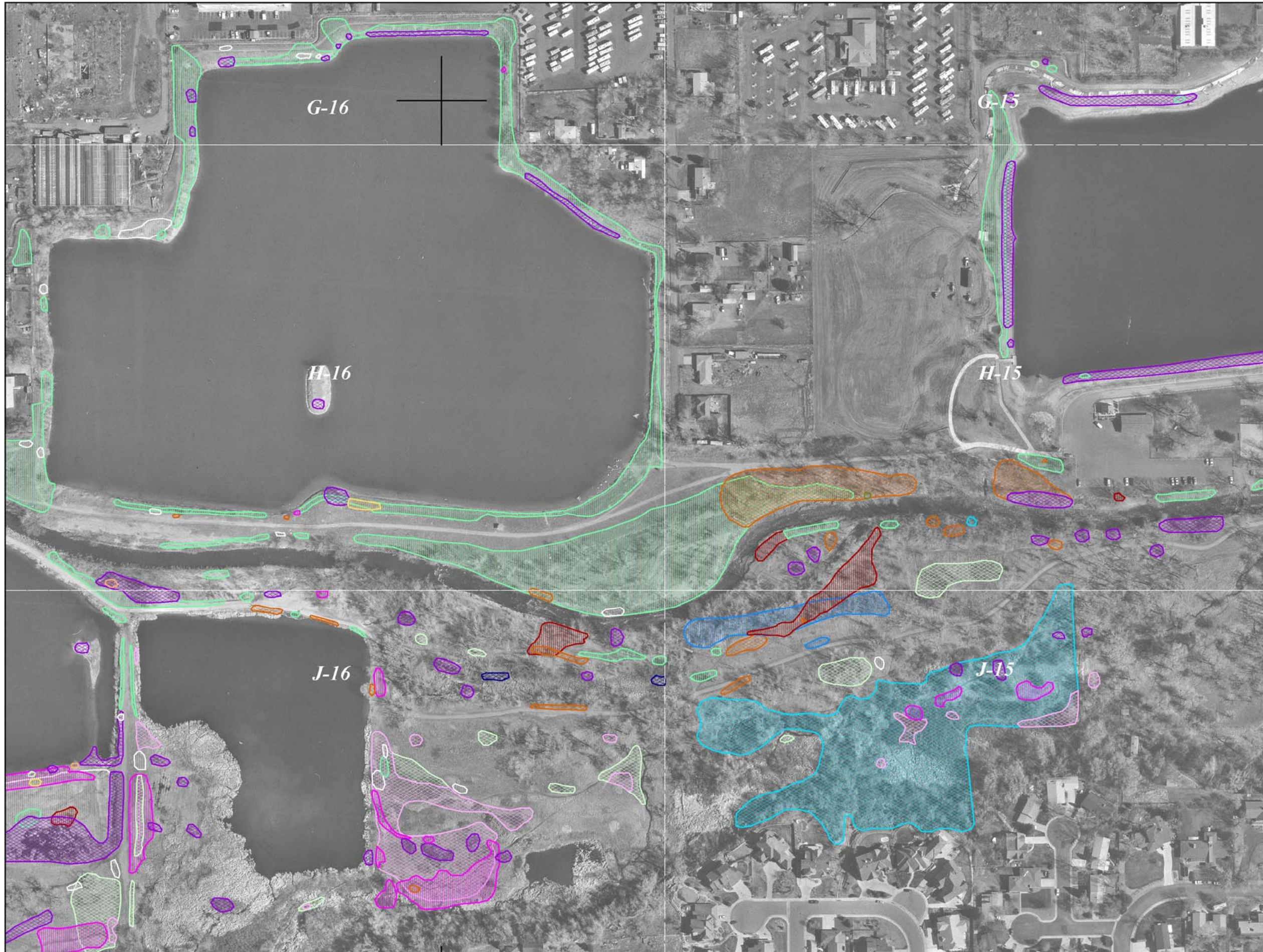
 Tic Marks

### Location in Wheat Ridge



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Map 17 is not available

