# COLORADO WETLAND INVENTORY
# U. S. FISH AND WILDLIFE SERVICE
# 1:100,000 MAP NARRATIVE REPORT
# -TRINIDAD SW-

## INTRODUCTION

In 1974, the U. S. Fish and Wildlife Service directed its Office of Biological Services to complete an inventory of the Nation's wetlands. As part of this overall objective, an effort began in September, 1978 to delineate and classify photointerpretable wetlands within the eastern five-sevenths of Colorado.

Wetland maps at 1:100,000 scale and wetland overlay maps at 1:24,000 scale are produced at National Wetland Inventory Headquarters in St. Petersburg, Florida. Final Colorado wetland maps are available at the U. S. Fish and Wildlife Service's Regional Office located in Denver, Colorado. An integral part of all final wetland maps is the completion of narrative reports for each 1:100,000 quadrangle inventoried. The following narrative report provides both basic and specific data which aids the user in understanding not only the general area of the Trinidad SW quadrangle, but also representative details of its wetland habitat.

## MAP PREPARATION

Contractor for this wetland inventory was Colorado Division of Wildlife, 317 West Prospect, P. O. Box 2287 in Fort Collins, Colorado 80526. Richard Hopper was contract officer. Photointerpretation was done by the subcontractor, Colorado State Forest Service, Foothills Campus, Colorado State University, Fort Collins, Colorado 80523. Photointerpreters were Thomas Owens and Alexander Kosinski. Preparation of this narrative report was completed by Thomas Owens. Regicnal Wetland Coordinator was Charles Elliott, U. S. Fish and Wildlife Service, Denver Federal Center, P.O. Box 25486, Denver, Colorado 80225.

Wetland delineation and classification for Trinidad SW 1:100,000 quadrangle was done on 1:80,000 black and white aerial photographs that were taken in July and September 1975, August 1976, and June and October 1977. Photography covered 100 percent of the quadrangle. Wetland classification was done in accordance with Cowardin, et al., December, 1979. Specific mapping conventions developed at National Wetland Inventory Headquarters were used to assist in photointerpretation. Field checking was done on November 15, 1978.

Map users are cautioned that mapping with aerial photography has limitations. Wetlands are identified and classified through stereoscopic examination of photography of the basis of tone, texture, pattern, site, size, local ecology, and cultural patterns. Aerial photography reflects conditions during the year and season they are taken. In addition, the 1:80,000 black and white photography that was used on the project was photographed for purposes other than wetland mapping. The small scale precludes delineating very small wetlands (less than one-fourth acre) and narrow linear wetlands (less than 15 feet wide). Black and white emulsion makes distinguishing between classes of vegetation (and non-vegetation) difficult. Some imagery was not photographed during the best season for wetland delineation and classification. If photographed too early or too late in the season, moist (dark) tones are not evident. The photography was 1 to 3 years old when it was interpreted and land use changes have occurred.

Any noted discrepancies regarding wetland omissions, inclusions, or errors should be given to the U. S. Fish and Wildlife Service Regional Wetland Coordinator who is located in Denver, Colorado, and whose address is on the previous page.

## Special Mapping Problems

The San Luis Valley represents the most complicated wetland habitat in Colorado. Additionally, it was the first area mapped for the Colorado Wetland Inventory and so unfamiliarity with the photography, habitat, and the National Wetland Inventory's classification system compounded the problems on an already difficult task.

The wetlands of the San Luis Valley change significantly with elevation changes of as little as 6 inches. Since the valley is nearly level and the water table is near the surface in many areas, small changes in elevation affect large areas. The small elevation changes significant for detecting different types of wetlands are too small at this scale of photography to be easily or consistently detected. The vegetative cover is often sparse, and is masked by the soil color, and so changes in vegetation often do not correspond to tonal changes on the photography. Finally, the complex and extensive nature of San Luis Valley wetlands make delineation and classification time-consuming and tedious.

Late season imagery (October) on some quadrangles made identification and classification of temporary and seasonal wetlands difficult, due to the light tones these wetlands had at this late season.

## AREA DESCRIPTION

### Bailey's Ecoregions

Trinidad SW 1:100,000 quadrangle falls into two provinces in Bailey's Description of the Ecoregions of the United States, 1978, which classes land into a hierarchal system based upon bio-climatic, geologic and geomorphic criteria. The quadrangle's northeastern corner falls into the Great Plains-Shortgrass Province, Grama-Buffalo Grass Section (3113L). This province is characterized by bunched short grasses, with scattered trees and shrubs, and covers 3 percent of the quadrangle. The balance of the quadrangle (97 percent) is in the Rocky Mountain Forest Province, Ponderosa Pine, Douglas-Fir Section (3113M). This province is characterized by well-marked vegetative zones, whose distribution is controlled by altitude and latitude.

