Level 4 Potential Conservation Area (PCA) Report

Name Colorado River **Site Code** S.USCOHP*15679

IDENTIFIERS

Site ID 1328 **Site Class** PCA

Site Alias Colorado River Megasite

Network of Conservation Areas (NCA)

NCA Site ID	NCA Site Code	NCA Site Name
-		No Data

County

Garfield (CO)

Grand (UT)

Mesa (CO)

SITE DESCRIPTION

Site Description

This site includes the stretch of the Colorado River that extends from Rifle to the Utah border. The Colorado River riparian corridor is the most heavily developed area in Mesa County. The floodplains near the river were historically dominated by stands of Rio Grande cottonwood (*Populus deltoides* ssp. *wislizeni*) with an understory of skunkbrush (*Rhus trilobata*). However, development of the floodplain, agriculture, and most notably, the invasion of non-native species such as tamarisk (*Tamarix ramosissima*), Russian olive (*Elaeagnus angustifolia*), and Russian knapweed (*Acroptilon repens*) have greatly reduced the amount of native riparian vegetation within this site. Extensive gravel mining operations in the river floodplain up and downstream of the City of Rifle has included the removal of cottonwood gallery forests and commensurate riparian and stream values that these forests provide. Along the immediate banks of the river and around wetlands in the floodplain, coyote willow (*Salix exigua*), cocklebur (*Xanthium strumarium*), barnyard grass (*Echinochloa crus-galli*), reedcanary grass (*Phalaris arundinacea*), common reed (*Phragmites australis*), cattail (*Typha latifolia*), hardstem bulrush (*Schoenoplectus acutus*), threesquare bulrush (*S. pungens*), alkali bulrush (*S. maritimus*), and redroot flatsedge (*Cyperus erythrorhizos*) are typically dominant. This site provides critically important habitat for endangered fish such as the razorback sucker (*Xyrauchen texanus*), Colorado pikeminnow (*Ptychocheilus lucius*), and humpback chub (*Gila cypha*). The river reach from New Castle into De Beque Canyon supports populations of roundtail chub (*Gila robusta*) and flannelmouth sucker (*Catostomas latipinnis*). In addition, a recovery program for razorback suckers (*Xyrauchen texanus*) stocked a total of 29,377 juvenile and adult razorback suckers into the Upper Colorado River near Parachute from October 1999 to November 2000; an additional 14,322 suckers have been released into the Gunnison River between April 1994 and November 2000 (Pfeifer and Burdick 2000). In 1999, 174 of these fish were recaptured during electroshocking surveys. Fish disbursement from stocking has been predominately downstream of release sites (Pfeifer and Burdick 2000). There are also records of Bald Eagles (*Haliaeetus leucocephalus*) attempting to nest here in the early 1980s and recent observations of feeding Peregrine Falcons (*Falco peregrinus anatum*) and Sandhill Cranes (*Grus canadensis tabida*). The cottonwood associations found within this site have the potential to support nesting Bald Eagles, and in time eagles could repopulate this site as populations continue to expand after the DDT induced declines of the 1970s and 80s. Reestablishment of the Bald Eagles is dependent on maintaining or improving the current quality of the area. This area historically contained numerous wetlands and extensive riparian forests, but the I-70 corridor, Rio Grande-Southern Pacific Railroad, and agriculture practices have modified and/or destroyed many of these areas. Irrigated pastures are interspersed along the river's floodplain with cottonwood galleries composed of narrowleaf cottonwood (*Populus angustifolia*), Rio Grande cottonwood, skunkbrush (*Rhus trilobata*), tamarisk, and Russian olive. Small patches of the globally imperiled Rio Grande cottonwood riparian forest (*Populus deltoides* ssp. *wislizeni* / *Rhus trilobata*) dot the islands and portions of the floodplain. Sporadic marshes dominated by cattail (*Typha* sp.) and hardstem bulrush (*Schoenoplectus acutus*) and alkaline meadows dominated by Baltic rush (*Juncus balticus*), common threesquare, and saltgrass (*Distichlis spicata*) are scattered throughout the floodplain. Most patches of the Rio Grande cottonwood forest are only in fair condition due to the influx of non-native shrubs such as tamarisk and Russian olive and improper grazing. Although small, the most intact stands of this community in Mesa County occur on an island within the Bureau of Reclamation's De Beque Wildlife Area and on private land in the Cameo area. The narrow De Beque Canyon portion of the river is historical habitat for at least two of the river's endangered fish. However, recent surveys conducted by Colorado Parks and Wildlife (CPW) and United States Fish and Wildlife Service (USFWS) did not locate any Colorado pikeminnow (Osmundson 2001). A proposed fish ladder would enable the natural migration of the fish to take place. If it is