# City of Wheat Ridge Greenbelt and Lewis Meadows

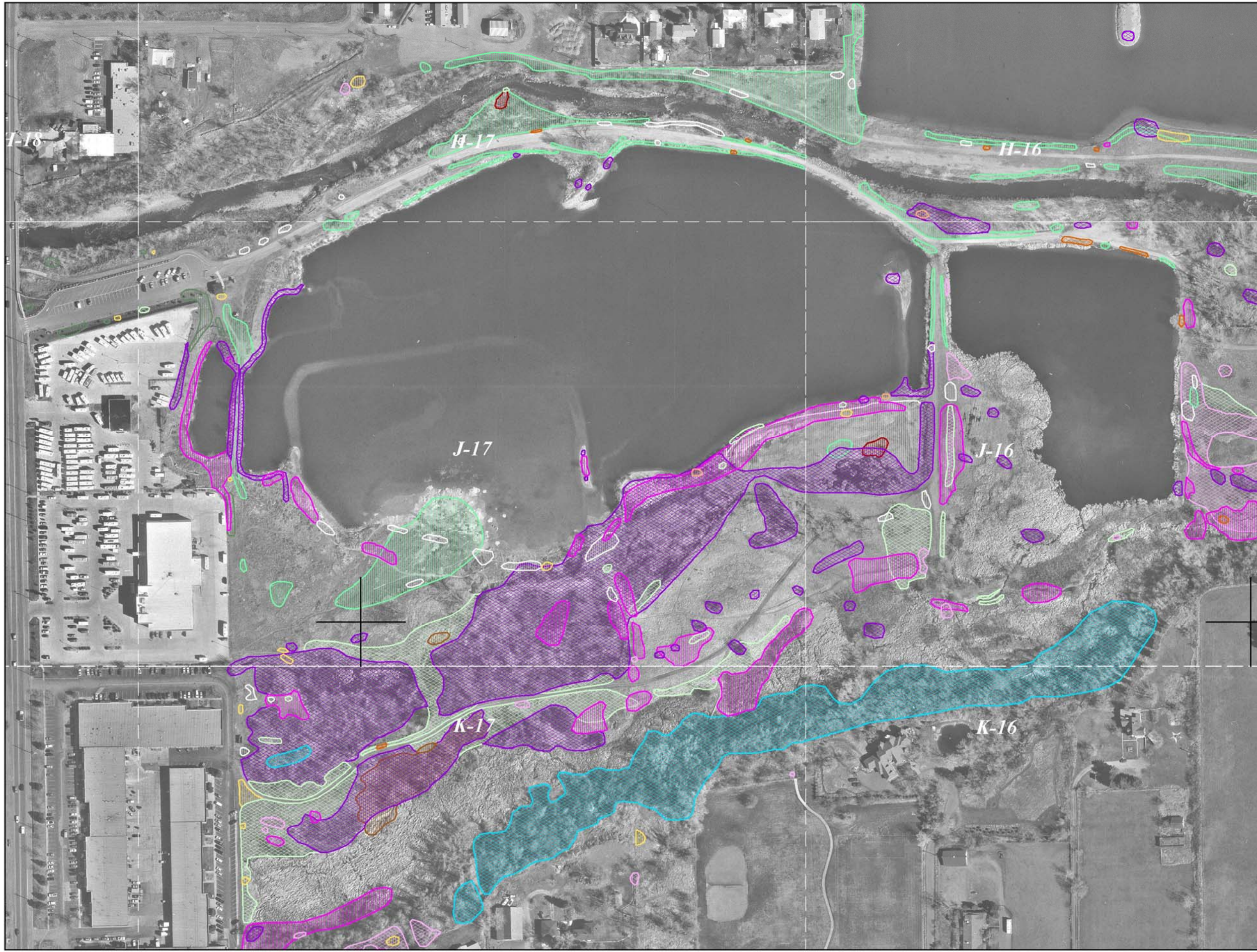
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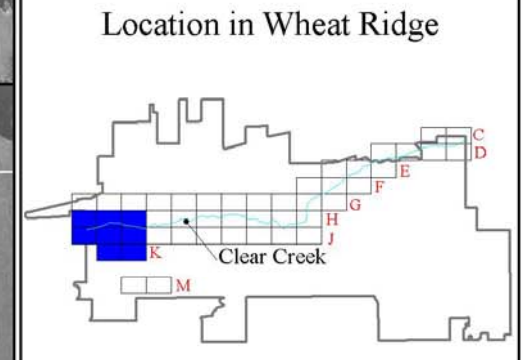


