LAND USE

Historic Land Cover/Land Use

Historical land cover within the uplands of the Jacks Fork Watershed primarily consisted of oak and mixed pine/oak forest composed of black and white oak species as well as shortleaf pine with an open understory of shrubs and wild grasses such as bluestem (Nigh 1988 and MDC 1997). Occasional prairie and savanna openings were also common in some areas. Land cover of the sideslopes consisted of oak and oak/pine forests composed of black and white oak species as well as walnut and hickory with occasional glade and woodland type openings associated with exposed slopes and ridges having shallow soils. Valley bottom land cover consisted of mixed hardwood or oak/pine forest with occasional fen openings.

The Ozarks are believed to have first been explored approximately 14,000 years ago by semi nomadic Native American tribes which subsisted as hunters and foragers (Rafferty 1980, Jacobson and Primm 1994). Approximately 1000 B.C., tribes on the fringes of the Ozarks became less nomadic, existing in more permanent villages and incorporating agricultural practices as a means of subsistence. Tribes in the Ozarks interior did not begin adopting these practices until 900 A.D. By 1500 A.D. this culture had disappeared as large agricultural based villages began to grow along the eastern fringe of the Ozarks and along the Mississippi River. During this period the interior of the Ozarks was used primarily as a seasonal hunting ground as well as a source for flint and chalcedony (a type of quartz) for making tools. It is believed that a climatic shift to cooler, drier summers and the resulting failure of maize crops, on which early agriculture was based, may have caused an abrupt abandonment of the larger villages. Remnants of these villages and tribes reassembled to form the Osage Tribe which existed throughout much of the Ozarks and was present as European settlement of the area began to occur in the late 1700s and early 1800s (Jacobson and Primm 1994). Native American use of fire, as well as naturally occurring incidences of fire (i.e. lightening strikes), are believed to have been a large factor in determining the types of vegetation found by Schoolcraft and others as exploration of the Ozarks interior began to occur after the Louisiana Purchase of 1803. Native Americans are believed to have set fires for many reasons including harassment of enemies as well as an aid in hunting. These fires stimulated warm-season grasses such as bluestem and eliminated woody undergrowth thus creating open woodlands or savannas.

European settlement of the Ozark fringe began in the early 1700,s under French and, later, Spanish political control. After the Louisiana Purchase of 1803, American settlers began settling the same areas earlier occupied by the Spanish and French. The Osage, in treaty with the federal government, relinquished claims to much of the Ozarks interior in 1808 although they refused to relinquish their hunting rights in this area (Rafferty 1980). Settlement of the Ozarks Interior increased after the war of 1812 (Jacobson and Primm 1994). Many of the early settlers came from states such as Indiana, Illinois, Kentucky, Virginia, and Tennessee (Rafferty 1983). Most of these states were previously considered the frontier prior to the Louisiana Purchase, thus many of these settlers brought along skills they had learned for survival in frontier territory. Early settlers subsisted by hunting and fishing as well as maintaining gardens in the small bottomland areas which they cleared. In addition early settlers raised livestock which grazed on the open range of the slopes and uplands in the summer. In the winter, livestock were fed from forage crops cultivated and harvested from the bottom lands (Jacobson and Primm 1994). The annual practice of burning was continued by early settlers in order to enhance the livestock forage of the uplands. In addition to the influx of settlers of European origin which occurred after the war of 1812,

Native American tribes such as the Cherokee, Shawnee, and Delaware which had been displaced from the East began moving through the region (Jacobson and Primm 1994). As the population of the area increased, more settlers were forced to settle the uplands (Ryan and Smith 1991). Fenced pasture began to replace the practice of open range. These two factors reduced the use of fire on the uplands thus decreasing the grassland and savanna type land cover (Ryan and Smith 1991; Jacobson and Primm 1994). The population of the area remained sparse until the large-scale exploitation of the vast timber resources of the region began in the late 1800's.

The virgin forests of the Ozarks remained relatively undisturbed by logging until the late 1800s (Cunningham and Hauser 1989). Part of the reason for this was due to the rugged nature of the topography which made railroad construction (one of the main means of lumber transport) a less feasible proposition than in other less rugged areas of the country. However, as the forest resources of the Eastern United States were depleted and more settlers began moving onto the sparsely forested western plains, the demand for lumber in the Ozarks increased. Undoubtedly, the cheap price of land having uncut timber was also very attractive to eastern speculators. In some instances uncut timber land often sold for $1.00 an acre (Cunningham and Hauser 1989). This led to the construction of railroads in the region in the 1800s. Initially, the distribution of the first extensive commercial timber cutting in the Ozarks was limited by the distribution of shortleaf pine and transportation routes provided by rivers and railroads (Jacobson and Primm 1994). Shortly thereafter; however, the exploitation of hardwood species began. Larger shortleaf pine trees were harvested for lumber, while a variety of sizes of hardwood trees were harvested for products such as railroad ties, charcoal, barrel staves, and flooring (Rafferty 1983, Cunningham and Hauser 1989). The many different products produced from the timber of the Ozarks resulted in a wide range of species and sizes harvested. The population of the area sprang up as did several lumber towns including some within or bordering the Jacks Fork Watershed such as West Eminence, Birch Tree, and Winona.