built, the fish could be returned to the canyon within a few years. Other species of concern in De Beque Canyon include Peregrine Falcons, Bald Eagles, Great Blue Herons, and the northern leopard frog (*Lithobates pipiens*). The Grand Valley portion of the river is highly developed and heavily used for agriculture. Nonetheless, it is the most important stretch of the river in Mesa County for the endangered fish due to the amount of historical and current backwater areas, sloughs, and ponds which provide critical habitat for these fish. Most of the cottonwood galleries have been heavily infested with tamarisk, Russian olive, and Russian knapweed but still provide valuable wildlife habitat and perform importance ecological functions in an otherwise arid, urbanizing landscape. The stretch of river through Horsethief and Ruby Canyon does not contain extensive stands of riparian vegetation but does contain important areas for the endangered fishes. Difficulties encountered in the recovery efforts for the razorback sucker and Colorado pikeminnow are not unrelated to other conservation issues in the area. Natural flows of the river have been altered by upstream water diversions, dams, and levees, resulting in a lack of floodplain dynamics that are critical to wetland habitat creation, regeneration of cottonwoods, and maintenance of aquatic habitat for native fishes. Floods, which created the areas that the fish historically used for spawning, and which are also necessary for the normal regeneration of cottonwood and willow, are no longer viable options because of the water development in the area and development within the floodplain. The lack of natural flooding has increased tamarisk invasion, which, in turn, reduces flows via very high transpiration rates and increased sedimentation (The Nature Conservancy 1998). Decreased flows and the absence of flushing results in a concentration of elements such as selenium, which move up the food chain, affecting the survival of the fish. The area near Grand Junction is an important area for open space and recreation. Grand Junction's Riverfront Project includes a system of trails and protected areas and the Western Colorado Botanic Garden. State protected areas include the Walker State Wildlife Area, and Connected Lakes Park. The U. S. Fish and Wildlife Service's Colorado River Recovery Program uses the area as an experimental spawning ground for endangered fish. It encompasses several standard sites, including Ruby Canyon, the Colorado River at Grand Junction, and Debeque Canyon in Mesa County. Soils are derived from alluvium and vary in texture depending on geomorphic position. Organic matter accumulation is minimal except around wetlands and near the banks of sloughs where small O- and thick A-horizons may form. The substratum along the Rifle Stretch consists of unconsolidated surficial deposits of Quaternary gravel and alluvium in the valley bottom. The soils within floodplain consist of a mosaic of Torrifluvents, Halaquepts, and Wann series. The Torrifluvents formed in alluvium and are located closest to the current river channel. The Wann series is found on slightly higher portions of the floodplain or in areas where soil development has had time to occur. The Wann series is classified as a coarse-loamy, mixed, mesic Fluvaquentic Haplustolls. These soils are deep, somewhat poorly drained soils formed in alluvium derived from sandstone and shale. These soils are calcareous and moderately alkaline (USDA Soil Conservation Service 1978). Halaquepts are a broadly defined soil type that consists of deep, somewhat poorly drained to poorly drained, level, salt-affected soils on low terraces (USDA Soil Conservation Service 1978). Texture in these soils is highly variable with the upper 24 inches ranging from loam to clay, and the underlying layers generally gravelly. Halaquepts are commonly gleyed from the surface down (USDA Soil Conservation Service 1978). Soils within De Beque Canyon are not mapped by the Natural Resources Conservation Service (NRCS), but given the narrow nature of the canyon and subsequent lack of extensive floodplains, most soils likely consist of various textures of alluvium. Backwater areas and soils under cottonwood canopies likely have organic rich A-horizons. Soils along the river within the Grand Valley are not mapped by the NRCS, but given what is mapped along the river in Ruby Canyon and along the Gunnison River, a likely common soil type in the area may be the Youngston Series. The Youngston is classified as a fine-loamy, mixed, (calcareous), mesic Typic Torrifluvents. The Youngston consists of deep, well-drained soils that have been formed in alluvium on floodplains and alluvial fans (USDA Soil Conservation Service 1978). It is mapped as occurring along the Gunnison River and in Ruby Canyon.

