Draft Existing and Desired Conditions of Riparian-Wetlands
Anderson Mesa Landscape Assessment

USDA Forest Service
Southwestern Region
Coconino National Forest

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Table of Contents

Existing Condition of Riparian-Wetlands

Introduction

This objective of this report is to identify and describe existing and desired conditions of riparian-wetland as well as functions and processes that influence riparian-wetlands in the Anderson Mesa Landscape. A goal of the Anderson Mesa Landscape Scale Assessment is to complete a comprehensive document that describes the existing and desired conditions and ecosystem functions. This document is not a Decision document (EA, EIS, etc.) with proposed projects, but rather a compilation of data that identifies those ecosystem functions that are working and those that are not, and suggestions for restoring functions that are broke.

The Anderson Mesa area lies between the extensive pine country of the rim and the high desert of the little Colorado River-Basin. It is an area of limited rainfall making grass and forb productivity variable from year to year. The entire mesa is geographically defined by 4 watershed boundaries; however, there are common, repeated vegetative types throughout. It is large in scale, covering approximately 270,000 acres.

There are two unique riparian-wetland types identified on the mesa: 1) the lentic type is characterized by standing water habitat such as lakes, ponds, seeps, bogs, and meadows, and 2) lotic, which consists of running water habitat such as rivers, streams, and springs. The lentic type is commonly referred to as wetlands, with the lotic type commonly referred to as riparian areas.

This report is organized by an Introduction section, a Review section that gives a general overview of functions and definitions used, an Existing Condition section, which will describe the current conditions and summarize inventory data and methodologies, a Desired Condition section that will outline current Forest Plan direction, followed by an Adequacy of Forest Plan section. The bulk of the report will describe the existing conditions and ecosystem functions of vegetation, soils, and disturbances by identified vegetation type.

Review of Functions

Lentic Riparian-Wetlands

Lentic wetlands have a variety of definitions. According to the National Wetlands Inventory, a wetland is defined as:

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes:

- *At least periodically, the land supports predominantly hydrophytes,*
- *The substrate is predominantly undrained hydric soil,*
- *The substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year. The definition of a wetland was taken from the Forest Service Manual for wetland definition.* (Cowardin et al, 1979)

The definition of a wetland within the Forest Service manual is as follows:

Those areas that are inundated by surface or ground water with a frequency sufficient to support and that, under normal circumstances, does or would support a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions form growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds. (FSM 2527.05)

The Forest Service manual definition mirrors the language of Executive Order 11990 (E.O. 11990) which states: The term "wetlands" means those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds (E.O. 11990, May 24, 1977). For the purposed of this report, the Forest Service manual and E.O. 11990 will be used as what defines a lentic wetland.

Function of Wetlands-Hydrologic Process of Wetlands

The formation, size, persistence, and function of wetlands are controlled by hydrologic process (USGS, 1996). The hydrologic processes occurring in wetlands on Anderson Mesa are the same processes that occur everywhere and are collectively referred to as the hydrologic cycle (see figure 1).

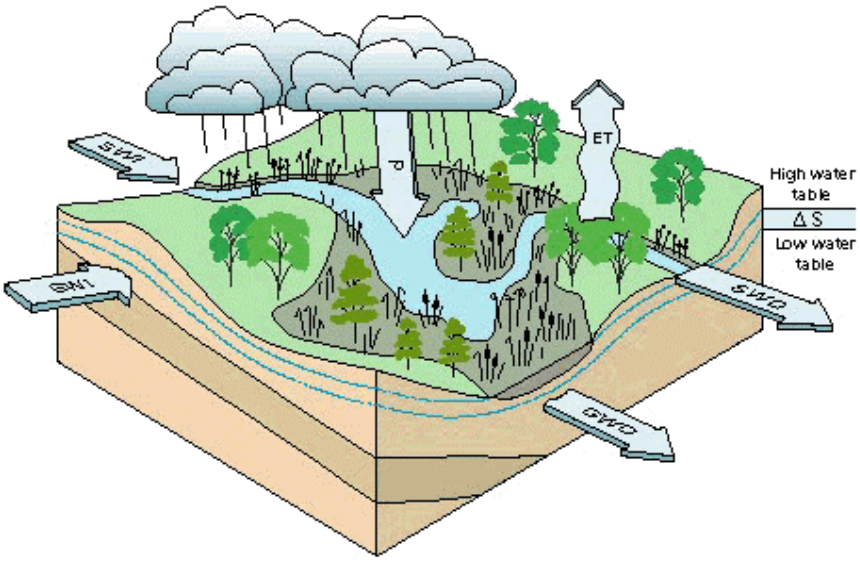


Figure 1: Components of the wetland water budget. (P + SWI + GWI = ET + SWO + GWO + ΔS, where P is precipitation, SWI is surface-water inflow, SWO is surface-water outflow, GWI is ground-water inflow, GWO is ground-water outflow, ET is evapotranspiration, and ΔS is change in storage.) **(source: USGS, 1996)**

On Anderson Mesa, not all of the hydrologic components listed in figure 1 occur. None of the wetlands on the Mesa have a connection to groundwater, and as such, the water table is below the wetland basin (Fredrickson and Dugger, 1993). In this case, the components of a wetland water budget are P+SWI=ET+SWO+ΔS. In addition, there are many of the wetlands on the Mesa that do not have outflow. In this case the components of the wetland water budget are P+SWI=ET +ΔS. Water retention in these basins is facilitated by soils high in clay (Fredrickson and Dugger, 1993). Surface water inflow is augmented on the reservoir wetlands, as well as the Melatone wetland site by an extensive ditch system and the construction of dams.

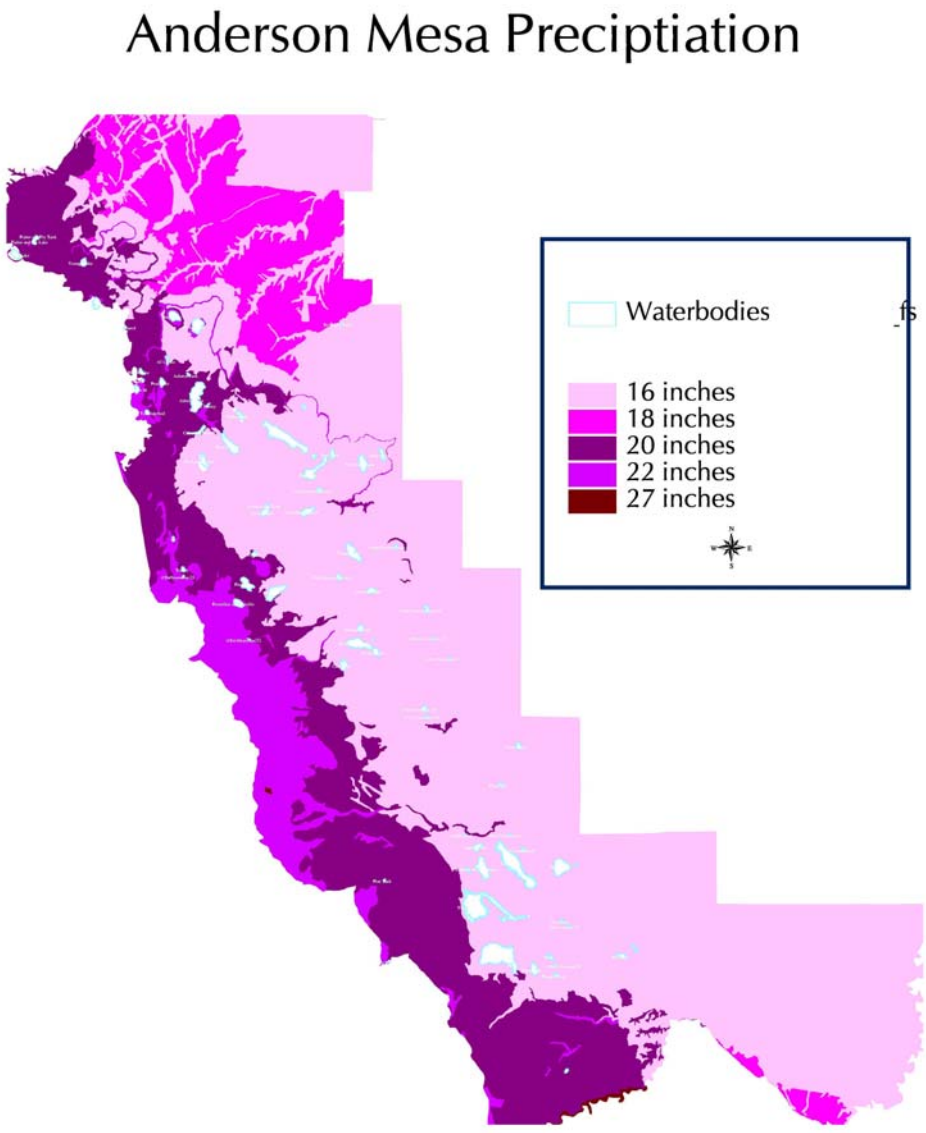


Figure 2: Average precipitation on Anderson Mesa. The average precipitation shown is derived from midpoint precipitation levels from the Terrestrial Ecosystem Survey for the Coconino National Forest (Miller et al, 1995).

Precipitation on Anderson Mesa varies, but generally ranges from 14-26 inches annually (see figure 2). Precipitation is the direct and indirect means of input of water into the wetlands on Anderson Mesa. Direct precipitation occurs directly within the wetland basin. Indirect effects of precipitation are runoff that comes into the wetland basin from storm events—either snow melt or rain events (surface water input).

Evapotranspiration is the loss of water to the atmosphere. Water is removed by evaporation from soil surfaces of water bodies and by transpiration of plants—the combination of these two components is termed evapotranspiration (USGS, 1996). Evapotranspiration is highly variable both seasonally and daily. For example, there is a great difference in transpiration when plants are actively growing and when they are dormant. Also, evaporation varies from hot days to cold days, and by the location of the water table (more water evaporates from the soil or is transpired by plants when the water table is closer to the land surface) (USGS, 1996). In addition, there is considerable evaporation loss both in standing water and in the upper soil surface on the mesa due to very high winds.. These winds are amplified by the orographic nature (Mormon Mountain and Mormon Lake) of the landscape.

Water is also lost in the system through flow out of the basin (surface water outflow) when the basin completely fills. On Anderson Mesa, this only occurs on a handful of the wetlands because most of the wetlands are closed basins. Water storage capacity also affects how water moves out of the system. Water storage in wetlands consists of surface water, soil moisture, and ground water (USGS, 1996). On Anderson Mesa, storage capacity consists solely of surface water and soil moisture. Water storage capacity refers to the space available for water storage. Storage capacity generally increases during the growing season as water tables decline and evapotranspiration increases. When storage capacity is high, infiltration may occur and the wetland is effective in retaining moisture (USGS, 1996).

As stated above, the wetlands on Anderson Mesa do not have a groundwater connection (Fredrickson and Dugger, 1993). In wetlands with these hydrologic cycle components, the wetlands range from very wet to dry depending on seasonal and long-term climatic cycles (USGS, 1996). The variability of hydrologic function due to precipitation is key to the function of the wetlands on Anderson Mesa, as well as the different types of wetlands that occur on the Mesa. Figure 3 displays a potential affect to different wetland types is wet versus dry years.

Function of Wetlands-Soils, Decomposition, and Nutrient Cycling

Soils are a key component of a wetland because it is the medium in which chemical processes occur within the wetland and they store nutrients for macrophytes and invertebrates (Fredrickson and Dugger, 1993). Wetland soils generally have higher clay contents, more organic material, higher water holding capacity, and greater redox potential than upland soils (Fredrickson and Dugger, 1993).