Along with the eastern-backed lumber companies came the logging practices that had decimated much of the forests of the Eastern United States. These "cut and get out"operations, as they have been referred to in Cunningham and Hauser (1989), paid little or no attention to forest regeneration; focusing only on feeding the gigantic lumber mills located in the area. Williams (1904) states that the mill of the Ozark Land and Lumber Company at Winona, whose lumber stock covered 30 acres, had a production capacity of 140,000 board feet per day. With little or no attempt to reforest cut-over areas, land which had previously been dominated by pine and mixed pine oak forest began to regenerate to thick oak sprouts (Nigh 1988).

As the logging industry began to decline in the area, residents turned increasingly toward farming the rugged cut-over land in an attempt to carve out a means of survival. This is exemplified by a peak occurring between 1899 and 1920 in the acres cultivated for corn as shown in Figure Lu01. In addition, lumber companies as well as land speculators, eager to dispose of taxable cut-over land, began to offer the land for sale through nationwide advertizing (Rafferty 1983; Cunningham and Hauser 1989). In many instances the land was advertised as being more productive than what it actually was (Cunningham and Hauser 1989). In 1904, the counties of Howell and Texas had approximately 154,000 acres (26%) and 185,681 acres (25%) respectively under cultivation (Williams 1904). Williams (1904) states that Shannon County had 50,665 acres of "improved farmlands" in 1904. Estimates of 1899 cropland within Howell, Shannon, and Texas Counties indicate combined harvested acres of wheat and corn were 73,021; 25,790 and 77,045 respectively (Table Lu01) (MASS 1999). This type of land use would have undoubtedly contributed significantly to erosion and thus sedimentation and an increased gravel load in

the streams of the regions watersheds such as the Jacks Fork.

As the century progressed, much of the area was found to be unsuitable for large scale row-cropping. This is illustrated in the relatively rapid decline during the first half of the Twentieth Century of the acres of corn harvested in Howell, Shannon and Texas Counties (Figure Lu01). As row crop farming began to decline, livestock farming became more prevalent (Figure Lu02). The 1930s saw an increase in livestock numbers of all three counties. Livestock numbers in Shannon County peaked in 1940 at approximately 40,400 head; while livestock numbers in Howell and Texas County continued to increase peaking at 130,200 (1980) and 107,000 (1994) respectively. The state and federal government began purchasing land in the area in the 1930s (Nigh 1988). Initial natural resource development was accomplished by the Civilian Conservation Corps (CCC); a work program of the Great Depression. Thus began the era of natural resource management in the area.

In an effort to determine the effects of land use changes on stream disturbance in the Ozark Region, Jacobson and Primm (1994) evaluated present (1993) conditions of Ozark streams, pre-settlement period historical descriptions, stratigraphic observations, and accounts of oral-history responses on river changes during the last 90 years for the Jacks Fork River and Little Piney Creek Watersheds. This led Jacobson and Primm (1994) to the conclusion that Ozark streams are disturbed from their natural conditions. Jacobson and Primm (1994) state that this "disturbance has been characterized by accelerated aggradation of gravel, especially in formerly deep pools, accelerated channel migration and avulsion, and growth of gravel point bars". Jacobson and Primm (1994) also suggest that "land use changes have disturbed parts of the hydrologic or sediment budgets or both".

As part of the effort to determine the effects Jacobson and Primm (1994) summarized the land use changes from pre-settlement conditions to the 1970's in the Jacks Fork Watershed (Table Lu02).

" Different types of land use have taken place on different parts of the landscape, and at different times, resulting in a complex series of potential disturbances. Uplands have been subjected to suppression of a natural regime of wildfire, followed by logging, annual burning to support open range, patchy and transient attempts at cropping, a second wave of timber cutting, and most recently, increased grazing intensity. Valley side slopes have been subjected to logging, annual burning, and a second wave of logging. Valley bottoms were the first areas to be settled, cleared, and farmed; removal of riparian vegetation decreased the erosional resistance of the bottom lands. More recently, some areas of bottomland have been allowed to grow back into forest. The net effects of this complex series of land-use changes are difficult to determine and separate from natural variability."

Jacobson and Primm (1994) offer the following observations which summarize the probable, qualitative changes to runoff, soil erosion, and riparian erosional resistance on parts of the Ozarks landscape relative to man’s impact (Table Lu03):

1. Initial settlement of the Ozarks may have initiated moderate channel disturbance because of decreased erosional resistance of cleared bottom lands. This trend would have been countered by decreased annual runoff and storm runoff that accompanied fire suppression in the uplands.