Key Environmental Factors

No Data

Climate Description

The climate of the area is characterized as arid semi-desert. The average maximum summer daytime temperature is 93 (deg F) and nighttime minimums of 57 (deg F). Summer maxima may be as high as 110 (deg F). Average winter daytime and nighttime temperature extremes are 38 (deg F) and 12 (deg F), respectively. Precipitation averages less than 8.64 inches per year and primarily occurs in the late summer and fall as rain. (WRCC 2004)

Level 4 Potential Conservation Area (PCA) Report

Name Colorado River **Site Code** S.USCOHP*15679

Land Use History

Dams and diversion for irrigation. There has been much alteration of plant associations within the floodplain of the Colorado River that stem from altered hydrology and past land use.

Cultural Features

No Data

Minimum Elevation	4,440.00	**Feet**	1,353.00	**Meters**
Maximum Elevation	5,689.00	**Feet**	1,734.00	**Meters**

SITE DESIGN

Site Map Y - Yes **Mapped Date** 01/18/2002

Designer Rocchio, F.J.

Boundary Justification

The site boundary encompasses the mainstem of the Colorado River and its floodplain, including the adjacent highway and railroad, which are unavoidably parts of this site. The boundaries incorporate an area that will allow natural hydrological processes such as seasonal flooding, sediment deposition, and new channel formation to maintain viable populations of the elements. The boundaries also provide a small buffer from nearby agriculture fields, roads, and houses where surface runoff may contribute excess nutrients, sediment, and herbicides/pesticides. The site contains areas where old oxbows, sloughs, and ponds could provide a source of recruitment for native wetland and riparian plant species and provide critical fish habitat. It should be noted that the hydrological processes necessary to the elements are not fully contained by the site boundaries. Given that the elements are dependent on natural hydrological processes associated with the Colorado River, any upstream activities along the Colorado River and its tributaries such as water diversions, impoundments, and development could potentially be detrimental to the elements. This boundary indicates the minimum area that should be considered for any conservation management plan.

Primary Area	40,652.57	**Acres**	16,451.58	**Hectares**

SITE SIGNIFICANCE

Biodiversity Significance Rank B1: Outstanding Biodiversity Significance

Biodiversity Significance Comments

The site includes multiple occurrences of three of the endangered fish of the Colorado River, the razorback sucker (*Xyrauchen texanus*), Colorado pikeminnow (*Ptychocheilus lucius*), and humpback chub (*Gila cypha*). All three species are considered globally critically imperiled (G1). The USFWS and Colorado Division of Wildlife list the razorback sucker as endangered. Fewer than seventy specimens of razorback sucker have been collected since 1979, and these have all been adult fish, which may live for thirty years (Woodling 1985). This suggests that reproductive failure is the cause of their decline. Lack of recruitment of young into the population has been attributed to predation by non-native species including catfish and carp. Dams may block access to spawning habitats, change suitable juvenile habitat, block upstream migration, and lower water temperatures. There are confirmed spawning areas in Mesa County at Clifton, and the Colorado River between Grand Junction and Clifton is one of the main concentration areas of the fish. Backwaters, eddies, and impoundments are critical habitat for the fish. The fish are often associated with sand, mud and rock substrates in areas with sparse aquatic vegetation and moderate to warm temperatures (Sigler and Miller 1963). The Colorado River has been stocked with razorback suckers along the Rifle stretch. The USFWS and Colorado Division of Wildlife list the Colorado pikeminnow as endangered. The Colorado pikeminnow was once an important commercial fish throughout the Colorado River drainage in mainstream channels, including the Green, Yampa, White, Colorado, Gunnison, Dolores, and Animas rivers. Its current distribution is restricted to the lower reaches of these rivers, except the Dolores and Animas (Woodling 1985). The decline of the fish is not fully understood. It is thought that dams have restricted spawning migrations, and that lowered water temperatures resulting from cold-water releases prevent the development of fertilized eggs. Biotic interactions with other introduced fish species may also have impacted their decline (Woodling 1985). Young pikeminnows prefer small, quiet backwaters. Adults use various habitats, including deep, turbid, strongly flowing water, eddies, runs, flooded bottoms, or backwaters (especially during high flow). Lowlands inundated during spring high flow appear to be important habitats (Tyus and McAda 1984). Efforts for the recovery of the pikeminnow include reintroduction and the construction of fish ladders to facilitate their natural migration (R. Anderson, CDOW, personal communication.). The USFWS and Colorado Division of Wildlife list the humpback chub as endangered. The humpback chub was historically widely distributed