### Hammond's Land-Surface Forms

Trinidad SW falls into six of Hammond's Land-Surface Forms, which systematically characterizes the topography of the United States (Ecoregions and Land-Surface Forms Map, 1975). The northeastern 3 percent is Interior Division (III), Rocky Mountain Piedmont Subdivision (13), Tablelands with Considerable Relief (III-13B4c) which has 50 to 80 percent of area gently sloping, local relief 500 to 1,000 feet, and 50 to 75 percent of gentle slope on upland. The rest of the forms are in the Rocky Mountain Division (IV), Southern Rocky Mountain Subdivision (4). In the northeastern section 11 percent is Open High Mountains (IV-4C6a) which is characterized by 20 to 50 percent of area gently sloping, local relief over 3,000 feet, and more than 75 percent of gentle slope in lowland. In the southeastern corner 7 percent of the quadrangle is in Open Low Mountains (IV-4C5c) which is characterized by 20 to 50 percent of area gently sloping, local relief 1,000 to 3,000 feet, and 50 to 75 percent of gentle slope on upland. In the east-central portion of the quadrangle, 28 percent is High Mountains (IV-4D6) which has less than 20 percent of area gently sloping and local relief over 3,000 feet. In the west 39 percent is Smooth Plains (IV-4A2c) which is characterized by more than 80 percent of area gently sloping, local relief 100 to 300 feet, and 50 to 75 percent of gentle slope on upland. The southwestern 12 percent is Open Low Mountains (IV-4C5a) which has 20 to 50 percent of areas gently sloping, local relief 1,000 to 3,000 feet, and more than 75 percent of gentle slope on upland.

### Hydrologic Mapping Units

Seven hydrologic units are found in Trinidad SW (Hydrologic Unit Map of Colorado, 1974). Hydrologic units are part of an effort by the U. S. Geological Survey to provide a series of uniform, Nationally consistent maps which accurately delineate hydrographic boundaries for Federal and State water resource agencies. Units are designated by

eight-digit numbers which are tied to a computer file (Catalog of Information on Water Data) which contains information on water data activities (Langford and Kapinas, 1979). The first three units are in the Arkansas-Red-White Region (11). 11020010 in the east covers 10 percent of the quadrangle, while 11020006 in the northeast covers 6 percent, and 11080001 in the southeast covers 1 percent. The rest of the units are in the Rio Grande Region (13). 13010002 in the west covers 69 percent of the quadrangle, with 13010003 covering 2 percent in the north-central section. 13020101 covers 6 percent in the south-central section, while 13020005 covers 6 percent in the southwestern corner.

## Geography

Trinidad SW is divided into two geographic areas: The San Luis Valley and the mountains. The San Luis Valley in the western part of the quadrangle is a nearly flat, high, broad valley. Elevations average over 7,500 feet. It contains many artesian wells which supply water for agriculture and ranching. Vegetation includes greasewood, saltbush, and rabbitbrush over sparse grasses, forbs, and emergents. River bottoms are forested with cottonwoods and willows. The San Luis Valley is intensively farmed; important crops include potatoes, barley and other small grains, alfalfa, and native hay, as well as cattle (Bureau of Land Mangement, 1977).

East of the San Luis Valley is the Sangre de Cristo Range which is a steep and spectacular north-south tending range 20 miles wide. Elevations rise to 14,042 feet at Culebra Peak. There are extensive alpine areas along the crest of the Sangre de Cristos; alpine vegetation includes dwarf willows, sedges, rushes, grasses, and forbs. Below timberline the mountains are heavily forested with conifers and aspen. On lower slopes pinon-juniper dominate.

The Rio Grande is the quadrangle's major river, flowing from the northwest through Alamosa, then south to the New Mexico border. The Rio Grande is important for wildlife, fish, agriculture, and carries water to downstream users as well.

Major town of note include Alamosa, an agricultural community in the San Luis Valley, and San Luis, the oldest town in Colorado, dating back to 1760. Economic activities in Trinidad SW include not only agriculture in the San Luis Valley but also ranching in mountain valleys. Benefits the mountains provide include watershed, recreation, wildlife, and forestry.

## Geology

The Sangre de Cristo Mountains are made up of Permian (225-275 million years ago) and Pennsylvanian (275-310 million years ago)

conglomerates, sandstones, siltstones, shales, and fossil bearing limestone. The western part of the range are Precambrian (570 million years plus) gneisses, which are metamorphic rocks. The Sangre de Cristos were upthrust during the Laramide Orogeny in the Tertiary Period (3-70 million years ago) which thrust older rocks over younger in some cases; in other cases erosion stripped away younger overlying rocks exposing older rocks (Chronic and Chronic, 1972; Tweto, 1979).