2. Because of low-impact skidding methods and selective cutting during initial logging for pine during the Timber-boom period, logging would have had minimal effects on runoff and soil erosion. Low-impact methods and selective cutting continued to be the norm in timber harvesting of hardwoods until the late 1940's, when mechanization and diversified markets for wood products promoted more

intensive cutting. Locally, log and tie jams, tie slides, and logging debris may have added to channel instability by diverting flow, but because aggradation and instability also occurred on streams not used for floating timber, these factors were not necessary to create channel disturbance.

3. Significant channel disturbance probably began in the Timber-boom period because of continued clearing of bottom land forests and road building in the riparian zone. This hypothesis is supported by evidence that significant stream disturbance began before the peak of upland destabilization in the post-timber-boom period. Extreme floods during 1895 to 1915 may have combined with lowered erosional thresholds on bottom lands to produce the initial channel disturbance.

4. The regional practice of annual burning to maintain open range had the most potential to increase annual and storm runoff and soil erosion because of its considerable areal extent and repeated occurrence. Burning would have been most effective in increasing runoff and erosion on the steep slopes that had been recently cut over during the timber boom. Generally, accelerated soil erosion was not observed after burning, and relict gullies presently (1993) are not apparent on valley-side slopes and uplands. These observations support the hypothesis that burning did not produce substantial quantities of sediment.

5. The greatest potential for soil erosion on valley slopes and upland areas occurred during the post-timber-boom period when marginal upland areas were cultivated for crops. Accelerated erosion of plowed fields was observed and noted by oral-history respondents and by soil scientists working in the Ozarks during the post-timber-boom period.

6. Valley bottoms have the longest history of disturbance from their natural condition because they were the first to be settled, cleared, and farmed. The lowered resistance to stream erosion that results from removing or thinning riparian woodland would have been a significant factor, especially on small to medium sized streams for which bank stability and roughness provided by trees are not overwhelmed by discharge. Disturbance of bottom land riparian forest increased as free-range grazing, crop production, and use of valley bottoms for transportation expanded and reached a peak in the post-timber-boom period. Headward extension of the channel network because of loss of riparian vegetation may have increased conveyance of the channel network (and hence flood peaks downstream) and removed gravel from storage in first and second order valleys at accelerated rates. This hypothesis is supported by a lack of other source areas for gravel and by observations that gravel came from small stream valleys, not off the slopes.

7. During present (1993) conditions, channel instability seems somewhat decreased in areas where the riparian woodland has recovered, but stability is hampered by high sedimentation rates because of large quantities of gravel already in transport and effects of instability in upstream reaches that lack a riparian corridor.

8. Land use statistics indicate that the present trend in the rural Ozarks is toward increased populations of cattle and increased grazing density. This trend has the potential to continue the historical stream-channel disturbance by increasing storm runoff and sediment supply and thus remobilization of sediment already in transit."

Human populations in Howell and Texas Counties have experienced relatively similar trends since the turn of the century with both experiencing an increase since 1970 (Figure Lu03)(OSEDA 1998). However, the population of Howell County experienced an overall increase in population between 1900

and 1990, while the population of Texas County was slightly less in 1990 than 1900 . The population of Shannon County experienced a sharp decrease after 1940 from which it has never recovered.

The 1990 human population within the Jacks Fork Watershed was estimated to be 6,621 (Blodgett J. and CIESIN 1996). Population density in 1990 was approximately 15 persons per square mile as compared to the overall population density for Missouri which was approximately 73 persons per square mile (Figure Lu04). Of course, one must take into account the effect of the states urban centers on this estimate.

Projections of human population increase of Missouri counties have been calculated by the Missouri Office of Administration (MOA), Division of Budget and Planning for three different projection scenarios in a report entitled "Projections of the Population of Missouri Counties By Age, Gender, and Race: 1990 to 2020" (http://www.oa.state.mo.us/bp/popproj/index.htm)(MOA 1994). Combined population estimates for Howell, Shannon, and Texas Counties from 1990-2020 have been used to calculate percent increase in population for all three scenarios. The scenarios project a combined population increase of 9% to 26% by the year 2020.

Ecological Classification

The Ecological Classification System (ECS) is a management tool which provides a means of "describing distribution of current and potential natural resources in a manner that considers land capability upfront" using a knowledge of landform, geology, soils, and vegetation patterns (MDC 1997a). There are several levels of classification within the ECS. For purposes of this document the three lowest levels are dealt with. These levels are, in descending order, section, subsection, and land type association (LTA). The Jacks Fork Watershed lies within the Ozarks Highlands Section and intersects two subsections and 9 LTAs. The Ozark Highlands Section consists of very old and highly weathered plateaus which, coupled with its physigraphic diversity and central geographic location relative to the continent, has created a region of unique ecosystems harboring many endemic species.

The subsections intersected by Jacks Fork Watershed include the Current River Hills, and the Central Plateau. The Current River Hills Subsection;

"encompasses the hilly to rugged lands associated with the Current, Jacks Fork, and Eleven Point River Valleys. These valleys have primarily cut through Roubidoux sandstone/dolomite, and Gasconade or Eminence dolomites. Soils are mainly deep and very cherty, but vary in depth, amount of chert and depth to clays. Original vegetation consisted largely of oak and oak-pine woodland and forest with scattered glades and savannas. Streams are both losing and gaining. Gaining reaches are often spring-fed and moderate to relatively high gradient" (MDC 1997a).