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Map Date: 30 March 2001  
 615 Dept: db

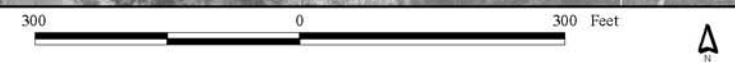


- Weeds**
- Dalmatian Toadflax
  - Canada Thistle
  - Diffuse Knapweed
  - Bull Thistle
  - Scotch Thistle
  - Poison Hemlock
  - Cutleaf Teasel
  - Russian Olive
  - Musk Thistle
  - Tamarisk
  - Chinese Clematis
  - Yellow Toadflax
  - Common Teasel
  - Buckthorn
  - Poison Ivy
  - Purple Loosestrife
  - Leafy Spurge
  - Tic Marks



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Map 19 is not available

# City of Wheat Ridge Greenbelt and Lewis Meadows

## Selected Weeds





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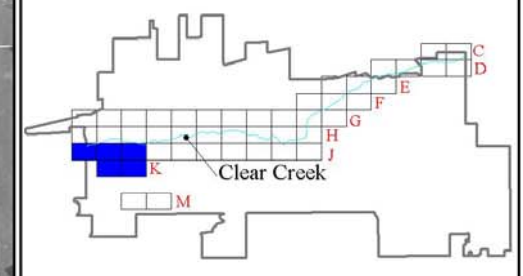
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 615 Dept: db

### Weeds

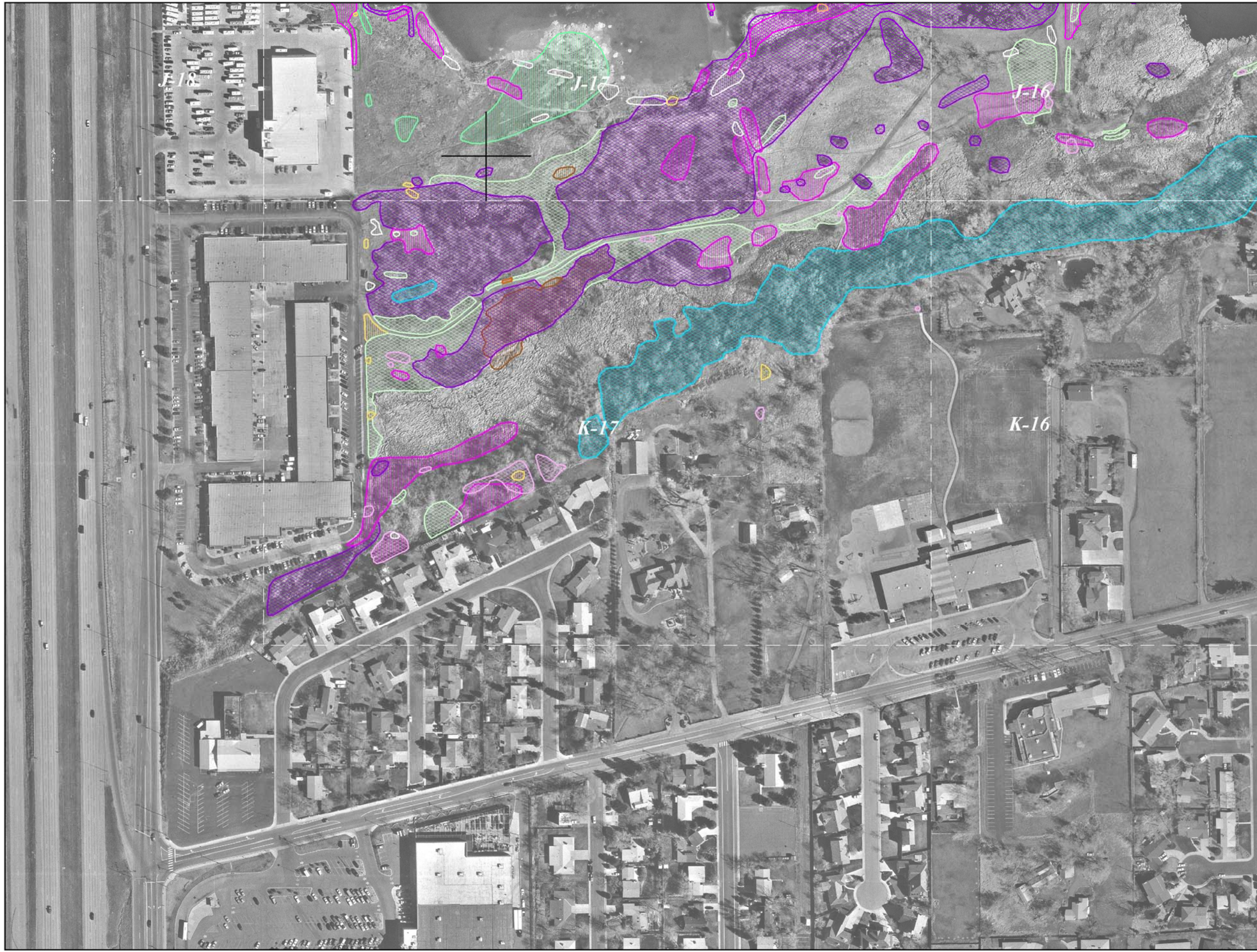
-  Dalmatian Toadflax
-  Canada Thistle
-  Diffuse Knapweed
-  Bull Thistle
-  Scotch Thistle
-  Poison Hemlock
-  Cutleaf Teasel
-  Russian Olive
-  Musk Thistle
-  Tamarisk
-  Chinese Clematis
-  Yellow Toadflax
-  Common Teasel
-  Buckthorn
-  Poison Ivy
-  Purple Loosestrife
-  Leafy Spurge
-  Tic Marks