Above 8,000 feet glaciers were active during the last glacial period creating spectacular high mountain scenery. Glaciers carved steep cirques and U-shaped valleys which were filled with terminal moraines as glaciers retreated. This process left stair-stepped valleys which were filled in by strings of lakes (Owens, 1980). As glaciers melted, swollen streams cut deeply across the uplifted ridges and carved deep valleys and canyons (Chronic).

Uplifted mountains provided material for alluvial deposition in the adjacent San Luis Valley which is filled with Quaternary (3 million years ago to the present) alluvium consisting of gravels, sands, silts, and clays (Tweto). These depositions are called the Alamosa Formation and consist of a thick series of interlayered clays and sand which slope down from the surrounding mountains into the center of the basin. Water enters sand from the mountains' edge and flows to the basin's center. The water has a large hydrostatic head and rises in wells without pumping. Many artesian wells contain warm or hot water (Chronic).

## Soils

Soil is an important element of wetlands and is one criterion used to define wetland. "The substrate of wetlands is predominately undrained hydric soil" (Cowardin). The National Wetland Inventory, in cooperation with the U. S. Soil Conservation Service, is preparing a list of hydric soils to accompany the Cowardin et al., wetland classification system.

There is no detailed soil information for the mountains in Trinidad SW. The only area that has detailed soil information is the northwestern corner of the quadrangle in the San Luis Valley (Pannell, et al., 1973). Information on soils at that location can be extended to the rest of the San Luis Valley due to homogeneous geology, physiography, and climate in the San Luis Valley.

There are two different wetland situations in the San Luis Valley: wetlands in river floodplains, and wetlands out of the floodplains. Soils in floodplains have higher water tables than soils out of floodplains and are occasionally flooded. Native vegetation on soils within the floodplain include cottonwoods, willows, sedges, rushes, cattails, grasses, and forbs. Outside of the floodplain native vegetation includes greasewood, saltbush, rabbitbrush, saltgrass, and alkali sacaton. Floodplains are 5 to 10 feet lower than the surrounding uplands.

Most wet soils in the San Luis Valley are alkaline. This is due to three factors: low precipitation, high evaporation, and high water table. Water is drawn up in the soil by capillary action and evaporates once it reaches the surface, leaving salts behind. There is little precipitation to dissolve the salts and move them back down through the soil. In wet areas there are salt accumulations of several inches on the surface.

There are two types of wetland soils on the upland: poorly drained soils and well-drained soils. Poorly drained soils are "natural" wetland soils, that is, they were wet before irrigation came into the valley. These soils are poorly drained due to an impermeable layer, fine texture, or a high water table. These soils are level, alkaline, with water tables 1 to 2 feet below the surface in spring and 2 to 5 feet below the surface in winter. Native vegetation has already been mentioned, although many of these soils are flood-irrigated and are now vegetated with sedges, rushes, grasses, and forbs. Mixed in with these irrigated soils are strips of soil that are 1 to 2 feet higher and still have native vegetation on them.

Well-drained soils are irrigated, either intentionally or accidentally, and as a result have a high water table. These soils are level, alkaline, and support sedges and rushes.

In floodplains wetland soils are poorly drained, level, and alkaline. They are subject to occasional flooding and the water table is 1 foot below the surface in spring and 1 to 3 feet below the surface in winter. There are small pockets of permanently flooded marshes which are composed of clayey to sandy soils and are vegetated by cattails, sedges, and rushes. Small pockets of peat are found in old stream channels. Peat is 2 to 8 feet deep, underlain by sand, strongly acidic, and receives ground water for moisture. Peat is vegetated by sedges and rushes.

## Climate

Elevation rises to over 14,000 feet and climate becomes more severe accordingly. There are great variations in climate within short distances in the mountains due to rugged and steep topography. Change in climate can be noted by the difference between Alamosa, located in the San Luis Valley (elevation 7,536 feet), and North Lake, located in the Sange de Cristos (elevation 8,8000 feet).

Alamosa receives 7.1 inches of precipitation per year, with 37 inches of snow. July's average maximum temperature is 82.0$^{o}$F, average minimum temperature is 48.3$^{o}$F. January's maximum temperature is 35.4$^{o}$F on average, minimum is -1.2$^{o}$F (Benci and McKee, 1977). The growing season is 93 days (SCS data).