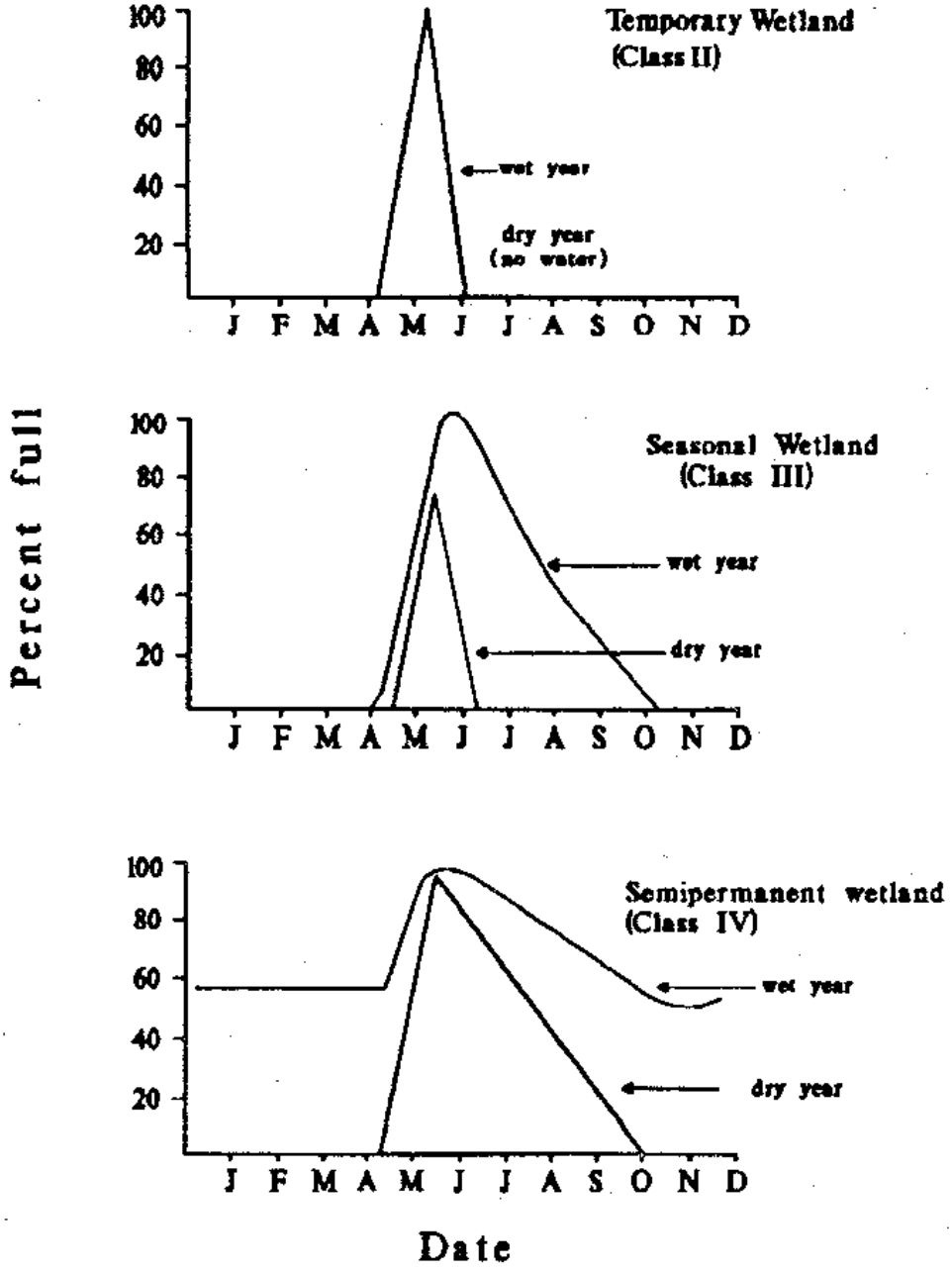


Figure 3: Potential range of flooding regimes characteristic of temporary, seasonal and semi-permanent wetlands in wet versus dry years. Note that a temporary wetland does not have any water in a dry year (source: Fredrickson and Dugger, 1993).

According to Fredrickson and Dugger (1993), decomposition is the mineralization of organic matter. Decomposition in wetlands is important in wetland sites because the rate

at which decomposition occurs regulates the release of nutrients that are available to plants and the microbes that perform the decomposition process are the first link in the food chain for other animals (Fredrickson and Dugger, 1993).

Nutrient cycling is another important function that occurs within wetlands. There are three major components to nutrient cycling within wetlands—1) decomposition (discussed above), 2) translocation (the removal of nutrients from the soil by plants and converting these nutrients into plant tissue or roots), and 3) production (the production of litter and senescence that provides the organic material that drives the decomposition process). Nutrient cycling is seasonal in nature, with translocation generally occurring during the growing season and production of litter usually occurring the fall. Decomposition occurs year-round, but is driven by temperature, flood level and pH of the wetland (Fredrickson and Dugger, 1993).

Functions of Wetlands—Geomorphic Setting

The wetlands across Anderson Mesa are primarily located within small closed basins derived primarily from Anderson Mesa volcanics (Peacock, 1978). The wetlands are generally located in the center of the closed basin (Myers, 1982), and consists primarily of undifferentiated alluvial and colluvial deposits (Peacock, 1978). The basin bottom is high in clays that are able to hold water readily once they are saturated (Steinke, personal communication). The relatively small basin size limits the amount of water available to the wetland sites. The basin size, as well as the location of the wetland (the farther north on the mesa, the greater the precipitation), dictates the length of inundation, as well as the type of vegetation that can grow on-site. Man-made structures provide an exception to the last statement. Dams have been constructed at several sites that have increased depth and duration of water on-site. Water augmentation has also taken place through a rather extensive ditch system that was constructed in the mid-20th century.

The formation of the wetlands in a basalt flow also provides many of the sites with rock shores that inhibit wave energy. On sites with primarily alluvial and colluvial deposits, there is little to inhibit wave energies that can provide sediments to the water at the wetland sites. On non-rock sites, vegetation can dissipate wave energies.

Functions of Wetlands--Summary

As stated above, wetland function is a combination of a variety of processes. The most important process that dominates the wetland function is the hydrologic cycle. Wetlands on Anderson Mesa are disconnected from groundwater and thus are completely reliant on precipitation for water input. Therefore, standing water and vegetation in wetlands can fluctuate wildly from being basically non-existent in dry periods to being highly productive, lush wetlands in wet periods.

Other key processes include the type of soils, the amount of decomposition, and nutrient cycling, as well as the geomorphic setting. The combination of these process result in a unique vegetative component. All of these processes combined result in a functioning wetland. These processes differ across the Anderson Mesa landscape as a result of the amount and timing of precipitation that is received at each wetland, and also from year-

to-year. Different precipitation amounts, as well as the size of the basin, define different plant associations and different wetland types.

Wetland Types of Anderson Mesa

The types of wetlands that occur on Anderson Mesa are a function of the seasonal and yearly fluctuations of wetland water levels (termed the wetlands hydroperiod) (Fredrickson and Dugger, 1993). The hydroperiod also determines the structure and composition of wetland flora and fauna (Fredrickson and Dugger, 1993). The wetland types that occur on Anderson Mesa are defined by Fredrickson and Dugger (1993) using the classification system developed by Stewart and Kantrud (1971). The wetland types on Anderson Mesa include are listed in Table 1. The table indicates the wetland type, the flooding regime, the typical plant species occupying the deepest zone of the wetland, and the flooding frequency of the wetland.

Table 1: Wetland types that occur on Anderson Mesa

Wetland Type	Flooding Regime	Plant Species Occupying Deepest Zone	Flooding Frequency
Reservoir, open water	Permanent water	submergent vegetation; bare soil	every year
Semi-permanent	6-12 months	Hardstem bulrush Cattail submerged aquatics	>7 of 10 years
Seasonal	3-6 months	Manna grass spikerush Carex spp.	<7 of 10 years
Temporary	1-2 months	Alpine Timothy Foxtail barley	3 of 10 years
Ephemeral	2-6 week	Bare soil, short vegetation	3-10 years

As stated in Table 1, the hydroperiod of the different wetland types has different plant associations. Seasonal and semi-permanent wetland types contain emergent vegetation that has adapted to a wetter environment. Temporary and ephemeral wetland sites do not contain plants that are emergent in nature.

Lotic Riparian

As stated above, lotic riparian areas are sites that have running water. On Anderson Mesa, these sites include streams and springs. The same processes that occur within lentic sites occur within lotic sites, the major difference between the two is the geomorphic setting that lotic systems occur within.

Function of Riparian-Hydrologic Process of Riparian Sites

The formation, size, persistence, and function of riparian area are controlled by hydrologic process (USGS, 1996). As displayed in figure 1 above, the hydrologic

processes that occur in wetland sites include all of the components listed, which is unlike the lentic wetlands. In this case, the components of a wetland water budget are P+SWI+GWI=ET+SWO+GWO+ΔS. The groundwater connection within Anderson Mesa Landscape Assessment area are primarily perched aquifers, that is an aquifer in which a ground water body is separated from the main ground water below it by an impermeable layer (which is relatively small laterally) and an unsaturated zone. Perched aquifers are common in volcanic depositional sequences where weathered ash and cinder layers of low permeability are sandwiched between high permeability basalts. Water moving downward through the unsaturated zone will be intercepted and accumulate on top of the lens before it moves laterally to the edge of the lens and seeps downward to the regional water table or forms a spring on the side of a hillslope (EPA, 1998)

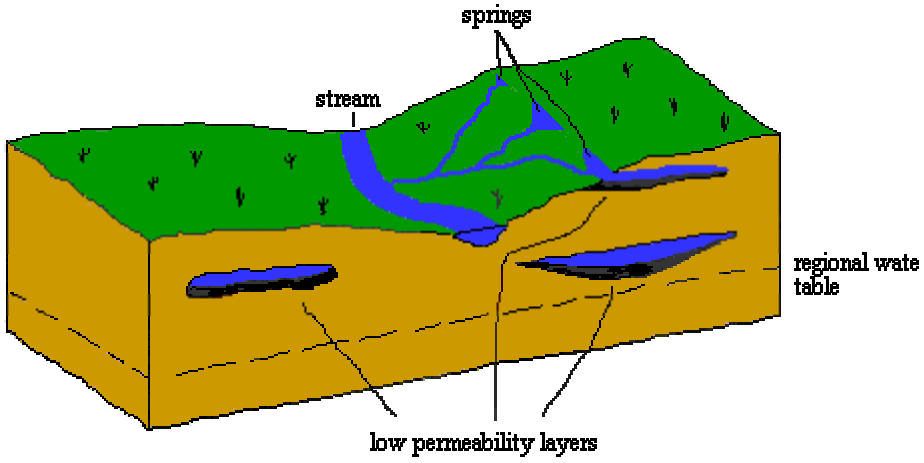


Figure 4: Graphic representation of a perched aquifer. Note a perched aquifer is not connected to a regional aquifer (source: EPA, 1998).

The connection of springs to perched aquifers makes these sites susceptible to diminished or non-existent flows with long-term drought, but generally there is an increase potential for flow than with lentic wetland sites. East Clear Creek is the only riparian site that does have a connection to the regional "C" aquifer, and as such, does have persistent flow (USDA, 2002).

Function of Riparian-Soils, Decomposition, and Nutrient Cycling

The functions of riparian areas concerning soils, decomposition, and nutrient cycling are similar to those outlined in the lentic riparian-wetland discussion above. The abundance and distribution of soil differs within lotic setting depending on the geomorphic setting in which the stream occurs.

Function of Riparian-Geomorphic Setting

The geomorphic setting of streams is another key component in the function of riparian systems. Geomorphology can be defined as the study of landforms, the processes that created them, and the history of their development. Different geomorphic settings will contain different stream types (Rosgen, 1994). The geomorphic setting will also be a key factor in determining how a stream is able to dissipate its' energy (Prichard et al, 1998a).

As stated above, the abundance and distribution of soil varies by geomorphic setting. In relatively steep channels (greater than 2% slope), water moves rather efficiently through the system and there is little soil deposition in comparison with a low gradient stream (slopes less than 2%). This is directly related to the streams energy. The general rule of thumb is the higher the streams energy, the larger the material that can be moved by the water (FISRWG, 1998).

Function of Riparian-Vegetation

The function of vegetation is to dissipate energy in relation to its hydrologic and geomorphic settings (Prichard, et al 1998a, Rosgen, 1994). The presence of riparian vegetation dissipates energy through root mass production, emergent basal area, and in systems that produce woody vegetation, the presence of woody vegetation in stream systems.

As stated above, different riparian types produce different vegetation types. Low gradient stream systems generally produce grass-like and grass species, and in some cases, willow species. Steeper sloped streams generally produce woody vegetation, with some small patches of grass-like and grass species. A key determinant in vegetative composition is tied to soil particle size and internal rock fragments.

Function of Riparian-Summary

As stated above, riparian function is a combination of a variety of processes. The hydrologic process is a key component of lotic riparian sites, however, there is an additional input into the hydrologic process through groundwater interactions that was absent in the lentic wetland sites. Prolonged drought is minimizing this function in perched aquifer systems.

Other key processes include the type of geomorphic setting soils, the amount of decomposition, and nutrient cycling. The combination of these process result in a unique vegetative component.. All of these processes work in tandem to form a functioning wetland that is in dynamic equilibrium with its setting.

Draft Existing Conditions—Riparian and Wetlands of Anderson Mesa

Previous Classification

Previous efforts at classifying the wetlands include the National Wetland Inventory and the Forest-wide Riparian Implementation Plan (1986). The NWI was primarily prepared by stereoscopic analysis of high altitude aerial photographs. The NWI mapping protocol (Cowardin et al, 1979) classifies wetlands if the area meets at least one of three attributes: 1) at least periodically, the land supports predominantly hydrophytic vegetation, 2) the substrate is predominantly hydric soil, or 3) the substrate is non-soil and is covered with water at some time during the growing season of each year. The NWI also states that not all intermittently flooded areas fall within their definition of a wetland. In these areas, regional guidelines should be referred to. The NWI has classified approximately 300 individual wetlands within the Anderson Mesa EM area. Most of these are stock tanks (approximately 250), and are classified as a variety of Palustrine wetland types (less than 8 acres in surface area and less than 6.6 feet in depth). No sites identified in the NWI were field checked within the Anderson Mesa area.