The Central Plateau Subsection;

"represents the high, flat to gently rolling plains that are the least eroded remnant of the Salem Plateau. Underlain primarily by Jefferson City-Cotter dolomites or Roubidoux sandstone/dolomite, the plains are often mantled in a thin layer of loess and have droughty soils. Streams are mainly intermittent, low gradient headwater streams that are often losing. Savannas and woodlands were originally the dominant vegetation types" (MDC 1997a).

Land Type Associations (LTAs) represent the smallest level of the three levels previously mentioned. LTAs intersecting the Jacks Fork Watershed include the following:

Upper Gasconade Oak Woodland Dissected Plain

Mtn. View Oak Savanna/Woodland Plain

Summersville Oak Savanna/Woodland Plain

Current River Oak-Pine Woodland Forest Hills

Current-Eleven Point Pine-Oak Woodland Dissected Plain

North Fork Pine-Oak Woodland Dissected Plain

Current River Oak Forest Breaks

Jacks Fork River Oak-Pine Forest Breaks

Eminence Igneous Glade/Oak Forest Knobs

Table Lu04 gives descriptions of LTAs within the watershed.

The Ecological Classification System (Figure Lu05)could prove to be a useful tool for planning and implementing management activities by providing an indication of what natural resource management options will be more adapted to specific areas thus increasing the success of management decisions as well as helping to ensure that management decisions are ecologically enhancing.

Current Land Use

The Missouri Resource Assessment Partnership (MoRAP) Phase 1 Land Cover Classification (1997) (morapmd.wpd) data indicates estimated combined forest/woodland cover within the Jacks Fork Watershed at 76.1% while grassland/cropland comprises 22.7% of the total land cover (Table Lu05, Figures Lu06 and Lu07). Combined forest/woodland cover is the most dominant land cover type in all but one of the drainage units. The Jam Up Creek Unit contains the highest percentage of combined grassland/cropland within the watershed at 52.0%. This unit also has the highest percentage of urban area at 13.7% due to the presence of the City of

Mountain View. The Jacks Fork-Alley Unit has the highest percentage of combined forest/woodland cover at 91.5%

Soil Conservation Projects

There currently are no SALT, SALT AgNPS, EARTH, PL566, or 319 projects within the Jacks Fork Watershed.

Public Land

A knowledge of land ownership within a watershed is an important key to understanding various characteristics of a watershed as well as addressing related issues and concerns. Within the Jacks Fork Watershed, approximately 19% (55,330 acres) of land is under public ownership. (Tables Lu06 and Lu07; Figures Lu08 and Lu09). Approximately 73% (40,490 acres) of public land within the watershed is owned by the Missouri Department of Conservation. The majority of this land is included in three areas. These areas include Angeline Conservation Area (CA), Gist Ranch CA, and Rocky Creek CA which are 16,960 acres; 7,400 acres; and 15,753 acres respectively (within the watershed). The National

Park Service owns approximately 9,860 acres within the watershed. In addition, the United States Forest Service and the State of Missouri own approximately 4,162 and 790 acres respectively. The public land within the watershed includes approximately 36.2 miles of permanent public stream frontage and 10 stream accesses.

Public land ownership within the Jacks Fork Watershed is not evenly distributed. Instead, most of the public land is concentrated in the lower, or more eastern half, of the watershed (Table Lu07 and Figure Lu09). Analysis of land ownership percentages within drainage units shows that three units contain no public land. These units are Pine Creek, Leatherwood, and Lower South Prong. The Jacks Fork-Alley Unit contains the largest percentage of public land ownership at 57.8%; most of which is managed by the Missouri Department of Conservation.

Figure Lu01. Historical acreage estimates of corn harvested in Shannon, Howell, and Texas Counties (MASS 1999).