throughout the Colorado River Basin to which it is endemic. Its habitat has been altered by the construction of dams, and today it is found in widely separated river areas in the upper and lower Colorado Basin. The species is also threatened by hybridization with the roundtail chub (*Gila robusta*). Reduced river flows allow the round tail chub to successfully inhabit some deep water areas during low water periods where humpback chubs were previously isolated, resulting in competition and hybridization. Intermediates between the species occur in altered river systems, but not in unaltered rivers, emphasizing the importance of natural riverine environments for the recovery of the species (Tyus and Karp 1989). This site also supports multiple occurrences of the globally imperiled (G2) Rio Grande cottonwood/skunkbrush (*Populus deltoides* ssp. *wislizeni* / *Rhus trilobata*) riparian forest. 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). 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 of cottonwoods is poor at all sites, and tamarisk is invading stands of this type on many of the aforementioned rivers. Historically, only two to three pairs of Bald Eagles nested along the Colorado River, but the nesting pairs have increased steadily since the 1980s to 38 confirmed nests in 1995 (Winternitz 1998). There were active nests along the Colorado River in the mid-1990's but they have not been successful since the early 1980s (Lyon et. al 2001). However, recently an active and successful nest was discovered on one of the large islands near Rhone (Soker, D. USFWS, personal communication, 2002). Colorado is a very popular wintering area for Bald Eagles. The annual midwinter count shows a stable population of 600 to 800 eagles. Although now in recovery, populations of Bald Eagles declined during the 1980s because of high pesticide use, poisoning, and poaching (feathers are valuable on the black market). Several Peregrine Falcon records, one in good condition (B-ranked), are also within this site. Though there are more than 70 known Peregrine Falcon pairs breeding in Colorado, there are fewer than 300 individuals estimated as breeding in Colorado. Human disturbance of nests by recreational rock climbers, illegal capture by falconers, and uncertain breeding status across the state are factors considered important in the conservation of this species which is vulnerable through its range (G4T3). A portion of this site has also been designated an Important Bird Area (Grand Valley Riparian Corridor) by the Audubon Society due to the fact that nearly 300 bird species have used the lowland riparian vegetation in the Grand Valley over the last 15 years. This includes nearly 70 breeding species and over 70 wintering species (National Audubon Society 2000).

Other Values Rank No Data

Other Values Comments

Numerous occurrences of the state rare (G5/S3) northern leopard frog were documented throughout this site.