The 1986 Riparian Implementation Plan used riparian area delineation as outlined in the Riparian Area Handbook (FSH 2509.23). This classification used three categories of classification: 1) Open Water, 2) W-1 (wetland dominated by tall emergent vegetation such as bulrush or cattail), and 3) W-2 (wetland dominated by low emergent vegetation such as spikerush or western wheatgrass).

Current Classification

Existing conditions for the Anderson Mesa area were completed through field inventory that began in 1999. Lotic proper functioning condition assessments were completed in Jacks Canyon and East Clear Creek in 1999. Methodology for this assessment method is outlined in Prichard et al, 1998a.

Lentic proper functioning condition assessments were completed in 2002 and 2003. Methodology for this assessment method is outlined in Prichard et al, 1998. Soil pits were also dug at select lentic sites in addition to the inventory to determine if a site was a wetland or not. In addition, the National Wetland Inventory maps available at the Coconino National Forest Supervisor's Office were reviewed prior to field inventory to check for possible wetland sites. After field review of sites in 2002, additional plant data for the wetland sites were gathered where available from Rickertson 1990 2-volume thesis entitled *Aquatic and wetland vascular plants of Coconino National Forest, Arizona*, as well as from range monitoring data to provide a more complete picture of plant species within wetlands in wet and dry time periods and to aid in classification of the wetlands.

After inventory was completed, the wetlands were classified based on the presence of hydric soils and the presence of hydrophytic vegetation using the methodology outlined in Fredrickson and Dugger, 1993 and discussed above in the lentic riparian-wetland section of this document.

Results

The 2002 inventory first examined the Forest-wide Geographic Information Systems layer for waterbodies[1]. There are approximately 320 waterbodies located within the Anderson Mesa boundary. A majority of these are stock tanks and correspond to the NWI inventory (approximately 270 are stock tanks). Stock tanks do have the three attributes of a wetland, and as such meet the definition of what a wetland is. However, for the reasons stated below, the Coconino National Forest is not going to classify stock tanks as wetlands at this time. If a stock tank resides within a classified wetland, the stock tank is considered the wetland type it resides in. The rationale for not including stock tanks as wetlands are as follows:

- Intent of stock tanks is for livestock and wildlife watering, not as habitat.
- Size of most stock tanks is very small (less than ½ acre on the average).
- Many of the Cowardin et al wetlands are palustrine intermittent wetlands, which NWI states may not be wetlands.
- The US Army Corps of Engineers excludes "artificial lakes or ponds created by excavating and/or diking dry land to collect and retain water and which are used exclusively for such purposes as stock watering…"[2] as waters of the United States.
- Arizona Revised Statutes excludes "ponds used for watering livestock and wildlife" in ARS 49-250 B(4) for aquifer protection permits.

If from this process there is a decision to classify stock tanks as wetlands, then there will be a need to make specific standards and guidelines strictly for stock tanks.

Table 2 displays all of the lentic riparian-wetland types that occur within the Anderson Mesa Landscape Assessment boundary. The table displays the wetland name, the acres of the wetland, the wetland type, how it is currently grazed and whether a stock tank occurs within the wetland site. Overall, there are 4 sites and 72 acres of ephemeral wetland, 4 sites and 110 acres of temporary wetland, 24 sites and 1,370 acres of seasonal wetlands, 9 sites and 421 acres of semi-permanent wetlands, and 8 sites and 1,397 acres of reservoir wetlands. There are a total of 47 different wetland sites and a total of 3,371 acres of wetlands.

Proper functioning condition assessments have been completed for each of the wetland types. There are a total of five wetlands that are currently classified as being in proper functioning condition. Two of these are ephemeral wetlands (49 acres), 1 is a seasonal wetland (5 acres), and 2 are semi-permanent sites (40 acres). There are a total of 42 wetland sites that are currently classified as being functional at-risk, primarily from

[1] The GIS File is located on the Coconino National Forest server at the following address: J:/fsfilesf/ref/library/gis/Coconino/waterbod/waterbod. The metadata for the file can be found at the following address: J:/fsfilesf/ref/library/gis/Coconino/waterbod/waterbod.met.

[2] USACE. 2001. *Final Summary Report: Guidelines for jurisdictional determinations for waters of the United States in the arid southwest.* USACE South Pacific Division. 12 pp

altered hydrology due to the presence of stock tanks. There are 2 ephemeral sites that are functional at-risk (23 acres), there are 4 temporary wetlands (110 acres) that are classified as at-risk, there are 23 seasonal wetlands (1,398 acres) that are at-risk, there are 5 semi-permanent wetlands (240 acres) that are at-risk and all 8 reservoir wetlands (1,398 acres) are at-risk. The reservoir wetlands are at-risk from recreational activities and grazing on woody vegetation. Maps of wetlands are included in Appendix A. A complete list of plants that were found during inventory and from Rickertson's thesis are included in Appendix B.

Table 2: Riparian-Wetland in the Anderson Mesa Landscape Assessment Area

Lentic Riparian-Wetlands

Name	Acres	Wetland Type	Grazing Status	PFC Class	Stock Tank
Driveway	5	Ephemeral	Grazed by cattle within Lakes pasture Bar T Bar Allotment.	At-risk	1
Gonzalo	18	Ephemeral		At-risk	1
Unnamed_16_11_28	5	Ephemeral	Grazed by cattle within West Melatone pasture Bar T Bar Allotment.	PFC	
Daze Lake	44	Temporary	Grazed by cattle in -T-, west melatone pasture	PFC	
Total Acres	**72**				
Crater Lake	22	Temporary	Grazed by cattle in -T-, broomy pasture	At-risk	1
Horse Tank	8	Temporary	Grazed by cattle within Ashurst pasture-Pickett/Padre Allotment.	At-risk	1
McDermit Lake	72	Temporary	Grazed by cattle within Boot pasture-Pickett/Padre Allotment. This pasture rested 1999-2004.	At-risk	1
Pollimo	8	Temporary	Grazed by cattle, North Yeager pasture, Anderson Mesa Allotment.	At-risk	2
Total Acres	**110**				
Als Lake	40	Seasonal	Grazed by cattle within Ashurst pasture-Picket/Padre Allotment.	At-risk	1
Antelope North	5	Seasonal	Grazed by cattle within Ashurst pasture-Picket/Padre Allotment.		
Antelope Tank	8	Seasonal	Grazed by cattle within Ashurst pasture-Picket/Padre Allotment.	At-risk	1
Boot Lake	70	Seasonal	Grazed by cattle within Boot pasture-Picket/Padre Allotment. This pasture rested 1999-2004.	At-risk	1
Breezy	33	Seasonal	Grazed by cattle within Breezy pasture-Pickett/Padre. This pasture rested 2000-2002.	At-risk	4
Camillo Tank	46	Seasonal	Grazed by cattle within North Tinny/East Mud Lake pasture Anderson Springs Allot	At-risk	3
Corner Lake	38	Seasonal	Grazed by cattle within the Southeast Pine Hill pasture, mid-summer defer, Anderson Springs Allotment	At-risk	2
Corral Tank	11	Seasonal	Grazed by cattle within East Mud Lake pasture Anderson Springs Allotment.	At-risk	1

Lentic Riparian-Wetlands

Name	Acres	Wetland Type	Grazing Status	PFC Class	Stock Tank
Cow Lake	30	Seasonal	Grazed by cattle within North Grapevine pasture Bar T Bar Allotment.	At-risk	1
Ducknest	42	Seasonal	Grazed by cattle within Ducknest Pasture-Pickett/Padre Allotment. Mid-summer grazing only 2002-04.	At-risk	1
Hay Lake	459	Seasonal	NRCS wetland easement, no cattle grazing	At-risk	1
Indian Lake	25	Seasonal	Grazed by cattle within Breezy pasture-Pickett/Padre Allotment. This pasture rested 2000-2002.	At-risk	1
Indian Tank	13	Seasonal	Grazed by cattle within Ducknest pasture-Pickett/Padre Allotment. Mid-summer grazing only 2002-04.	At-risk	1
Long Lake (D-5)	179	Seasonal	Excluded from cattle grazing in early 1990's. New fence planned 2003.	At-risk	1
Melatone Lake	12	Seasonal	Grazed by cattle within East and West Melatone pasture Bar T Bar Allotment.	At-risk	1
Mud Lake	73	Seasonal	Grazed by cattle within East Mud Lake pasture Anderson Springs Allotment.	At-risk	2
Pickett Lake	11	Seasonal	Grazed by cattle within Ashurst pasture-Pickett/Padre Allotment.	At-risk	1
Pine Lake	53	Seasonal	Grazed by cattle within East Mud Lake pasture Anderson Springs Allotment.	At-risk	2
Potato Lake	89	Seasonal	Grazed by cattle within Ashurst pasture-Pickett/Padre Allotment.	At-risk	1
Tony's Tank	9	Seasonal	Grazed by cattle within West Mud Lake pasture Anderson Springs Allotment.	At-risk	1
Wallace Lake	9	Seasonal	Grazed by cattle within North Tinny pasture Mud-Tinny Allotment.	At-risk	1
West Breezy	5	Seasonal	Grazed by cattle within Breezy pasture-Pickett/Padre Allotment. This pasture rested 2000-2002.	At-risk	1
Yeager Lake	87	Seasonal	Grazed by cattle within North Yeager pasture Anderson Springs Allotment.	At-risk	4
Youngs Lake	23	Seasonal	Grazed by cattle within Youngs pasture Walnut Allotment.	At-risk	1
Total Acres	**1,370**				
Deep Lake	63	Semi-Permanent	Grazed by cattle within Deep Lake Allotment.	At-risk	1
Fisher Fry Lake	18	Semi-Permanent	Grazed by cattle within Observatory/ Youngs pasture Walnut Allotment.	At-risk	1
Horse Lake	61	Semi-Permanent	Cattle exclosure present Deep Lake Allotment.	At-risk	1
Little Dry Lake	9	Semi-Permanent	Grazed by cattle within Marshall Lake Riparian pasture Walnut Allotment.		1
Marshall Lake	132	Semi-Permanent	Grazed by cattle within Marshall Lake Riparian pasture Walnut Allotment.		1
Perry Lake	27	Semi-Permanent	Grazed by cattle within Ducknest pasture-Pickett/Padre Allotment and the Perry pasture in the Anderson Springs allotment. Mid-summer grazing only 2002-04.	At-risk	3

Lentic Riparian-Wetlands

Name	Acres	Wetland Type	Grazing Status	PFC Class	Stock Tank
Post Lake	27	Semi-Permanent	Grazed by cattle within Ashurst pasture-Pickett/Padre Allotment. Bull rush located on far north end of area.	PFC	
Prime Lake	13	Semi-Permanent	Grazed by cattle within Observatory pasture Walnut Allotment	PFC	
Vail Lake	71	Semi-Permanent	Cattle Exclosure Walnut Allotment	At-risk	1
Total Acres	**421**				
Ashurst Lake	199	Reservoir	Excluded from cattle grazing except for North end of Lake, which is rocky.	At-risk	
Coconino Dam	10	Reservoir	Grazed by cattle within Ducknest pasture-Pickett/Padre Allotment. Mid-summer grazing only 2002-04.	At-risk	
Kinnikinick Lake	123	Reservoir	Excluded from cattle grazing Anderson Springs Allotment/Bar T Bar	At-risk	
Long Lake	367	Reservoir	Grazed by cattle within Lakes pasture Bar T Bar Allotment.	At-risk	
Morton Lake	27	Reservoir	Grazed by cattle within North Grapevine pasture Bar T Bar Allotment.	At-risk	
Soldier Annex	123	Reservoir	Grazed by cattle within Lakes pasture Bar T Bar Allotment.	At-risk	
Soldier Lake	32	Reservoir	Grazed by cattle within Trap pasture Bar T Bar Allotment.	At-risk	
Tremaine Lake	517	Reservoir	Grazed within Bar T Bar Allotment.	At-risk	
Total Acres	**1,397**				
All Wetland Acres	**3,371**				

Table 3 displays the lotic riparian spring sites that occur within the Anderson Mesa Landscape Assessment Area. Note that there are 14 spring sites within the analysis area. Eight of the fourteen springs are open to livestock grazing, four of the springs do receive some grazing from livestock, but livestock access to these sites are restricted due to topography. Two of these sites are protected from all grazing through elk exclosure fencing. The other 11 sites are available for grazing by wildlife, with the five springs that are difficult to reach by topography also limiting livestock grazing.