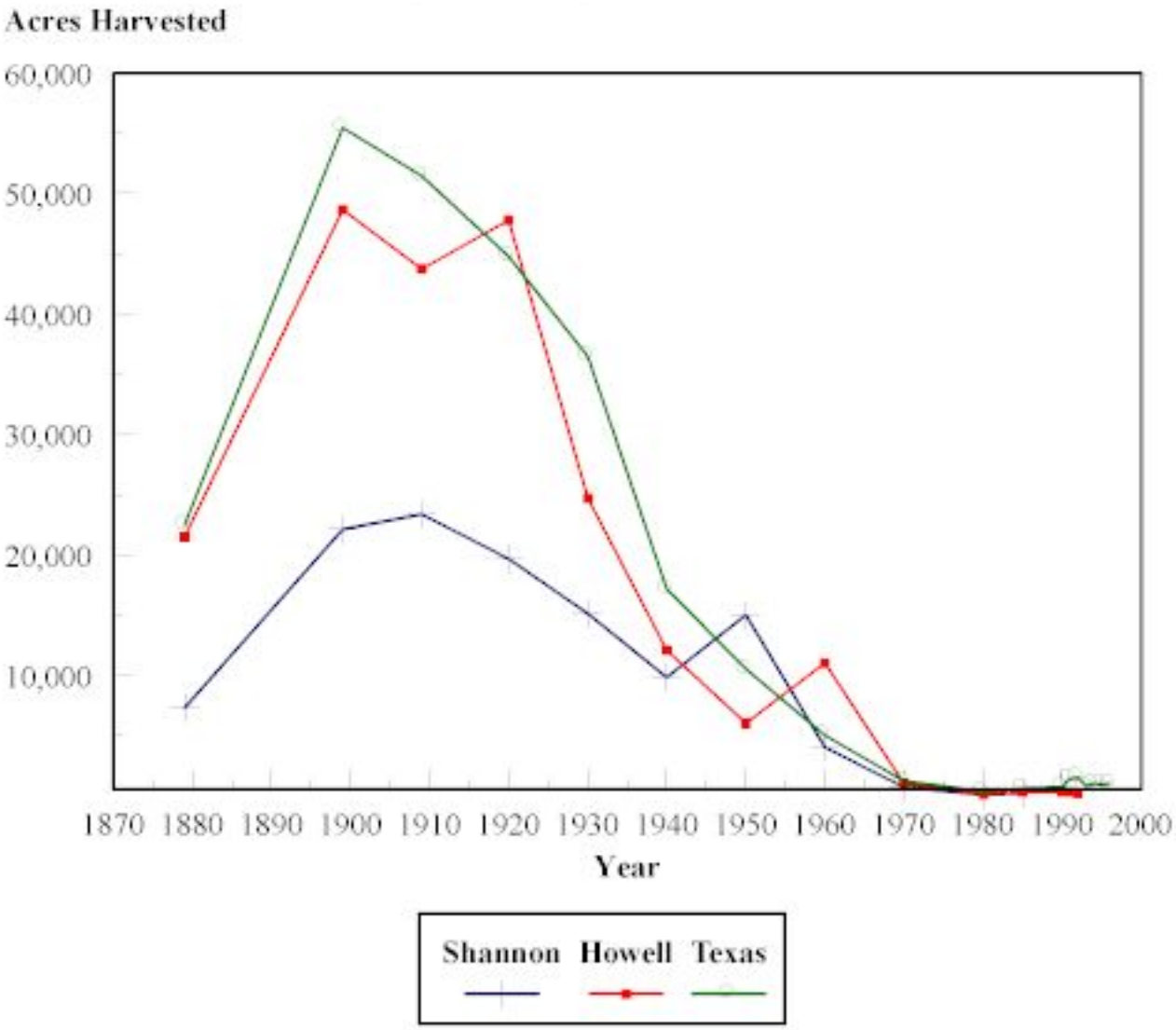
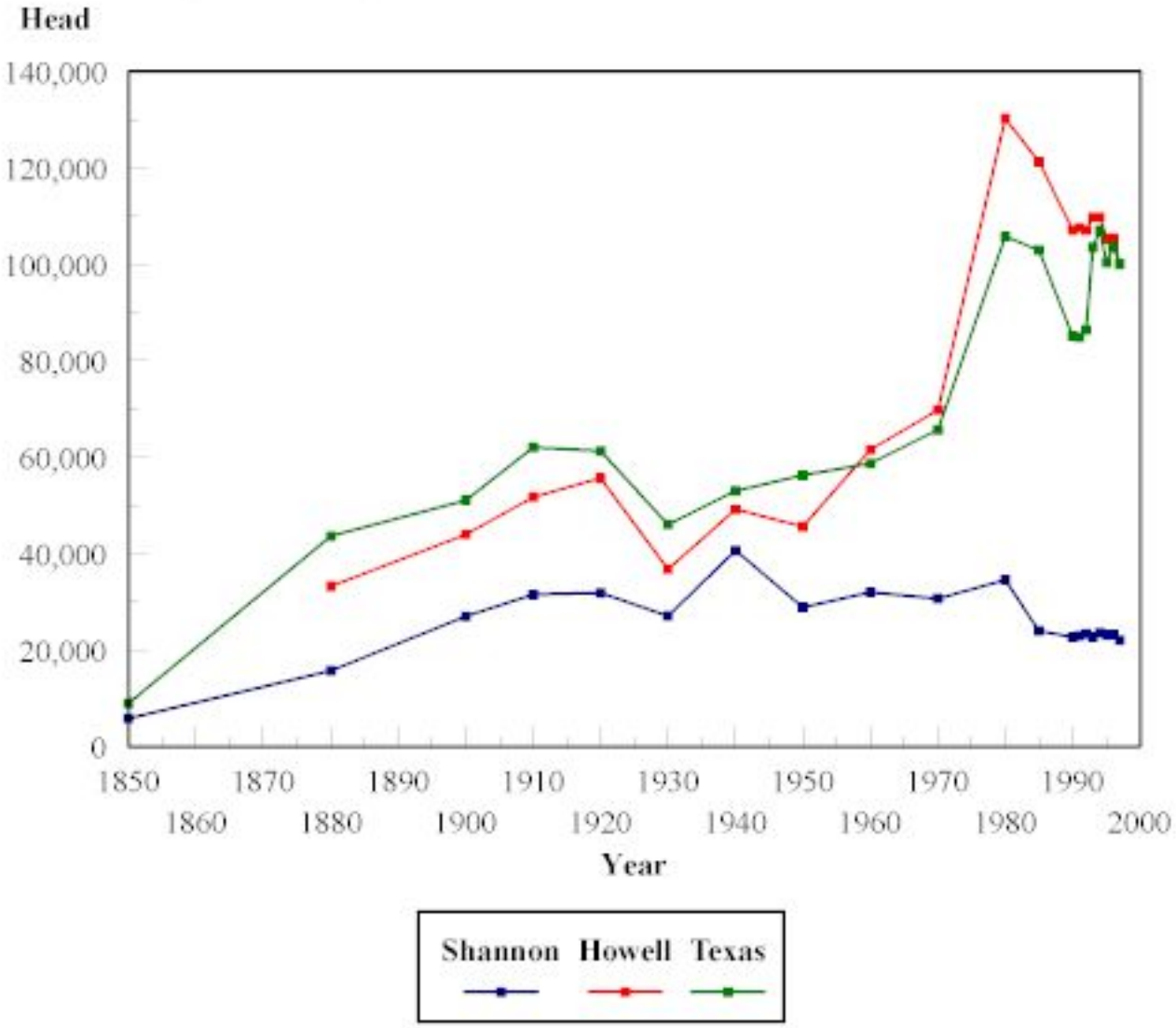