ASSOCIATED ELEMENTS OF BIODIVERSITY

Element State ID	State Scientific Name	State Common Name	Global Rank	State Rank	Driving Site Rank
20765	*Gila robusta*	Roundtail Chub	G3	S2	N
19424	*Gila cypha*	Humpback Chub	G1	S1	Y
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
23729	*Xyrauchen texanus*	Razorback Sucker	G1	S1	Y
19424	*Gila cypha*	Humpback Chub	G1	S1	Y
22268	*Gila elegans*	Bonytail Chub	G1	SX	N
20983	*Ptychocheilus lucius*	Colorado Pikeminnow	G1	S1	Y
20765	*Gila robusta*	Roundtail Chub	G3	S2	N
21249	*Haliaeetus leucocephalus*	Bald Eagle	G5	S3B,S3N	N
21249	*Haliaeetus leucocephalus*	Bald Eagle	G5	S3B,S3N	N
23729	*Xyrauchen texanus*	Razorback Sucker	G1	S1	Y
20765	*Gila robusta*	Roundtail Chub	G3	S2	N
20765	*Gila robusta*	Roundtail Chub	G3	S2	N
20983	*Ptychocheilus lucius*	Colorado Pikeminnow	G1	S1	Y
21249	*Haliaeetus leucocephalus*	Bald Eagle	G5	S3B,S3N	N
21249	*Haliaeetus leucocephalus*	Bald Eagle	G5	S3B,S3N	N
23729	*Xyrauchen texanus*	Razorback Sucker	G1	S1	Y

24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
20765	*Gila robusta*	Roundtail Chub	G3	S2	N
23729	*Xyrauchen texanus*	Razorback Sucker	G1	S1	Y
23729	*Xyrauchen texanus*	Razorback Sucker	G1	S1	Y
21249	*Haliaeetus leucocephalus*	Bald Eagle	G5	S3B,S3N	N
21725	*Falco peregrinus anatum*	American Peregrine Falcon	G4T4	S2B	N
20983	*Ptychocheilus lucius*	Colorado Pikeminnow	G1	S1	Y
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
20983	*Ptychocheilus lucius*	Colorado Pikeminnow	G1	S1	Y
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
21725	*Falco peregrinus anatum*	American Peregrine Falcon	G4T4	S2B	N
19424	*Gila cypha*	Humpback Chub	G1	S1	Y
20765	*Gila robusta*	Roundtail Chub	G3	S2	N
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
19424	*Gila cypha*	Humpback Chub	G1	S1	Y
23668	*Antigone canadensis tabida*	Greater Sandhill Crane	G5T5	S2B,S4N	N
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
20765	*Gila robusta*	Roundtail Chub	G3	S2	N
23729	*Xyrauchen texanus*	Razorback Sucker	G1	S1	Y
20983	*Ptychocheilus lucius*	Colorado Pikeminnow	G1	S1	Y
23729	*Xyrauchen texanus*	Razorback Sucker	G1	S1	Y
23729	*Xyrauchen texanus*	Razorback Sucker	G1	S1	Y
23729	*Xyrauchen texanus*	Razorback Sucker	G1	S1	Y
21249	*Haliaeetus leucocephalus*	Bald Eagle	G5	S3B,S3N	N
20983	*Ptychocheilus lucius*	Colorado Pikeminnow	G1	S1	Y
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
21725	*Falco peregrinus anatum*	American Peregrine Falcon	G4T4	S2B	N
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
20765	*Gila robusta*	Roundtail Chub	G3	S2	N
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
21725	*Falco peregrinus anatum*	American Peregrine Falcon	G4T4	S2B	N
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N

24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N
19424	*Gila cypha*	Humpback Chub	G1	S1	Y
20765	*Gila robusta*	Roundtail Chub	G3	S2	N
20983	*Ptychocheilus lucius*	Colorado Pikeminnow	G1	S1	Y
20983	*Ptychocheilus lucius*	Colorado Pikeminnow	G1	S1	Y
21249	*Haliaeetus leucocephalus*	Bald Eagle	G5	S3B,S3N	N
19424	*Gila cypha*	Humpback Chub	G1	S1	Y
24600	*Populus deltoides ssp. wislizeni / Rhus trilobata* Riparian Woodland	Fremont's Cottonwood Riparian Forests	G3	S3	N