The springs have not had a proper functioning condition assessment completed on them at this time. However, Youngs, Yellow Jacket, and Elliot Springs have all been modified to facilitate livestock and wildlife water availability. Yellow Jacket and Elliot have livestock trails constructed to them to encourage animals to use the areas to obtain water. The concentrated use at these sites by wild and domestic animals have degraded riparian plant communities from decreased species diversity and community structure resulting from many years of animal concentrations. Sections of Ashurst spring below the exclosure also exhibit similar signs, although to a lesser degree, of a degraded riparian community (Goodwin, 2003).

Table 4 displays the lotic riparian stream sites. There are nearly 16 miles of riparian streams that occur within the analysis area. Of these, just over 7 miles occur within the

Clear Creek and just less than 8 miles occur in Jacks Canyon (1 occurs at Sawmill Draw drainage). Based on Proper Functioning Condition assessments, Jacks Canyon and Clear Creek of these stream reaches are currently in proper functioning condition. Access to livestock is limited due to topography. Some limited grazing does occur by wildlife species.

One wet meadow site and a riparian stream course of approximately 1 miles occurs from the outflow of Sawmill Springs (the Spring source itself is out of the analysis area boundary). There has not been an assessment of this site at this time.

Table 3: Lotic Riparian Spring sites in the Anderson Mesa Landscape Assessment Area

Name	Acres	Grazing Status	Stock Tank	Grazed by Livestock
Boot	<1	Picket/Padre	0	grazed
Youngs	<1	Walnut Canyon	1	grazed
Elk	<1	Deep Lake	0	grazed
unnamed	<1	Pickett/Padre	0	Difficult access due to topography
Yellow Jacket	<1	Pickett/Padre	0	grazed
Ashurst	<1	Pickett/Padre	0	Protected by elk exclosure
Billy Back	<1	Pickett/Padre	0	grazed
Elliot	<1	Pickett/Padre	0	grazed
Unnamed	<1	Anderson Springs	0	Difficult access due to topography
Anderson	<1	Anderson Springs	0	grazed
Kinnikinick	<1	Anderson Springs	0	Difficult access due to topography
Dove	<1	Bar T Bar	0	Protected by elk exclosure
Grapevine	<1	Bar T Bar	0	grazed

Turkey Seep	<1	Bar T Bar	0	Difficult access due to topography

Table 4: Lotic Riparian Stream sites in the Anderson Mesa Landscape Assessment Area

Stream Reach ID	Miles	5th Code Watershed	4th Code Watershed	PFC Rating	Grazed
Clear Creek-	7.2	Lower Clear Creek	Little Colorado River	PFC	no
Jacks Canyon	7.6	Jacks Canyon	Little Colorado River	PFC	no
Sawmill Springs	1	Diablo Canyon	Little Colorado River	Not assessed	yes
Grand Total	15.8				

Disturbance Mechanisms

There are a variety of mechanisms that disturb the function of wetlands and riparian areas. For wetland sites, there are "natural" disturbance mechanisms, such as fire, drought and flooding, and disturbance mechanisms that can be controlled by management activities, such as grazing by livestock and wildlife, stock tank construction, roads, off-road vehicle and other recreation use. Indirect disturbance mechanisms include increasing pinyon-juniper canopies that affect upland soil condition.

Grazing effects the wetland functions discussed above through affecting nutrient cycling, changing decomposition rates, and can affect soil physical properties through compaction (Skovlin, 1984; Fredrickson and Dugger, 1993). The effect to wetland function varies by graze intensities. Observations and limited documentation indicates soil condition is satisfactory in bulrush-dominated wetlands and impaired in all others.

Seasonal, temporary, ephemeral wetlands and spikerush dominated areas of semi-permanent wetlands have impaired soil conditions based on reduced ability of the soil to infiltrate water. Slight to moderate alteration of surface soil structure (blocky, or platy aggregation) was observed in several wetlands and probably caused by ungulate hoof action during periods when the soil was wet. A desired soil structure would be well-aggregated granular soil in the upper few inches. Soil nutrient cycling is variable but generally satisfactory and responses directly to climatic conditions for all wetland types. During periods of below normal precipitation, vegetative productivity and litter is very low or almost absent resulting in reduced nutrient cycling. It is believed that much of the litter component is removed by high winds during dry years and the remaining decomposes rapidly due to high amounts of soil bacteria and other microbes. During periods of normal or above precipitation, vegetative productivity and litter rebounds to high levels causing high nutrient cycling. Further on-site data may be needed to more accurately assess nutrient cycling following years of normal or above precipitation.

Impaired soil condition signifies a reduction in soil function. The ability of the soil to function properly and normally has been reduced and there exists an increased

vulnerability to degradation. The soil is still capable of maintaining resource values, and outputs but at a reduced rate. Changes in land management practices or other preventative measures may be appropriate.

Although many wetlands show signs of altered surface structure, soil conditions and wetland function can improve in the short or long-term if proper grazing strategy is combined with normal or above years of precipitation. The result would be improved soil structure and infiltration resulting in more plant available water in the soil and consequent improved vegetation productivity. The bottom line is, the heavier the graze, the more detrimental the effects (Skovlin, 1984).

Stock ponds alter the natural hydrology of wetland basins (Prichard et al, 1998). This directly affects the hydrologic function of wetland sites. Fredrickson and Dugger (1993) note that stock tanks increase the duration of water on-site and often prolong water availability during periods of drought when animals would not normally use wetland basins. If stock ponds were to be removed from wetland sites, the additional water on-site would usually only increase the duration of inundation by at most a week due to high evaporation rates on the Mesa and relatively low storage capacities of the stock ponds (Fleishman, 2003; Hink, 2003)

When water is present on-site at stock ponds, stock ponds serve as a water attractant and frequent grazing location for ungulates. Thus, stock tanks have an indirect effect to reduce nutrient cycling and soil productivity through removal of biomass in and around the site due to increased length of grazing caused by the presence of water from the tanks. Wetland areas immediately adjacent to constructed stock ponds seem to have somewhat poorer soil conditions than areas further removed (Rory Steinke pers. comm.). Where stock tanks occur within wetland basins, these sites are considered functional at-risk due to altered hydrology.

Roads and off-road vehicle use affects wetland sites by compacting soils, which in-turn affects nutrient cycling, changing decomposition rates, and soil physical properties. This change in upland soil condition affects the amount of material that enters wetland sites, thus again affecting the nutrient cycling and changing decomposition rates through increased sediments.

The disturbance mechanisms for riparian springs and riparian streams are similar to wetland disturbance. The major difference between the lentic and lotic affects are that only one spring contains a tank (Youngs Spring), therefore this disturbance is lessened. Also, the affect to the riparian streams from grazing animals (and some springs) is lessened due to the topographic relief that minimizes animal impacts.

Vegetation associated with riparian areas is considered to be fire intolerant. The existence and health of riparian vegetation is associated primarily with water including permanent, intermittent, or underground sources. This plant community is highly dependent on extreme events to maintain a diverse range of age classes and site productivity, but these

extreme events are normally associated with flooding, not wildfires. However, wildfires could have promoted increased flows and exacerbated flood events

Wildfires did directly impact riparian areas with fires of all intensity levels, and did result in some of the positive impacts that are also associated with flooding such as generating new growth, but these fires were typically small and influenced by the presence of water, lush green foliage, high humidity, and high fuel moisture (live and dead). Wildfires biggest impact to riparian areas was mostly an indirect effect. Low and moderate intensity fires in adjacent vegetation types resulted in the following.

- Small amounts of ash entered riparian areas either as airborne particulates or from overland flows of water.
- Small amounts of soil entered riparian areas from overland flows of water after the first moisture event.
- Ground cover was maintained or increased over time. This included grasses, forbs and small shrubs and helped to reduce overland flow of water, promote soil stability, increase water percolation into the soil, and maintain a small but constant flow of water in the riparian area through percolation.

The net effect of low and moderate intensity fires in adjacent vegetation types was to inject small amounts of nutrient rich material (ash and top soil) into the riparian areas and stabilize localized flows of water. Also, fires maintained canopies to lower levels than current, which decreased evapotranspiration draws from ground water sites (this would only affect springs and creeks) and not wetlands because wetland sites do not have a connection to groundwater on the landscape.

Draft Desired Conditions—Riparian and Wetlands of Anderson Mesa

Desired conditions are statements that express how we want riparian and wetland areas to look and function now and in the future. To understand the desired condition of riparian and wetland areas, we must understand what a desired condition is.

A desired condition is defined as: “Land or resource conditions that are expected to result if goals and objectives are fully achieved.” (USDA, 2003). Desired future conditions are both ecological in context, as well as societal in context (USDA, 1999). As a future-visioning choice, a desired future condition seeks to protect a broad range of choices for future generations, avoid irretrievable losses, and guide current management and conservation strategies and actions. However, given the dynamic nature of ecological and social systems, a desired future condition is also dynamic and thus is always revisited during monitoring, external review, and evaluation of performance. (USDA, 1999).

Appendices C, D, and E describe desired future conditions that exists for riparian-wetland areas that occur within the Anderson Mesa area. The desired future conditions described

in these appendices also cover areas that occur outside the analysis area. The current Forest Plan in Management Area 12 does not differentiate between lotic riparian-wetland areas and lentic riparian areas, therefore it is felt that there is a need to split out desired future conditions for these two different riparian types to be more specific to the function of each wetland type.

Desired Conditions from Public Meetings

Public meetings were held on April 3 and 5, 2003 that gave the public an opportunity to tell us how they view the Anderson Mesa and what they hold near and dear (values) relative to the Mesa. For riparian and wetland areas, several comments were received. The major focus of these comments were 1) to restore natural hydrology to wetland sites, especially in relation to wetlands ith stock tanks within the wetland site; and 2) to improve water flow conditions at springs.

The first item listed above falls into the lentic riparian/wetland sites desired conditions. This item is expressed in the statement that lentic riparian wetland sites are to be in proper functioning condition. The second item expressed in the public meetings concerning springs is found in the lotic riparian wetland water section, where the desired condition is to "perennial, free flowing springs, when consistent with climate, watershed size, and geomorphology."

Draft Desired Condition –Lentic Riparian/Wetland Sites

Lentic riparian/wetland sites are highly variable wetlands based on flood frequency and the flooding regime. We recognize that there are different types of wetlands based on the duration and timing of inundation by water, as well as basin size. We recognize these different wetland types will have different plant assemblages based on the time and duration of water in these wetland types. The wetland types we see on the landscape include the following:

Wetland Type	Flooding Regime	Plant Species Occupying Deepest Zone	Flooding Frequency
Reservoir, open water	Permanent water	submergent vegetation; bare soil	every year
Semi-permanent	6-12 months	Hardstem bulrush Cattail submerged aquatics	>7 of 10 years
Seasonal	3-6 months	Manna grass spikerush Carex spp.	<7 of 10 years
Temporary	1-2 months	Alpine Timothy Foxtail barley	3 of 10 years
Ephemeral	2-6 week	Bare soil,	3-10 years

Wetland Type	Flooding Regime	Plant Species Occupying Deepest Zone short vegetation	Flooding Frequency

We recognize that each of these wetland types have different potentials, and that the potential varies through different climatic regimes.

Our vision is of these wetland types is that they are in proper functioning condition with satisfactory soils, so that the result provides the type of ecosystem that will support flora and fauna typical of wetlands sites. We recognize that disturbance agents may preclude the attainment of desired future functioning condition (DFFC) and satisfactory soil condition at some places and at some times. We recognize that these disturbance agents will promote a variety of seral stages across the landscape

CULTURAL RESOURCES

We respect and protect evidence of past uses of the area.

We work with Tribal representatives to ensure that their interests are protected. The area provides educational opportunities for the Native American People to pass on cultural knowledge within their own communities.

We respect medicinal, ceremonial, and personal uses of the area.

DISTURBANCES

Disturbance agents such as drought, fire, insects, pathogens, and extreme water flow events occur as natural functions within the ecosystem. To minimize the effects of catastrophic events, we identify and employ appropriate preventative measures to manage disturbances when they threaten desired healthy ecosystem functions or significantly endanger life, property, or sensitive resources.

The actions of people, wildlife, and livestock are also disturbance agents since they may affect the functioning condition of these areas.

GRAZING

The combination of wildlife and livestock animals exists at levels compatible with satisfactory soil conditions and proper functioning riparian/wetland conditions. These characteristics include soil loss within the natural threshold, good infiltration, complete nutrient cycling including adequate surface litter and vegetation (depending on climate), and high levels of organic matter that are appropriate for the wetland type.

The duration and timing of all grazing on plants are at levels that allow for sustainable use of forage and maintain or improve the proper functioning condition and maintain or improve satisfactory soil conditions in wetland/riparian areas.

RECREATION AND VISUALS

Ephemeral, temporary, seasonal, and semi-permanent wetland sites are visually attractive and free from evidence of physical, mechanical, or vegetative damage due to recreation activities.

Human activities create patches of disturbance. Human activities (especially at reservoir wetland types) may create linear disturbances or permanent structures which exist over long periods of time. In any case, the raw effects of these activities are softened.