North Lake receives 20.6 inches of precipitation pery year, with 91 inches of snow. July's average maximum temperature is 74.9°F, average minimum is 44.6°F. January's average maximum is 39.9°F, average minimum is 12.2°F (Benci and McKee). No growing season data is available.

## WETLANDS

### Community Description

#### Lacustrine System

Two lake types are found within Trinidad SW (information in this section comes from field notes taken November 15, 1978). One type is alpine lake (L1OWZ). Alpine lakes are deep, cold, and above timberline. They are found below glacial cirques and in glacial valleys above terminal moraines. Alpine glacial valleys have little soil and vegetation; as a result alpine lakes have low fertility. Alpine lakes have low algae populations and few fish. Shorelines and bottoms are rocky with little vegetation. Often alpine lakes are less than 20 acres, but due to their rocky shores, they are classified as lakes. Their water regime is permanent, and their water supply comes from snowmelt.

The second lake type found within Trinidad SW is reservoir (L1OWKZ), L2OWKZ). Reservoirs are found throughout the quadrangle, from the Sangre de Cristos to the San Luis Valley.

Water levels fluctuate as much as 30 feet during the year because of filling in spring with snowmelt and drawing down during summer for agricultural irrigation. The exposed shoreline is composed of rocks, gravel, sand, and mud. Reservoirs normally retain some water throughout the year.

#### Riverine System

In the mountains, most streams delineated are fast-flowing, permanent streams (R3OWZ), and called upper perennial rivers. These streams are characterized by a high gradient, bottoms with rocks, cobble, or gravel, and high dissolved oxygen concentrations.

In the San Luis Valley these streams become lower perennial rivers (R2OWZ). Lower perennial streams are characterized by slower-moving water, sand or mud bottoms, and lower dissolved oxygen concentrations.

Another type of river delineated in the San Luis Valley is irrigation canal (R2OWKY, R2OWKZ, R4SBKY). Canals that are large enough to be delineated (over 15 feet across) are feeder canals; that is, those that carry water to and from reservoirs and to irrigation ditches. Canals occasionally flow year round; their peak flow is during the growing season to get water to irrigated fields.

A final stream type delineated is intermittent stream (R4SBW). This stream type is delineated in the San Luis Valley where it is large enough to delineate. In the mountains, intermittent streams are too small to map. Intermittent streams have a sandy substrate that is very well drained. They flow after snowmelt and after local summer thunderstorms.

## Palustrine System

Small artificial impoundments (POWZ) are common on this quadrangle. These impoundments are found in small drainages and valleys and are used to provide water for flood-irrigation and livestock. The water regime is permanent to intermittently exposed; water is drawn down through the growing season for irrigation. Impoundments are often found with flood-irrigated fields.

Another type of impoundment is beaver pond (POWY). Beaver ponds are important wetlands found on small mountain streams and drainages. Beaver dams back water up, creating open-water habitat and large scrub/shrub-emergent areas (PSS/EMY, PSS/EMW).

Other stands of scrub/shrub-emergents are associated with undammed streams and also drainages below flood-irrigated fields. Often these scrub/shrub-emergent areas are flooded during spring runoff and remain moist most of the growing season. Species are the same as beaver dam associated scrub/shrub-emergent areas.

Large stands of scrub/shrubs are found in the San Luis Valley (PSS/EMW, PSS/EMKY, PSS/FLW). The shrubs are Sarcobatus vermiculatus and Atriplex canescens, which are water tolerant to a certain extent, but when the water regime becomes too wet, these species are drowned out and replaced by emergents. The water regime is not wet enough in many areas to drown out these stands of shrubs, and so they remain. Emergents include Distichilis stricta and Sporobolus airoides. These stands may be intentionally or unintentionally flood-irrigated; in many cases the water table is kept high by subirrigation from ditches.

Palustrine wetlands are associated with alpine lakes in valley bottoms (PEMY, PSS/EMY). The water table is high due to nearness of lakes. Vegetation includes Salix spp., Betula glandulose, Caltha leptosepala, Anemone spp., Eleocharis spp., Carex spp.

An important wetland type is flood-irrigated hay meadow (PEMKY). Extensive hay meadows are found in the San Luis Valley. Flood-irrigated meadows are found along streams and below springs. Ditches were built along the meadows' upper edges to allow water to flow from upper sources and spill out over the meadows. In the San Luis Valley water is supplied to meadows from artesian wells. Standing water can be found for short periods early in the growing season. Flood-irrigated meadows are not cultivated and vegetation is native. Meadows are hayed or grazed by cattle. Vegetation includes Juncus arcticus, Eleocharis acicularis, along with grasses and forbs. Many flood-irrigated fields are cultivated and were not delineated.