LAND MANAGMENT ISSUES

Land Use Comments

No Data

Natural Hazard Comments

No Data

Exotics Comments

No Data

Offsite

No Data

Information Needs

No Data

REFERENCES

Reference ID	Full Citation
193459	Anderson, Rick. 1996. Colorado Division of Wildlife. Personal communication to Mike Wunder, CNHP.
281894	Bennett, M. Weed Management in Riparian Areas With a focus on non-chemical strategies. No date. Oregon State University Extension Service. Available online at: http://extension.oregonstate.edu/sorec/sites/default/files/bennett_weed_management_in_riparian_areas.pdf. Accessed 2016.
193456	Briggs, M.K. 1996. Riparian Ecosystem Recovery in Arid Lands. Strategies and References. The University of Arizona Press. Tuscon, AZ.
158661	Buehler, D. A., et al. 1991e. Winter microclimate of bald eagle roosts on the northern Chesapeake Bay. Auk 108:612-618.
193458	Carothers, S.W., G.S. Mills, and R.R. Johnson. 1990. The Creation and Restoration of Riparian Habitat in Southwestern Arid and Semi-Arid Regions. In Wetland Creation and Restoration: The Status of Science, Vol. 1, Regional Reviews, edited by J.A. Kusler and M.E. Kentula, 359-376. Covelo, CA. Island Press.
164972	Keammerer, W. R. 1974. Vegetation of the Grand Valley area. Pages 73-117in Ecological inventory of the Grand Valley area Unpublished report prepared for the Colony Development Operation, Atlantic Richfield Company, Denver, Colorado.
171269	Kittel, G.M. and N.D. Lederer. 1993. Final Report: A Preliminary Classification of the Riparian Vegetation of the Yampa and San Miguel/Dolores River Basins. Colorado Natural Heritage Program, Fort Collins, CO.
173289	Lyon, P., C. Pague, R. Rondeau, L. Renner, C. Slater, and C. Richard. 1996. Final Report: Natural Heritage Inventory of Mesa County, Colorado. Colorado Natural Heritage Program, Fort Collins, CO.
193460	Lyon, P., J. Sovell, and J. Rocchio. 2001. Final Report: Survey of Critical Biological Resources, Garfield County, Colorado. Vol. 1. Colorado Natural Heritage Program, Fort Collins, CO.
281907	Malone, D. J. Emerick, P. Lyon, and J. Sovell. 2016. CNHP Final Report: Survey of Critical Biological Resources: a resurvey and update of Potential Conservation Areas in Garfield County, Colorado. Colorado Natural Heritage Program, Fort Collins, CO.
193461	National Audubon Society. 2000. Important Bird Areas of Colorado. Compiled by K.A. Cafaro. Audubon-Colorado, Boulder, CO.
193463	Osmundson, D.B. 2001. Flow Regimes for Restoration and Maintenance of Sufficient Habitat to Recover Endangered Razorback Sucker and Colorado Pikeminnow in the Upper Colorado River. Interim Recommendations for the Palisade-to-Rifle Reach. Final Report. Recovery Implementation Program, Project No. 74. Colorado River Fishery Project, U.S. Fish and Wildlife Service, Grand Junction, CO.
193464	Pfeifer, F.K. and B.D. Burdick. 2000. A five year experimental stocking plan to evaluate survival of various sizes of razorback sucker. Colorado River Recovery Program, Recovery Program FY 2000 Annual Project Report. Project Number 50. U.S. Fish and Wildlife Service, Grand Junction, CO.
183498	Rocchio J., G. Doyle, D. Culver. 2002. Final Report: Survey of Critical Wetlands and Riparian Areas in Mesa County, Colorado. Colorado Natural Heritage Program, Fort Collins, CO.
193465	Sala, A.S., S.D. Smith, and D.A. Devitt. 1996. Water use by Tamarix ramosissima and associated phreatophytes in a Mojave desert floodplain. Ecological Applications 6, 888-898.
163237	Sigler, W. F., and R. R. Miller. 1963. Fishes of Utah. Utah State Department of Fish and Game, Salt Lake City, Utah, 203 pp.
193466	Smith, S.D. and D.A. Devitt. 1996. "Physiological ecology of saltcedar: why is it a successful invader". Presentation at Saltcedar Management and Riparian Restoration Workshop, Las Vegas, NV. September 1996.
193467	Soker, D. 2002. Land Acquisition Coordinator, U.S. Fish and Wildlife Service, Colorado River Recovery Program, Grand Junction, CO. Personal Communication to the Colorado Natural Heritage Program.