RESERVOIRS

Reservoir wetland types are maintained and managed as recreation sites for camping and fishing.

RIPARIAN CONDITION

Seasonal, semi-permanent, and reservoir wetland areas are in proper functioning condition. These wetland types are functioning properly when adequate vegetation or landform is present to dissipate energy associated with wind action, wave action, and overland flow from adjacent sites, thereby reducing erosion and improving water quality; filter sediment and aid floodplain development; improve flood-water retention and groundwater recharge; develop root masses that stabilize islands and shoreline features against cutting actions; develop ponding and characteristics to provide the habitat and the water depth, duration, and temperature necessary to sustain aquatic flora and fauna and other uses; and support greater biodiversity. The functioning condition of riparian / wetland areas is a result of interaction among geology, soil, water, climate, vegetation and disturbance.

Ephemeral and temporary wetlands are in proper functioning condition. These wetland types are functioning properly when adequate vegetation or landform is present to dissipate energy associated with wind action, wave action, and overland flow from adjacent sites, thereby reducing erosion and improving water quality; filter sediment and aid floodplain development; improve flood-water retention and groundwater recharge; develop ponding and characteristics to provide the habitat and the water depth, duration, and temperature necessary to sustain aquatic flora and fauna and other uses; and support greater biodiversity. The functioning condition of riparian / wetland areas is a result of interaction among geology, soil, water, climate, vegetation and disturbance.

ROADS

Roads provide access to wetland areas to sufficiently accommodate recreational or other activities. People take responsibility to use roads in a way that minimizes resource damage. Roads that exist create minimum effects to wetland function. No new roads are allowed within wetland areas.

SOIL CONDITIONS

In general, soil condition is in satisfactory condition. Soil quality is being sustained, and the soil is functioning properly and normally. The ability of the soil to maintain resource values, sustain outputs, and recover from impacts is high. We evaluate soil condition using three factors: rate of soil loss, rate of water infiltration, and organic content. We sort soils into three condition classes: satisfactory, impaired, and unsatisfactory. Satisfactory soils exhibit minimal on-site soil loss from erosion; absorb water quickly enough to prevent surface runoff and overland flow, except during extraordinary rainfall events; and contain organic matter sufficient to support a complete nutrient cycle. Impaired soils fail to meet the standard for satisfactory in one of the three factors. Unsatisfactory soils fail to meet the standard for satisfactory in two or more of the three factors.

VEGETATION

Riparian vegetation is specific to each different wetland type and has a diverse age-class distribution, a diverse composition, and includes species that indicate maintenance of riparian soil moisture characteristics.

WATER

We see flood frequency and flooding regimes consistent with climate, watershed size, and geomorphology. We see unaltered hydrologic functions that promote an uninterrupted hydrologic cycle. Reservoirs are exceptions to this vision.

WILDLIFE

Seasonal and semi-permanent wetlands provide habitats that consist of mosaics with a variety of vegetation and structural conditions that provide for a sustainable and diverse community of aquatic and terrestrial fauna; including game and non-game species, native and some introduced species, common and rare species.

Ephemeral and temporary wetlands provide habitats that are consistent with their potential.

Reservoir wetlands provide habitats that accentuate recreation use at these sites.

Anglers find sportfishing opportunities within the reservoir wetlands.

Draft Desired Condition –Lotic Riparian Sites

Lotic riparian sites include springs, wet meadows and riparian streamcourses (Jacks Canyon and Clear Creek). We recognize that there is a connection between groundwater and surface water at these sites.

Our vision is of these wetland types is that they are in proper functioning condition with satisfactory soils, so that the result provides the type of ecosystem that will support flora and fauna typical of riparian sites. We recognize that disturbance agents may preclude the attainment of desired future functioning condition (DFFC) and satisfactory soil condition at some places and at some times.

CULTURAL RESOURCES

Same as Lentic Riparian/Wetland sites.

DISTURBANCES

Same as Lentic Riparian/Wetland sites.

GRAZING

Same as Lentic Riparian/Wetland sites.

RECREATION AND VISUALS

Riparian areas are visually attractive and free from evidence of physical, mechanical, or vegetative damage due to recreation activities. Physical impacts to meadows and riparian areas shall be confined to specified road crossings, trail crossings and access points. These structures are designed to minimize damage to meadows and riparian area.

Human activities create patches of disturbance. Some human activities may create linear disturbances (see glossary) or permanent structures which exist over long periods of time. In any case, the raw effects of these activities are softened

RIPARIAN CONDITION

Riparian areas and wetlands are in proper functioning condition. Riparian / wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid floodplain development; improve flood-water retention and groundwater recharge; develop ponding and characteristics to provide the habitat and the water depth, duration, and temperature necessary to sustain aquatic flora and fauna and other uses; and support greater biodiversity. The functioning condition of riparian /

wetland areas is a result of interaction among geology, soil, water, climate, vegetation and disturbance.

ROADS

Roads provide access to and crossings of riparian areas to sufficiently accomodate recreational or other activities. People take responsibility to use roads in a way that minimizes resource damage. Roads that exist create minimum effects to riparian function. All options for resource protection are evaluated for effectiveness.

SOIL CONDITIONS

Same as Lentic Riparian/Wetland sites.

VEGETATION

Riparian vegetation has a diverse age-class distribution, a diverse composition, and includes species that indicate maintenance of riparian soil moisture characteristics. Streambank vegetation is comprised of plant communities that have root masses capable of withstanding high streamflow events, and has adequate cover to protect banks and dissipate energy during high flows. Riparian plants exhibit high vigor, resist compaction, and where soils are appropriate, provide an adequate source of coarse and / or large woody debris.

WATER

We see perennial free-flowing streams in the major canyons (e.g. Lower Clear Creek, and Jack Canyon) and perennial, free flowing springs, when consistent with climate, watershed size, and geomorphology.

WILDLIFE

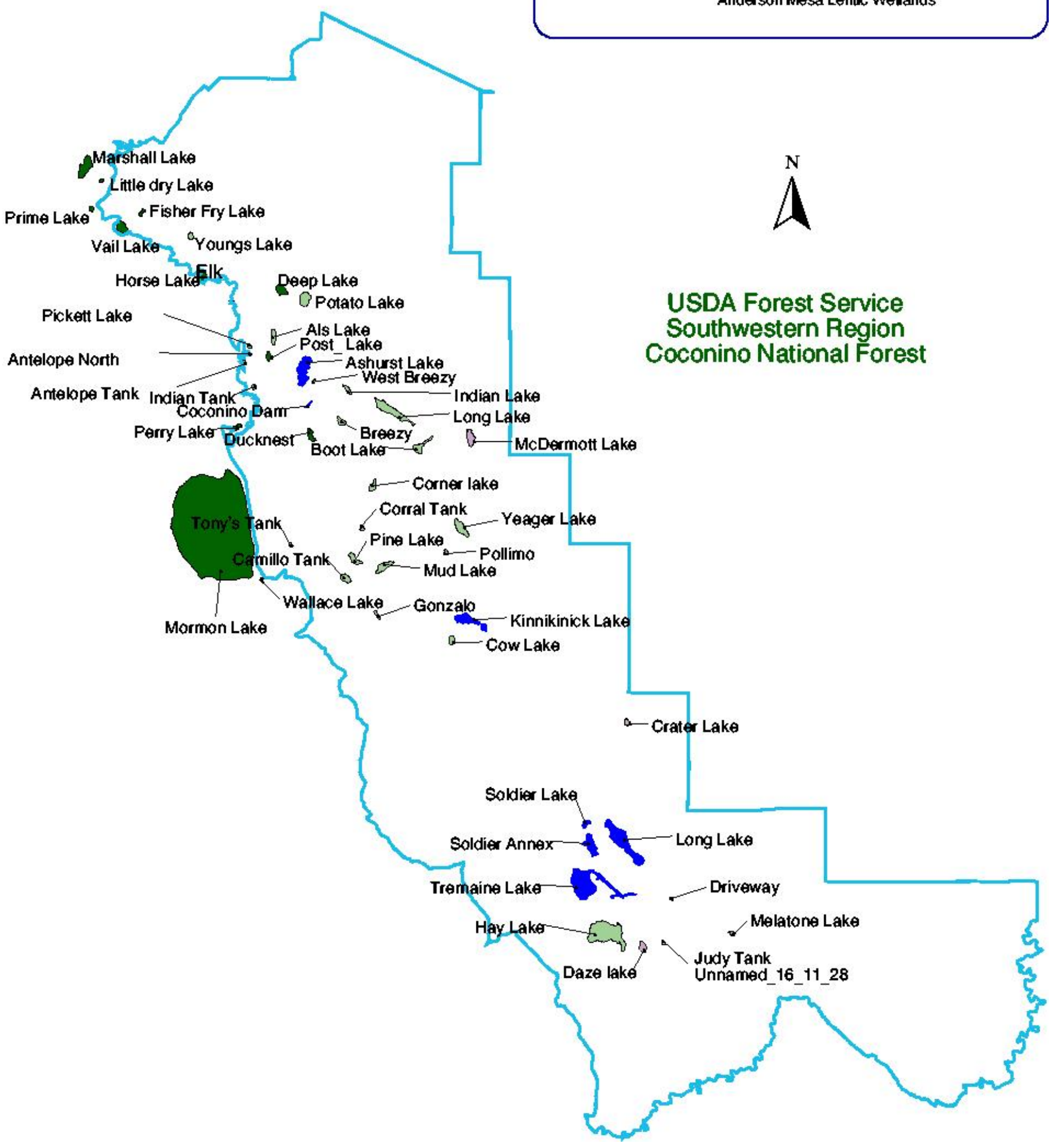
Habitats consist of mosaics with a variety of vegetation and structural conditions that provide for a sustainable and diverse community of aquatic and terrestrial fauna; including game and non-game species, native and some introduced species, common and rare species.

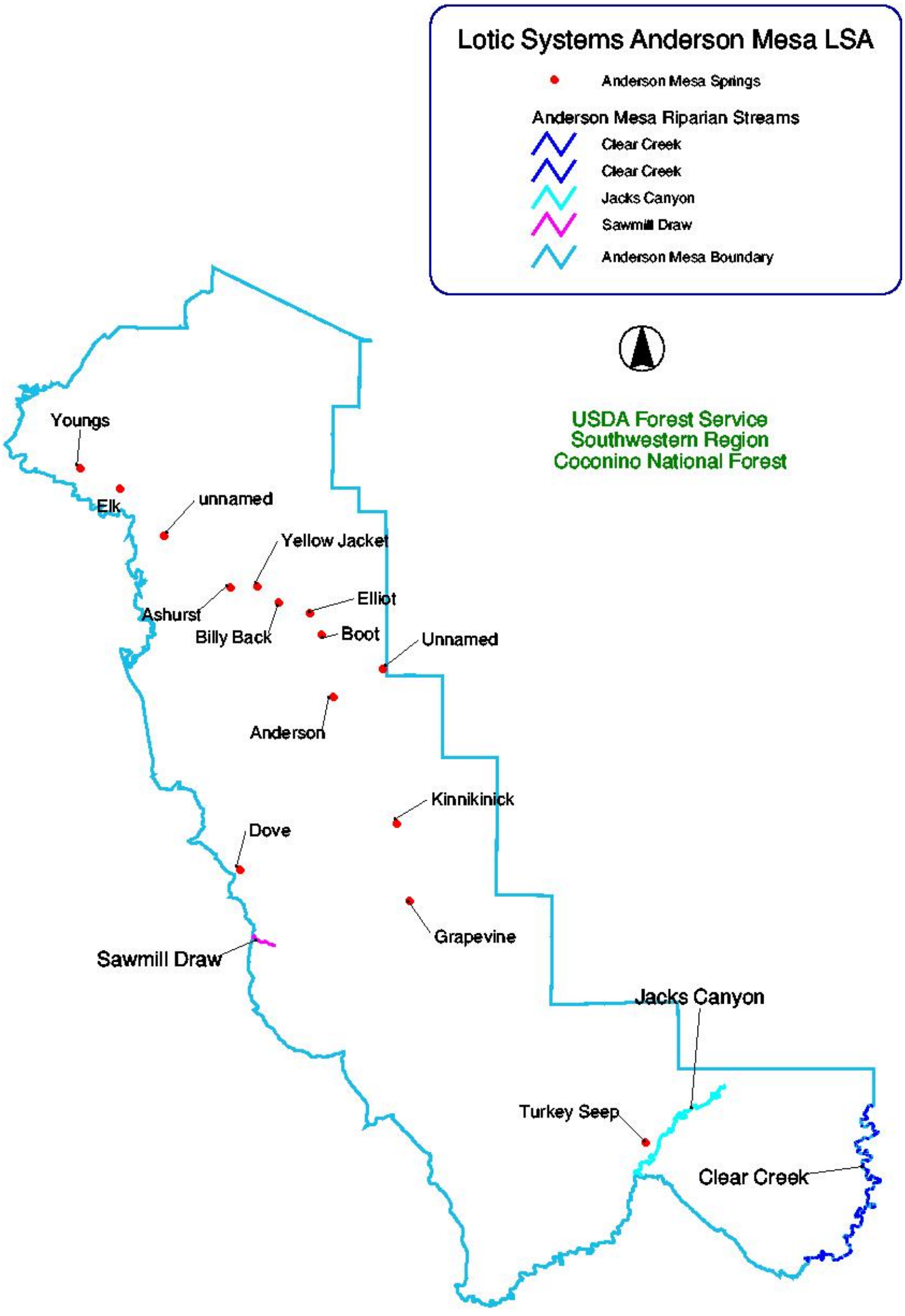
Native fish have secure, self-sustaining populations within their historic habitat.