### Location in Wheat Ridge



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# City of Wheat Ridge Greenbelt and Lewis Meadows

## Vegetation Types, Rare Plants and Vertebrates

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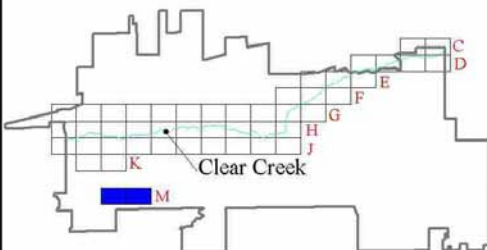
### Vegetation Types

- Mixed Grass/Forb Meadows
- Revegetated/Planted - Pond Margins
- Revegetated/Planted - Irrigated
- Revegetated/Planted - Non-irrigated
- Disturbed/Weedy
- Cattail Marsh
- Willow - Raised Bank
- Willow - Floodplain
- Willow - Channel
- Mixed Shrub Floodplain
- Rabbitbrush Mixed Herbaceous
- Snowberry/Skunkbush Meadows
- Mixed Non-Native Woodland
- Mixed Cottonwood/Mesic Grasses
- Mixed Cottonwood/Mixed Shrub/Mesic Grasses
- Native Cottonwood/Willow/Mesic Grasses
- Mixed Bluff Slope Woodlands
- Bare Ground
- Infrastructure
- Open Water

Vertebrates

Tic Marks

### Location in Wheat Ridge



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300 0 300 Feet



# City of Wheat Ridge Greenbelt and Lewis Meadows

## Selected Weeds

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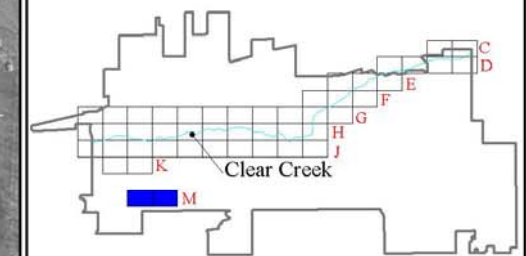
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 615 Dept: db

### Weeds

-  Dalmatian Toadflax
  -  Canada Thistle
  -  Diffuse Knapweed
  -  Bull Thistle
  -  Scotch Thistle
  -  Poison Hemlock
  -  Cutleaf Teasel
  -  Russian Olive
  -  Musk Thistle
  -  Tamarisk
  -  Chinese Clematis
  -  Yellow Toadflax
  -  Common Teasel
  -  Buckthorn
  -  Poison Ivy
  -  Purple Loosestrife
  -  Leafy Spurge
-  Tic Marks

### Location in Wheat Ridge



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