Natural wet meadows (PEMY) are found below mountain seeps and springs. These meadows remain moist for a large part of the growing season, but because they are sloped, water does not stand on them. Vegetation includes Carex scopularum and Eleocharis acicularis.

Above timberline, steeply sloped wetlands (PSS/EMY) occur below snowfields and springs which supply water throughout much of the growing season. Moisture flows underground through the coarse alpine soils which keeps these areas wet. These wetlands are common and extensive above timberline. Characteristic vegetation is dwarf willows and emergents. Species include Salix glauca, Salix planifolia, Carex nigricans, Carex drummondiana, and Juncus arapahoensis (Komarkova, 1979).

Forested wetlands (PFOW, PFO/EMW, PFO/EMY, PFO/SSW, PFO/SSY) are found throughout the quadrangle along streams, in drainages, and near beaver ponds. Tree species include Populus angustifolia, as well as Salix spp. Understory species are the same as those mentioned with beaver dam scrub/shrub-emergent areas.

## Wetland Values

From an economic standpoint the most valuable wetlands in Trinidad SW are flood-irrigated hay meadows (information in Values Section is from Hopper, 1980). Irrigated hay meadows produce forage at a higher rate than dry meadows. Hay meadows provide nesting habitat for ducks, which breed in the meadows in the San Luis Valley. Species include mallard, pintail, gadwall, blue-winged, green-winged, cinnamon teal, and redhead. Shorebirds, such as the great blue heron, are found in meadows, as are elk, which feed on haystacks in winter. Water running in ditches to and from hay meadows serve as breeding areas for ducks, as well as recharging the ground water table. Wetlands in the San Luis Valley are important for Colorado's duck population. The San Luis Valley is Colorado's number one duck production area; 55,000 ducks breed here annually. Twenty-eight thousand ducks winter here as water is kept open by warm artesian flows.

Sandhill cranes use the San Luis Valley as a resting area during spring and fall migrations. As part of a program by the Fish and Wildlife Service to create a new breeding population, whooping cranes are migrating with the sandhill cranes who are the whooping cranes "foster parents". From a standpoint of important habitat for a nearly extinct species, San Luis Valley wetlands are very significant.

There are three major coldwater fishing streams in Trinidad SW. Flowing out of the Sangre de Cristos into the San Luis Valley are Sangre de Cristo, West Indian, and Tinchera Creeks. When they leave the mountains and enter the valley they are no longer classified as major fishing streams. Sanchez Reservoir in the San Luis Valley is rated as a major coldwater fishing reservoir (Stream and Lake Evaluation Map, Colorado, 1979).

Alpine wetlands have several functions. They act as sponges absorbing large amounts of runoff in their organic material. This slows down spring runoff, reducing flood danger downstream and spreading runoff through the growing season. They also provide food and cover for ptarmigan, blue grouse, sheep, and elk. Alpine lakes are popular for fishing, hiking, and camping.

Below timberline blue grouse use drainages and draws for food and cover. Beaver dam small streams, creating ponds, which are used by mallards and green-winged teal for nesting. Trout are also found ir beaver ponds.

## Wetland Loss and Vulnerability

Wetlands are very susceptible to loss in this quadrangle. Development of recreational home subdivisions in various parts of the mountains is a problem. Increased population in the mountains means increased water use. Wells pumping water out of the ground lowers the water table and reduces the supply of water to streams and wetlands. Increased road-building and house-building disturbs and destroys wetlands.

Increasing use of center pivot irrigation systems to replace flood irrigation in the San Luis Valley poses a threat to wetlands. Center pivot irrigation uses well water, which lowers the water table, reducing the supply of water to wetlands. Center pivot irrigation is more efficient in its use of water than flood irrigation, resulting in less return water into ditches, thereby reducing breeding habitat for ducks, as well as returning water to the water table.

There is a trend in the San Luis Valley to cap artesian wells to save water in the artesian aquifer. Capping may be done on a season basis or even a permanent basis. This also results in less water flowing into ditches, which provide breeding areas for ducks.

A project in its initial stages is being carried out by the Water and Power Resources Service (WPRS, formerly Bureau of Reclamation). The Closed Basin Project will affect wetlands in this quadrangle's portion of the San Luis Valley. The Closed Basin Project will pump out 100,000 acre feet of water per year from the unconfined surface aquifer and into the Rio Grande to fulfill water commitments to downstream users, and will lower water tables 8 feet in the project area and 2 feet in surrounding areas. The WPRS states that this project will have "minimal effect on vegetation"; however, ultimate short-term and long-term impacts remain unquantified (Bureau of Reclamation, 1979).

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