Anglers find sportfishing opportunities occur within Lower Clear Creek.

APPENDIX A--MAPS

Anderson Mesa Draft Lentic Wetlands




Lotic Systems Anderson Mesa LSA
Anderson Mesa Springs
Anderson Mesa Riparian Streams
Clear Creek
Clear Creek
Jacks Canyon
Sawmill Draw
Anderson Mesa Boundary
USDA Forest Service
Southwestern Region
Coconino National Forest
Youngs
Elk
unnamed
Yellow Jacket
Ashurst
Billy Back
Elliot
Boot
Unnamed
Anderson
Kinnikinick
Dove
Grapevine
Sawmill Draw
Jacks Canyon
Turkey Seep
Clear Creek

APPENDIX B—PLANTS IN WETLAND SITES

Regional and National Indicators of Wetland Plants

Scientific name	Common Name	Regional Indicator	National Indicator	Habit
Agrostis stolonifera	carpet bentgrass	NI	FAC+, FACW	PNG
Alisma plantago-aquatica var americanum	common water-plantain	OBL	OBL	PNEF
Alopecurus aequalis	short-awn foxtail	OBL	OBL	PNG
Alopecurus geniculatus	water foxtail	OBL	FACW+,OBL	PNG
Amaranthus graecizans	pigweed			
Ambrosia tomentosa	ragweed			
Amelanchier utahensis	Utah serviceberry			
Artemesia biennis	biennial wormwood	FACW	FACU-,FACW	AIF
Artemesia spp	sagebrush			
Boisduvealia glabella	smooth spike-primrose		FACW,OBL	ANF
Bouteloua gracilis	blue grama			
Callitriche palustris	waterstarwort			
Carex spp.	sedge			
Chara spp	???			
Chenopodium pratericola	goose foot			
Cirsium spp	thistle			
Cirsium vulgare	bull thistle	FACU	UPL,FAC	BIF
Convolvulus arvensis	field bind-weed			
Echinochloa crusgalli	barnyard grass	FACW-,DRA	FACU,FACW	AIG
Elatine californica	California waterwort	NC	OBL	ANEF
Elatine rubella	south western waterwort	NC	OBL	ANEF
Eleocharis acicularis	needle spikerush	OBL	OBL	PNEGL
Eleocharis ovata	spikerush	OBL	OBL	PNEGL

Regional and National Indicators of Wetland Plants

Scientific name	Common Name	Regional Indicator	National Indicator	Habit
Eleocharis palustris	creeping spikerush	OBL	OBL	PNEGL
Elodea bifoliata	two-leaf waterweed	OBL	OBL	PNZF
Elymus smithii	western wheatgrass			
Elymus elymoides	squirreltail			
Epilobium hornemanni	Hornmann's willowherb	FACW	FACW,FACW+	PNF
Eriogonum spp.	buckwheat			
Erodium cicutarium	fillaree			
Geranium spp.	geranium			
Gnaphalium exilifolium	cudweed			
Helenium arizonicum	Arizona sneezeweed	FACW	FACW	ABNF
Hordeum brachyantherum	meadow barley	FAC	FAC,FACW	PNG
Hordeum jubatum	foxtail barley	FACW-	FAC,FACW	PNG
Ipomoea spp	morning glory			
Juncus balticus	Baltic rush	OBL	FACW,OBL	PNGL
Juncus ensifolius var brunnescens	swordleaf rush	FACW	FACW,FACW+	PNGL
Limosella acaulis	owyhee mudwort	OBL	OBL	PNEF
Limosella aquatica	water mudwort	OBL	OBL	APNEF
Lycium pallidum	wolfberry			
Marsilea mollis	pepperwort			
Mentha arvensis	field mint	FACW	FAC,FACW	PNF
Mimulus guttatus	monkey flower	OBL	OBL	ANF
Muhlenbergia rigens	spike muhly	NR	FAC,FACW	PNG
Muhlenbergia wrightii	deergrass	FACU	FACU	PNG
Myriophyllum sibiricum	water-milfoil			
Navarretia intertexta var propinqua	naverretia			
Panicum virgatum	swithcgrass	FAC+	FAC,FACW	PNG
Penstemon spp.	beardtounge			

Regional and National Indicators of Wetland Plants

Scientific name	Common Name	Regional Indicator	National Indicator	Habit
Phacelia pediculoides	scorpion weed	FAC+	FAC,FACW	
Phleum pratense	timothy	FACU	FACU	PIG
Phyla cuneifolia	wedge-leaf frog-fruit	FACW	FAC,FACW	PNF
Plagiobothhrys scouleri var penicillatus	scouler popcornflower	FACW+	FACW,OBL	ANF
Plantago major	common plantain	FACW	FACU,FACW	PIF
Poa compressa	Canada bluegrass	FACU	FACU-,FAC	PIG
Poa pratensis	Kentucky bluegrass	FACU	FACU,FAC-	PNG
Polygonum amphibium var stipulaceum	water smartweed	OBL	OBL	PNE/F
Polygonum aviculare	prostrate knotweed	FACW	UPL,FACW	APIF
Polygonum coccineum	knotweed			
Polygonum pectinatus	knotweed			
Polygonum pensylvanicum	pinkweed	OBL	FACW-, OBL	ANEF
Polygonum spp	knotweed			
Populus fremontii var fremontii	fremont cottonwood	FACW	FACW-,FACW	NT
Populus tremuloides	quaking aspen	FACU	FACU,FAC+	
Potamogeton diversifolius	waterthread pondweed	OBL	OBL	PN/F
Potamogeton foliosus	leafy pondweed	OBL	OBL	PNZF
Potamogeton foliosus var foliosus	leafy pondweed	OBL	OBL	PNZF
Potamogeton gramineus var maximus	grassy pondweed	OBL	OBL	PNZF
Potamogeton nodosus	long-leaf pondweed	OBL	OBL	PN/F
Potamogeton pectinatus	sago pondweed	OBL	OBL	PNZF
Potamogeton pusillus	small pondweed	OBL	OBL	PNZF
Potamogoten gramineus var gramineus	variable pondweed	OBL	OBL	PNZF
Ranunculus aquatilis	white water buttercup	OBL	OBL	PNZF
Ranunculus aquatilis var capillecus	water buttercup	OBL	OBL	PNZF
Ranunculus aquatilis var subrigidus	water buttercup	OBL	OBL	PNZF
Ranunculus circinatus var subrigidus	buttercup			

Regional and National Indicators of Wetland Plants

Scientific name	Common Name	Regional Indicator	National Indicator	Habit
Ranunculus cymbalaria spp saximontanus	seaside crowfoot	OBL	OBL	PNEF
Ribes spp	currant			
Rorippa sphaerocarpa	round-fruited yellow-cress	OBL	FAC+,OBL	ANEF
Rorippa sylvestris	creeping yellow-cress	OBL	OBL	
Rosa spp	wild rose			
Rumex crispus	curly dock	FACW	FACU,FACW	PIF
Rumex mexicanus	Mexican dock	FACW	FAC-,FACW	PNF
Rumex spp	dock			
Sagittaria cuneata	northern arrowhead	OBL	OBL	PNEF
Salix exigua	coyote willow	OBL	FACW, OBL	NS
Salix lasiolepis	arryo willow	FACW	FACW	NS
Salix spp.	willow			
Schedonnardus paniculatus	tumble grass			
Scirpus acutus	hardstem bulrush	OBL	OBL	PNEGL
Sidalcea neomexicana	new mexico checkermallow	FACW	FACW	PNFH
Tamarix pentandra	salt-cedar	NI	FAC,FACW	IT
Taraxacum officinale	dandelion	FACU	FACU-,FACW	PNEF
Thalictrum spp.	meadow-rue			
Tribulus terrestria	goathead			
Typha latifolia	broad leaf cattail	OBL	OBL	PNEF
Utriculeria macrorhiza	common bladderwort	OBL	OBL	
Verbascum spp	mullien			
Verbena bracteata	prostrate vervain	FAC	UPL,FACW	APNF
Verbena bracteata	prostrate vervain			
Verbena spp	vervain			
Veronica peregrina ssp xalapensis	purslane speedwell	OBL	FACU-,OBL	ANEF
Vicia americana	American vetch	NI	FAC?	PNFV

Regional and National Indicators of Wetland Plants

Scientific name	Common Name	Regional Indicator	National Indicator	Habit
Virguiera annua	golden eye/resin weed			
Xanthium saccharatum	cocklebur			
Xanthium strumarium	rough cocklebur	NI	FAC-,FAC+	ANF
Zannichellia palustris	horned pondweed	OBL	OBL	PNZF

DEFINITIONS

1) Obligate (OBL): Always found in wetlands under natural conditions (frequency greater then 99%), but may persist
in non-wetlands if planted there by man or in wetlands tht have been drained, filled or otherwise transformed into non-wetlands.

2) Facultative wetland (FACW): Usually found in wetlands (67-99% frequency), but occasionally found in non-wetlands.

3) Facultative (FAC): Sometimes found in wetlands (34%-66% frequency), but also occur in non-wetlands.

4) Facultative Upland (FACU): Seldom found in wetlands (1%-33% frequency) and usually occurs in non-wetlands.

5) Non-wetland (UPL): Occurs in wetlands in another region, but not found (<1% frequency) in wetlands in the region
specified. If a species does not occur in any region, it is not on the list.

Drawdown (DRA): Typically associated with the drier stages of the wetlands, such as mud flats,vernal pools, and playa lakes.

NR: species that has not received any regional review.
NC: species that has not been considered because of their recent addition to the list.
+ : used in facultative indicator categories to indicate a frequency toward the higher end of the category (more frequently found in wetlands)
- : used in facultative indicator categories to indicate a frequency toward the lower end of the category (less frequently found in wetlands)

Those with no indicator (blank), are not on the 1986 and 1988 wetland plant list.

Habit
A=annual, B=biennial, C=Clubmoss, E=emergent, @=epiphytic, F=forb, /=floating, F3=fern, G=grass, GL=grasslike, H=partly woody
HS=half shrub, H2=horsetail, I=introduced, N=native, P=perennial, +=parasitic, P3=pepperwort, Q=quillwort, S=shrub, -=saprophytic
Z=submerged, S=succulent, T=tree, V=herbaceous vine, W=waterfern, WV=woody vine.

Sources: Reed, P.B.Jr. 1986. Wetland Plants of the State of Arizona. USDI Fish and Wildlife Service. WELUT-86/W12.03
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APPENDIX C—COCONINO NATIONAL FOREST MANAGEMENT STANDARDS AND GUIDELINES

This appendices contains standards and guidelines for MA 12 (riparian and open water) and from the Forest-wide standards and guidelines for soil and water resources.

Riparian and Open Water - Management Area 12

Analysis Areas: 32, 33
Acres: 37,969

Riparian areas are wetland ecosystems that have a high water table because they are close to surface or subsurface water. Riparian areas usually occur in the transition between aquatic and terrestrial ecosystems, but have distinct vegetation and soil characteristics.

There are eight types of riparian areas on the Forest:

- Intermittent streams
- Perennial streams
- Wet meadows
- Marshes
- Rivers
- Ponds
- Lakes
- Seeps and Springs

This management area includes both mapped riparian areas and riparian areas which were too small to be mapped as discrete units during the analysis process.

Riparian areas provide very important wildlife and fish habitat and recreation opportunity because of the water.

There are over sixty named lakes and wetlands in the area, including Mormon Lake and Stoneman Lake, the two largest natural lakes in Arizona.

Riparian areas are extremely variable due to different types of water bodies such as lakes, streams, and ponds. The characteristics of the area in which riparian areas occur such as gradient, topography, soil type, elevation, and plant communities also affect the area type. Each different type has associated vegetation that is characteristic.

Definition: Riparian ecosystems are distinguished by the presence of free water within the common rooting depth of native perennial plants during at least a portion of the growing season. Riparian ecosystems are normally associated with seeps, springs, streams, marshes, ponds, or lakes. The potential vegetation of these areas commonly includes a mixture of water (aquatic) and land (phreatic) ecosystems.

Riparian areas are critical for multiple-use management because:

- Riparian areas are generally more productive per acre of biomass (plants and animal) than other areas.