Figure Lu02. Cattle and hog population trends for Shannon, Howell, and Texas Counties (MASS 1999).



FigureLu03. Human population trends for Shannon, Howell, and Texas Counties (OSEDA 1998).

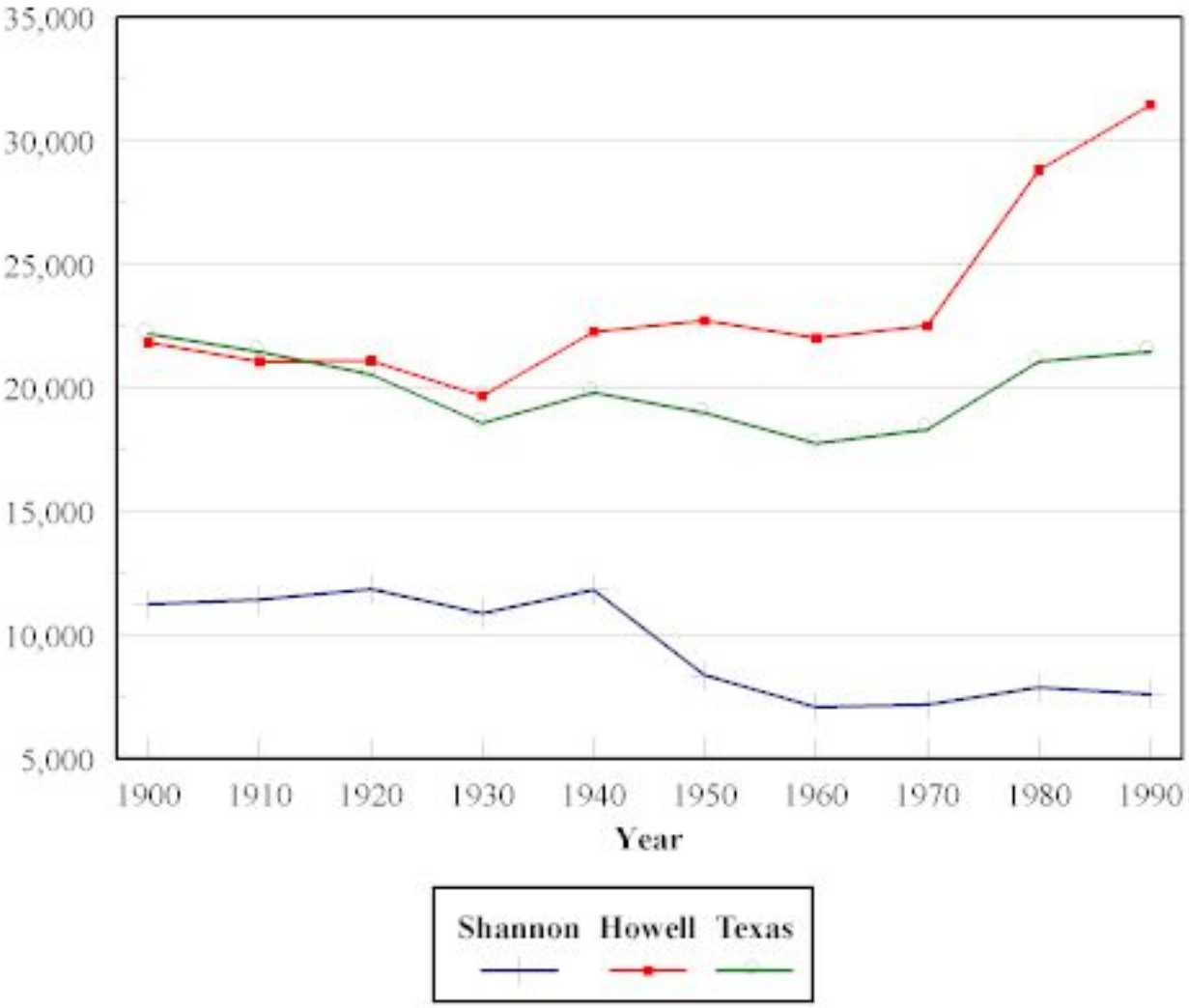
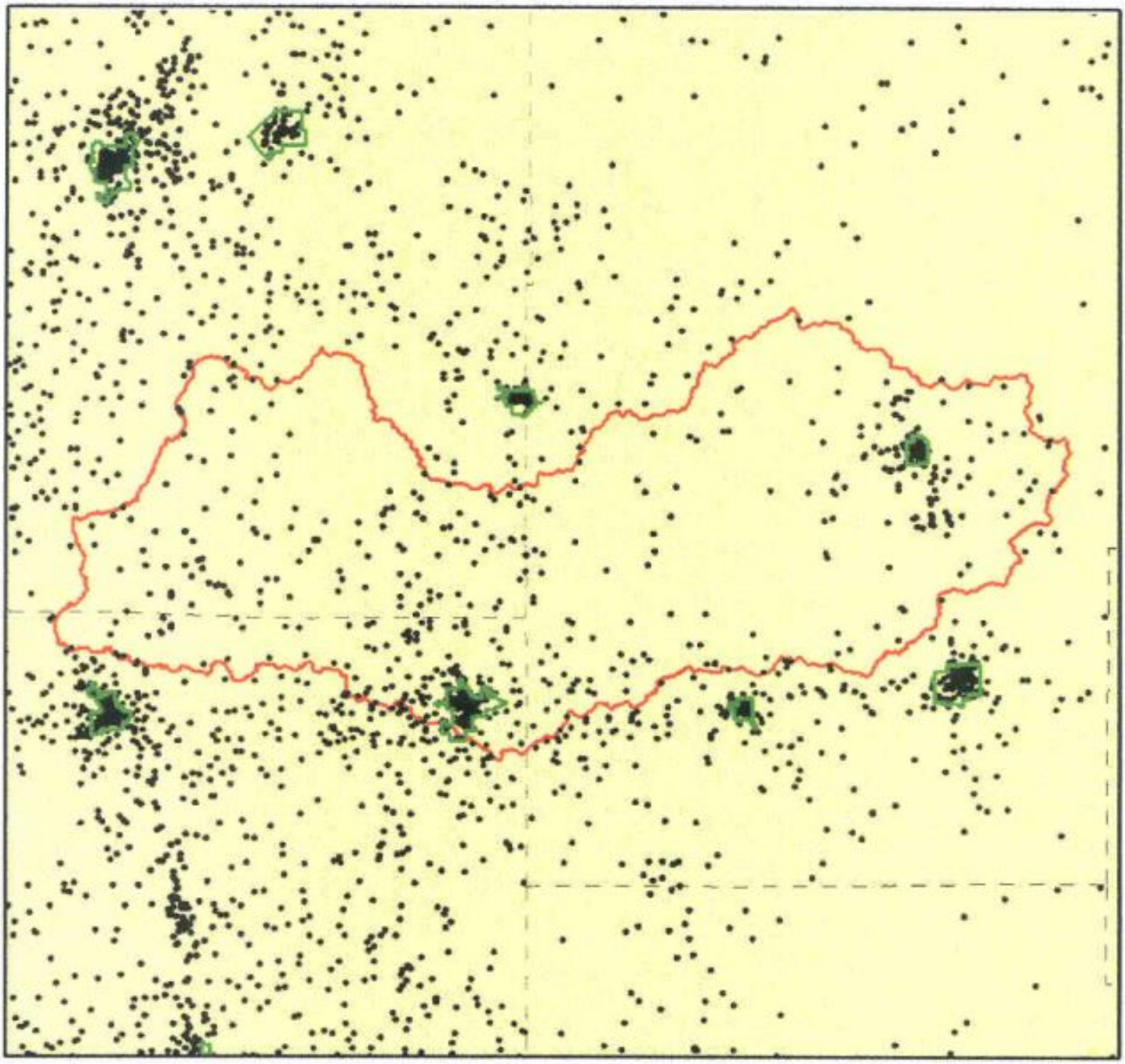


Figure Lu04.