184712	Stevens, J.E. 2004. Final Report: Biological Inventory of Colorado Canyons NCA. Colorado Natural Heritage Program, Fort Collins, CO.
193462	The Nature Conservancy. 1998. Element Stewardship Abstract for Tamarix ramosissima, T. pentandra, T. chinenesis, and T. parviflora (Tamarisk). Prepared by Alan T. Carpenter, Land Stewardship Consulting, Boulder, CO for The Nature Conservancy, Arlington, VA.
193468	Toolen, J. 2001. Colorado Division of Wildlife District Wildlife Manager. Personal communication to the Colorado Natural Heritage Program.
165784	Tyus, H. M., and C. A. Karp. 1989. Habitat use and streamflow needs of rare and endangered fishes, Yampa River, Colorado. U.S. Fish and Wildlife Service, Biological Report 89(14). 27 pp.
161915	Tyus, H. M., and C. W. McAda. 1984. Migration, movements and habitat preferences of Colorado squawfish, Ptychocheilus lucius, in the Green, White, and Yampa rivers, Colorado and Utah. Southwestern Naturalist 29:289-99.
193469	USDA Soil Conservation Service. 1978. Soil Survey of Mesa County Area, CO. U.S. Department of Agriculture.
193470	USDI Bureau of Land Management. 1987. Grand Junction Resource Area Resource Management Plan and Record Division. Grand Junction District, Grand Junction, CO.
184604	WRCC. 2004. Western Regional Climate Center. Division of Atmospheric Sciences, Desert Research Institute. Reno, Nevada. <http://www.wrcc.dri.edu>.
193471	Winternitz, N.L. 1998 Bald Eagle. In Colorado Breeding Bird Atlas, H.E. Kingery ed. Colorado Bird Atlas Partnership; co-published by Colorado Division of Wildlife.
160208	Woodling, J. 1985. Colorado's Little Fish: A Guide to the Minnows and Other Lesser Known Fishes in the State of Colorado. Colorado Division of Wildlife, Denver.

ADDITIONAL TOPICS

Additional Topics

Summarized threats: Ecological consequences of the loss of riparian vegetation, channelization and flow alteration includes impaired riparian and stream ecosystem functions including water cleansing and storage functions and provisioning of wildlife habitat. A natural flooding regime and channel morphology are necessary for cottonwood regeneration and the creation of wildlife habitat including fish spawning habitat and eagle nesting habitat. However, natural processes have been disabled and are no longer functioning due to development of both water and floodplains which has resulted in river channelization and prevented natural flooding processes to occur. Loss of cottonwood woodlands has further intensified channel downcutting, which has impaired the out-of-bank flows that recharge the aquifer and sustain riparian vegetation. These alterations have reduced the availability of nest sites for birds including eagles, great blue herons and Neotropical migrant songbirds, intensified flooding flows, reduced fish spawning habitat and, the consequent drying of floodplain soil, has enabled the invasion of tamarisk and other exotic plant species. Original site design by Lyon, M.J. 1996-12-01

LOCATORS

Nation United States **Latitude** 391734N

State Colorado **Longitude** 1081355W

Quad Code	Quad Name
39107-E8	Anvil Points
39107-E7	Rifle
39107-E6	Silt
39108-D2	Red Pinnacle
39108-D1	Grand Valley
39107-D8	Rulison
39107-D7	North Mamm Peak
39108-C3	Wagon Track Ridge
39108-C2	De Beque
39109-B1	Bitter Creek Well
39108-B8	Ruby Canyon

39108-B7	Mack
39108-B6	Fruita
39108-B3	Cameo
39108-B2	Mesa
39109-A1	Westwater
39108-A6	Colorado National Monument
39108-A5	Grand Junction
39108-A4	Clifton
39108-A3	Palisade

Watershed Code	Watershed Name
14010005	Colorado headwaters-Plateau
14010006	Parachute-Roan
14020005	Lower Gunnison

VERSION

Version Date 08/13/2016

Version Author Malone, D.G.

DISCLAIMER