- They provide large amounts of edge between life zones which adds significantly to the diversity of an ecosystem.
- Different species and age classes provide vertical edge for wildlife species.
- The three basic requirements of wildlife habitat (food, cover, and water) are met.
- The fisheries resource is associated with this area.
- Topography, high productivity, easy availability, and the presence of water attract livestock and they tend to concentrate here. Riparian areas are highly sensitive to overgrazing.
- Scenic values are very high.
- Stream channels and associated riparian vegetation are fragile components of good watershed condition.
- Most of the developed campgrounds and picnic areas are in or directly adjacent to the riparian area. Dispersed recreationists concentrate in the area because of the water, visual quality, and shade trees.
- The topography generally provides for less expensive road construction and serves as convenient wildlife travel corridors. These uses are often in direct conflict.

Management Emphasis

Emphasize wildlife habitat, visual quality, fish habitat, and watershed condition on the wetlands, riparian forest, and riparian scrub. Emphasize dispersed recreation, including wildlife and fish recreation, on the open water portion.

An interdisciplinary team approach will be used on management activities such as timber sales, allotment management plans, and other management activities to prescribe specific management practices to meet the goal of riparian area recovery by 2030. Manage riparian areas based on the potential to support riparian vegetation. Potential is determined through a consensus of an interdisciplinary review. In order to achieve certain aspects of recovery, such as establishing three age classes of woody riparian vegetation, implementing riparian Standards and Guidelines occurs in the first decade. Riparian areas provide a filter strip of vegetation, important for filtering sediments generated from upslope soil erosion. Eighty percent of the riparian recovery is expected by 2030. The remaining 20 percent will be significantly improved, but will not have all of the characteristics of a fully recovered riparian area. The goals and objectives for elk populations and for livestock grazing affect achievement of the full recovery.

Highlights include:

- Improve riparian areas through a combination of improvement projects and management activities.
- Manage for the following indicator species:
    Cinnamon teal
    Lincoln's sparrow
    Yellow breasted chat
    Lucy's Warbler
    Macroinvertebrates
- Manage for visual quality objectives of Retention, Partial Retention and Modification.

Timber Land Use Classes:

Nonforest	18,580 acres
Forested land withdrawn	
Ponderosa Pine/Mixed Conifer	0 acres
Pinyon-juniper	0 acres
Unsuitable (Pinyon-juniper)	0 acres
Unsuitable (physically unsuited or not capable)	19,389 acres
Forested lands not appropriate for timber harvest	0 acres
Suitable Timber lands	0 acres
TOTAL	37,969 acres

Program Components	**Activities**	**Standards and Guidelines**
		Recreation Planning and Inventory
A2 Recreation	A01, A02	In the first decade develop specific management direction for open water areas on lakes and reservoirs having significant amount of over water recreation use, e.g., sailboating, motorboating, canoeing, fishing, and windsurfing. Consider, as a minimum, ROS class demand and distribution, wildlife and fisheries habitat needs, user safety and enjoyment, and cost-effectiveness of management practices. Coordinate with Arizona Game and Fish Department (AGFD) in this analysis. Where determined through environmental analysis, identify and implement specific management practices such as wakeless zones, traffic circulation patterns, presence and/or size of gasoline motors, and regulations on use of jet skis. Coordinate with AGFD in implementation. Do not issue outfitter/guide permits or permit use which causes significant change for the ROS social or managerial setting, e.g., airboats or seaplanes. Manage Stoneman Lake basin for dispersed day-use. Overnight camping in the basin is prohibited. **M11 Contains additional management direction for a portion of West Clear Creek and Wet Beaver Creek.**
		Wildlife Planning and Inventory
C2 Wildlife and Fish	C01	Complete inventory, survey, and evaluate riparian areas by end of first decade. Cooperate with AGFD to develop implementation schedules for Arizona Cold Water Fisheries Strategic Plan. The following applies to riparian areas, whether they are large enough to bemapped out or not. Wetlands and open water containing emergent vegetation which provide nesting habitat are protected from disturbing uses that will harass nesting birds, such as activities that are noisy or would damage nests or nesting habitat from May 1 to July 15.

Program
Components ***Activities*** ***Standards and Guidelines***

C2	C01	Meet the following Riparian Standards in the Regional Guide for 80 percent of riparian areas above the Rim and 90 percent below the Rim by the year 2030: - Maintain at least 80 percent of the potential overstory crown coverage. - Maintain at least three age classes of woody riparian species, with at least 10 percent of the woody plant cover in sprouts, seedlings, and saplings. - Maintain at least 80 percent of the potential stream shading from June to September along perennial cold and cool water streams. - Maintain at least 80 percent of the potential shrub cover in high elevation areas. - Maintain at least 80 percent of the potential emergent vegetation cover from May 1 to July 15 in key wetlands. - Maintain at least 80 percent of the spawning gravel surface free of inorganic sediment. - Maintain at least 80 percent of streambank total linear distance in stable condition. - Retain snags in riparian areas that are not a safety hazard. Measures such as fencing to exclude livestock, vegetation projects, and special management prescriptions will be undertaken until the affected areas are brought into satisfactory riparian condition. In addition, the remainder of the Forest's riparian areas will have some of these characteristics, but not all of them by 2030.
	C01, A01, D01, E00, F04, L01 P01	Coordinate with other resource functions to pursue instream flow rights to protect aquatic ecosystems, fish, and wildlife.
		Nonstructural Wildlife Habitat Improvements
C3	C02	Determine the need to rehabilitate riparian areas through seeding and planting woody species in areas that are in unsatisfactory condition, including those areas not mapped as discrete riparian areas, and then proceed to rehabilitate areas as determined. Attempt using unpalatable species where necessary to avoid wildlife browsing. Maintain or improve nesting cover and waterfowl forage on existing waterfowl islands and shorelines. In conjunction with construction of waterfowl islands seed herbaceous species unpalatable to large herbivores.
	L01	Cooperate with Arizona Game and Fish Department on fish population control of aquatic plants and fish stocking to meet State fisheries management goals.

Program ***Components***	***Activities***	***Standards and Guidelines***
		Structural Wildlife Habitat Improvements
C3	C03	Construct 10 miles of fences per decade for the first two decades where necessary to protect key wet meadows, wetlands, and riparian regeneration from grazing. Construct 150 waterfowl islands per decade in Decades 2 and 3 and create potholes in wetland areas to provide nesting habitat.
	C03, D01	Maintain riparian and meadow communities by providing waters for wildlife and livestock away from these sensitive areas.
	C03	Establish administrative exclosures the first decade to determine riparian vegetation potential on representative streams. Modify watershed improvement structures where possible to provide water for wildlife.
	C03, C04	Manage lakes and streams to improve fisheries habitat by constructing structures and barriers as appropriate based on environmental analysis and on professional judgment of the responsible official and resource specialist: - Install 10 stream improvement projects on perennial streams in first decade; Improve fish habitat through placement of 200 cover structures on lake bottoms during the first decade; Create spawning habitat of 10 acres per year in lakes in the first decade.
		Range Resource Planning and Inventory
D2 Range	D01, D02	Grazing allotments are generally managed at Levels C and D. There are 3,159 acres of full grazing capacity lands, of this total 484 acres are in less than satisfactory range condition that will be improved through completion of thedevelopment programs contained in the AMP's. AMP's are reviewed and, if necessary, amended by 1992 to contribute towards the achievement of satisfactory riparian condition. Salt is used to help achieve proper livestock grazing distribution. Permanent salt is not placed within 1/4 mile of the edge of any riparian area. Temporary salting may be approved if it will help to achieve a specific management objective for enhancement of riparian areas.
	D01	Proper allowable use within MA 12 is not to exceed 20 percent on the woody vegetation.
	D02	Stoneman Lake is fenced to exclude livestock grazing below the rim of the basin.

Program ***Components***	***Activities***	***Standards and Guidelines***
		Range Forage Improvement
D2	D03	Favor the establishment of woody riparian vegetation, where potential natural vegetation has been determined through an interdisciplinary process to include woody riparian species. Control livestock grazing through management and/or fencing to allow for adequate establishment of vegetation and the elimination of overuse. Evaluate seeding projects for effects on concentrating livestock use in riparian and other sensitive areas.
		Timber Harvest and Administration
E8 Timber	E06, C02 A01	Plan, prepare, administer, and sell or issue permits for commercial and personal use miscellaneous convertible and nonconvertible products such as firewood only as requested by other resources to achieve wildlife habitat, visual quality, public safety, or dispersed recreation objectives.
		Evaluate bear habitat needs during project planning. Defer logging activities from April 15 to June 30 in known bear maternity areas.
	E05, P11	No precommercial thinning or piling thinning slash in riparian areas or areas that have riparian characteristics.
		Water Resources Planning
F2 Watershed/ Soil/Air	F02	Plan for suitable filter strips between streamcourses and disturbed areas and/or road locations. See Filter Strip Table in Forest-wide Standards and Guidelines under Watershed/Soil/Air, F2. Plan for suitable filter strips between stream courses and ground disturbing activities including roads.
	F09	**Water Resource Monitoring**
	F04	Cooperate with USDI Geological Survey in maintaining stream gages.
		Soil Resource Planning
	F02	Conduct an on-site soil investigation where needed to identify soil properties of riparian sites not delineated in the T.E.S. inventory due to mapping scale and inclusions such as soils with aquic subgroups, aquic soil moisture regimes, and poorly drained properties.

Water Resource Improvement

F3	F03	Through coordination with other disciplines, maintain or improve, where necessary, riparian vegetation along streams for moderating water temperature and protecting bank stability. Accomplish promptly after the inventory phase is completed. Investigate and implement where necessary, cost effective structural measures to control channel erosion.

Minerals

G1, G2 Minerals	G03	Mineral material excavation with the riparian zone may be allowed after environemntal analysis. Authorized mineral activies will maintain or improve riparian conditions.

Special-Use Management

J3 LMP/Special-Uses/Lands	J01	New special-uses are normally not allowed in riparian areas unless they benefit riparian management. Exceptions which cannot be avoided, such as utility lines or roads crossing stream courses, are designed to minimize the amount of riparian affected and the degree of effects.

Land Exchange

	J13	Acquiring riparian areas through land exchange has a high priority.

Fire Management Planning and Analysis

P2 Protection	P01	Fight fire aggressively, if necessary, to prevent resource damage, using suppression methods that minimize long-term adverse impacts to riparian habitats.

COCONINO NATIONAL FOREST FOREST-WIDE STANDARDS AND GUIDELINES FOR WATER RESOURCES

Water Resource Planning

. F2	F01	Participate in nonpoint assessments with the State of Arizona as required by sec. 319 (a)(1) of the Clean Water Act (amended 1987).
Watershed/ Soil/Air		Evaluate requests for weather modification through the environmental analysis process.
		Ensure compliance with PL 92-500 "Federal Water Pollution Control Act" and Arizona Water Quality Standards through the implementation of Best Management Practices (BMP) to prevent water quality degradation.

Best Management Practices:

Use project monitoring information to evaluate BMP'S currently used to reduce nonpoint pollution from activities on the Forest. BMP'S include project planning as well as on the ground measures. By 1995, develop guidelines for implementation of BMP'S on the Forest. In the interim period, a general list of BMP'S has been included below. Apply these practices, depending on individual project and site requirements, to reduce nonpoint source pollution and protect riparian areas.

Filter Strips

Plan for appropriate filter strips adjacent to streamcourses and/or riparian areas, as determined through the IRM process. A filter strip is an area of vegetation and forest litter located adjacent to streamcourse and/or riparian areas for the purpose of filtering sediment, providing bank stability, and in tree/shrub ecosystems providing shade for fisheries habitat. The ability of the strip to trap and filter sediments is a function of the amount and type of material on the ground, and width and slope of the strip. The ability of the strip to provide shade over perennial streams is dependent on the height of the vegetation and orientation of the stream with respect to the sun. Filter strip widths provided below are for average ground cover conditions. Significant topographic changes, such as abrupt canyon edges may be used as boundaries for filter strips, as long as ground disturbing activities beyond the canyon walls do not influence water quality. The table below should be used as a guide for determining filter strip width. Erosion hazard is defined as the risk of erosion and sedimentation that is based on slope, soil type, and the amount and type of material on the ground that is able to trap eroded material.

FILTER STRIP TABLE - NONRIPARIAN STREAMCOURSES

F2 **F01**

Erosion Hazard	Filter Strip Slope Distance
Severe	1.5 chains on each side of streamcourse
Moderate	1.0 chains on each side of streamcourse
Slight	0.5 chains on each side of streamcourse

- Limited skidding may occur within the filter strip of nonriparian streamcourses as long as the ability to function as a filter strip is maintained.
- Landings, decking areas, machine piling, skid trails, and roads (except at designated crossings) are planned outside of the filter strip of nonriparian streamcourses.

FILTER STRIP TABLE - RIPARIAN STREAMCOURSES

Erosion Hazard	Filter Strip Slope Distance
Severe	2.0 chains on each side of streamcourse
Moderate	1.5 chains on each side of streamcourse
Slight	1.0 chains on each side of streamcourse

- Directional falling and end-lining of logs out of the filter strip without crossing the streamcourse may occur.
- Landings, decking areas, machine piling, limited skidding, skid trails, and roads (except at designated crossings) are planned outside of the filter strip of riparian streamcourses.

Streamcourses

F2 **F01** - Designate stream courses and riparian areas to receive protection during projects such as timber sales and road work. As a minimum, those streams shown on 7-1/2 minute quads as stream courses are evaluated for the need to be designated stream courses.
- Existing wood debris in stream channels is not disturbed unless designated for removal as a special project to improve stream channel conditions.
- Logging and other debris that gets into stream channels is removed to above the high water mark before winter rains and snows begin except when an environmental analysis shows that the debris can be effectively used to improve fisheries habitat.
- Locate new roads out of stream courses and water-collecting features such as swales. Relocate roads out of bottom positions and obliterate poorly located segments as they are identified.
- Provide adequate road drainage to prevent concentrated flow and sedimentation.

- Maintain at least 80 percent of the potential crown cover in the riparian area..
- Plan projects, parts of projects, and/or management practices for soil and water resources improvement where watershed condition is unsatisfactory. Incorporate plans for soil and water improvements into project planning for other resources.

F2 F01 Use the following BMP techniques to minimize sedimentation from road construction and reconstruction:
- Outsloped road surface;
- Leadout ditches and relief culverts;
- Energy dissipators on culverts;
- Vegetating cut and fill slopes;
- Riprap installation;
- Rolling grade.

Water Resource Inventory

Conduct watershed condition inventory as outlined in R-3 Hydrology Note 20, dated February 19, 1984, (as updated) by 2000. Complete 60 percent of the inventory during the first decade.

Annually update inventory of gully systems and sheet erosion.

F2 F01 Inventory riparian communities and areas capable of supporting riparian species by the end of the first decade. Channel condition and aquatic habitat condition will be included in the survey. Plan and design projects in areas of unsatisfactory or degraded condition to promote channel and streambank stability and to improve flow and timing of water. Meet or exceed eighty percent of Regional requirements above the Rim and ninety percent below the Rim by 2030. Manage to achieve at least 25 percent of the currently unsatisfactory riparian areas will be in satisfactory condition by 2000.

As information is available, develop inventory of important groundwater recharge areas. Evaluate management practices to assure that recharge potential is maintained.

F03 Assure compliance with Executive Order 11990, protection of wetlands:

- Locate roads out of wetlands.
- Locate skid trails and decks out of wetlands.

Assure compliance with Executive Order 11988, floodplain management:

- Conduct flood hazard evaluations (100 year flood plain) on all potential land exchanges.
- Design structures built in drainages to meet appropriate flood occurrence intervals.

Inspect areas proposed to be treated with chemical agents such as pesticides and herbicides to ensure that surface or ground water contamination does not occur.

Water Resource Monitoring

F02 Cooperate with the University of Arizona and Northern Arizona University in carrying out the Memorandum of Understanding for work to be continued on the Beaver Creek watersheds.

Evaluate the need to monitor water quality from areas disturbed by management and use activities. Conduct monitoring where needed to assure compliance with the Arizona State Water Quality Standards and P.L. 92-500.

Conduct water quality monitoring of primary contact recreation sites to standards of FSM 2540 and Arizona Water Quality Standards for full body contact waters (swimming and wading). Conduct monitoring as necessary to assure compliance with standards for aquatic life and wildlife where known problems are occurring.

Evaluate watershed condition for its effect on turbidity.

Conduct snow surveys as per cooperative agreement with Soil Conservation Service.

Water Uses Management

F2 F04 Maintain close working relations with the City of Flagstaff to ensure coordination, cooperation, and compliance with permit conditions for the Inner Basin, Upper and Lower Lake Mary, Lake Mary Well Field, and Woody Mountain Well Field.

Take action to legally protect Forest uses of needed waters.

File for water rights on appropriable waters following State procedures. Complete all documentation required for the adjudication process by dates specified by the courts.

Evaluate current and proposed water uses to promote efficient use of Forest Water resources.

Take action to obtain instream flow water rights for fish, wildlife, recreation, and channel maintenance purposes:

- For nonappropriable water uses, check for compliance with Arizona Revised Statutes and R-3 guidelines.
- Participate in State water right adjudications.
- Secure water rights through purchase or severance-and-transfer when additional sources are needed.
- Maintain and update annually an inventory of all water uses on the Forest (WURR).

Water Resource Improvement

F3 F03 Complete Watershed restoration implementation schedule by 2005 to improve all unsatisfactory ecosystems and watersheds. These action plans cover all activities and uses and are supplemental to Forest Plans.

Maintain current satisfactory watershed conditions and improve any unsatisfactory conditions to satisfactory by 2020.

Implement resource improvement projects that are cost-effective and/or are beneficial for maintaining and improving water quality, quantity, and soil productivity. Priority is given to vegetative versus structural measures. On those areas where grazing occurs, projects are only done where there is an approved AMP. Treated areas are protected by grazing management, fencing, and/or other methods, until recovery is satisfactory. On those areas where grazing occurs, management will be evaluated and modified if necessary to be consistent with the objectives of the improvement project. In project planning evaluate the need for planting nonpalatable herbaceous and woody vegetation to discourage concentration of elk and livestock.

F3 F03 Implement emergency fire rehabilitation measures where necessary to protect soil and water resources from intolerable losses or to prevent unacceptable downstream damage.

Enhance watershed condition by obliterating roads causing resource damage. A total of 400 miles of roads will be obliterated by the end of the first decade (average of 40 miles annually).

Water Resource Improvement Maintenance

F06 Evaluate the need for maintenance and, where appropriate, do maintenance to protect investments in water resource improvement projects as needs are identified.

Terrestrial Ecosystem Survey

F2 F01 Conduct Terrestrial Ecosystem Survey to standards, policies, and guidelines as defined in 2550 TES Handbook and National Cooperative Soil Survey, by the Regional Zone TES team during the first decade.

Soil information from a Level 3 T.E.S. is intended for:
- Broad resource, land management, and activity planning at Regional, Forest, and District levels.
- Low investment, extensive land management projects such as timber sales and range allotment analysis that do not require site specific, precise, highly detailed soil interpretations.
- The initial identification of areas that will require additional specific soil information necessary for project level work as outlined in the Plan.

Conduct an on-site soils investigation for soil disturbing projects which require site specific, precise, highly detailed soil information which is beyond the scope of what is provided in a Level 3 T.E.S., such as terrestrial ecosystem information concerning inclusions and other miscellaneous areas which is important for site specific projects. Site specific projects would include but are not limited to site preparation, campgrounds, trails, and pit tanks.

APPENDIX D—RIPARIAN VISION STATEMENTS—EAST CLEAR CREEK ECOSYSTEM MANAGEMENT AREA

II. RIPARIAN AND WET MEADOWS

♦ Our vision is of riparian areas and meadows that are in proper functioning condition with satisfactory soils, so that the result provides the type of ecosystem that will support flora and fauna typical of riparian and wetland meadows. We recognize that disturbance agents may preclude the attainment of desired future functioning condition (DFFC) and satisfactory soil condition at some places and at some times.

CULTURAL RESOURCES

♦ We respect and protect evidence of past uses of the area.

♦ We work with Tribal representatives to ensure that their interests are protected. The area provides educational opportunities for the Native American People to pass on cultural knowledge within their own communities.

♦ We respect medicinal, ceremonial, and personal uses of the area.

DISTURBANCES

♦ Disturbance agents such as fire, insects, pathogens, and extreme water flow events occur as natural functions within the ecosystem. To minimize the effects of catastrophic events, we identify and employ appropriate preventative measures to manage disturbances when they threaten desired healthy ecosystem functions or significantly endanger life, property, or sensitive resources.

♦ The actions of people, wildlife, and livestock are also disturbance agents since they may affect the functioning condition of these areas.

GRAZING

♦ The combination of wildlife and livestock animals exists at levels compatible with satisfactory soil conditions and proper functioning riparian conditions. These characteristics include minimal soil loss, good infiltration, complete nutrient cycling, and high levels of organic matter.

♦ The duration and timing of all grazing on plants are at levels that allow for sustainable use of forage and maintain or improve the proper functioning condition of riparian areas and maintain or improve satisfactory soil conditions in meadows.

RECREATION AND VISUALS

♦ Meadows and riparian areas are visually attractive and free from evidence of physical, mechanical, or vegetative damage due to recreation activities. Physical impacts to meadows and riparian areas shall be confined to specified road crossings, trail crossings and access points. These structures are designed to minimize damage to meadows and riparian area.

♦ Human activities create patches of disturbance. Some human activities may create linear disturbances (see glossary) or permanent structures which exist over long periods of time. In any case, the raw effects of these activities are softened.

RESERVOIRS

♦ The flow regime in drainages downstream from Blue Ridge Reservoir and Knoll Lake mimics the shape of the natural hydrograph, making allowances for water loss through evaporation in the reservoirs. Recreation at both reservoirs is maintained.

RIPARIAN CONDITION

♦ Riparian areas and wetlands are in proper functioning condition. Riparian / wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid floodplain development; improve flood-water retention and groundwater recharge; develop ponding and characteristics to provide the habitat and the water depth, duration, and temperature necessary to sustain aquatic flora and fauna and other uses; and support greater biodiversity. The functioning condition of riparian / wetland areas is a result of interaction among geology, soil, water, climate, vegetation and disturbance.

ROADS

♦ Roads provide access to and crossings of riparian and meadow areas to sufficiently accomodate recreational or other activities. People take responsibility to use roads in a way that minimizes resource damage. Roads that exist create minimum effects to meadow and riparian function. All options for resource protection are evaluated for effectiveness. (See Partial List of Options for Resource Protection in appendix.)

SOIL CONDITIONS

♦ In general, soil quality is in a satisfactory condition. Soil quality is being sustained, and the soil is functioning properly and normally. The ability of the soil to maintain resource values,

sustain outputs, and recover from impacts is high. We evaluate soil condition using three factors: rate of soil loss, rate of water infiltration, and organic content. We sort soils into three condition classes: satisfactory, impaired, and unsatisfactory. Satisfactory soils exhibit minimal on-site soil loss from erosion; absorb water quickly enough to prevent puddling, surface runoff, and overland flow, except during extraordinary rainfall events; and contain organic matter sufficient to support a complete nutrient cycle. Impaired soils fail to meet the standard for satisfactory in one of the three factors. Unsatisfactory soils fail to meet the standard for satisfactory in two or more of the three factors.

VEGETATION

♦ Riparian vegetation has a diverse age-class distribution, a diverse composition, and includes species that indicate maintenance of riparian soil moisture characteristics. Streambank vegetation is comprised of plant communities that have root masses capable of withstanding high streamflow events, and has adequate cover to protect banks and dissipate energy during high flows. Riparian plants exhibit high vigor, resist compaction, and where soils are appropriate, provide an adequate source of coarse and / or large woody debris.

♦ Diverse meadow vegetation (non-riparian) minimizes soil loss, improves water infiltration, and provides a source for organic matter and nutrition for animals.

WATER

♦ We see perennial free-flowing streams in the major canyons (e.g. East Clear Creek, Leonard Canyon, Yeager Canyon, Miller Canyon, Dane Canyon, Barbershop Canyon, Bear Canyon) and headwater meadows, when consistent with climate, watershed size, and geomorphology. Blue Ridge Reservoir and Knoll Lake exist as exceptions to this statement.

WILDLIFE

♦ Habitats consist of mosaics with a variety of vegetation and structural conditions that provide for a sustainable and diverse community of aquatic and terrestrial fauna; including game and non-game species, native and some introduced species, common and rare species.

♦ Native fish have secure, self-sustaining populations within their historic habitat.

♦ Anglers find sportfishing opportunities within the East Clear Creek Ecosystem.

♦ Non-consumptive and regulated consumptive uses of wildlife exist within the East Clear Creek watershed.

APPENDIX E – VISION STATEMENT FOR WETLANDS/RIPARIAN FROM THE DIABLO TRUST

6. ZONE 6 Canyons and riparian areas within zones 1-5; low to high elevation, perennial water most of the year due to run-off and surface water.

DESIRED LANDSCAPE DESCRIPTION: Diablo Trust envisions the major canyons have diverse plant communities of varied age and species composition, and with soil cover and perennial grass cover adequate to stabilize the riparian ecosystem. To mitigate the impacts of floods, appropriate patterns of over story vegetation will be encouraged. Stream sinuosity will be encouraged in order to maintain deposition points. Water pooling will occur at grade changes. Lakes will have perennial vegetation to full-level waterlines, and as much below the water line as possible. The vegetation and soil treatments planned for forestlands, woodlands, and rangeland watershed areas of the Diablo Trust will significantly increase the available water and soil moisture within the lakes, canyons, and riparian areas.

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