Jacks Fork Watershed
Human Population



1 0 4 8 Miles

Legend

Watershed Boundary

County Boundary

N

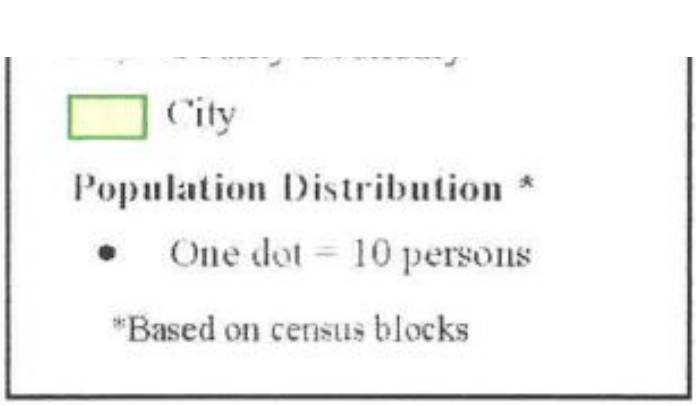
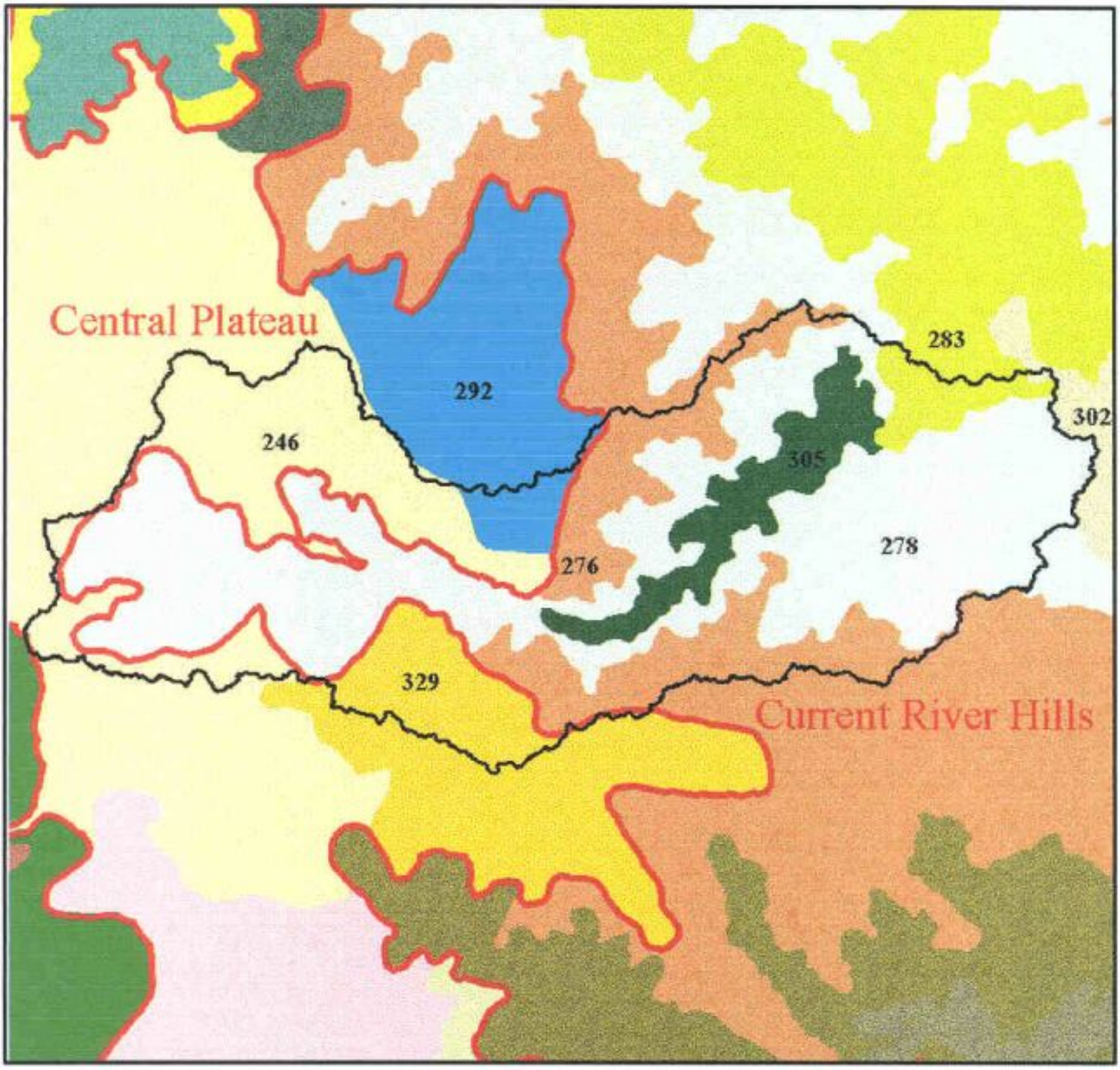

City
Population Distribution *
One dot = 10 persons
*Based on census blocks

Figure Lu05.

Jacks Fork Watershed
Ecological Classification



Legend

Watershed Boundary

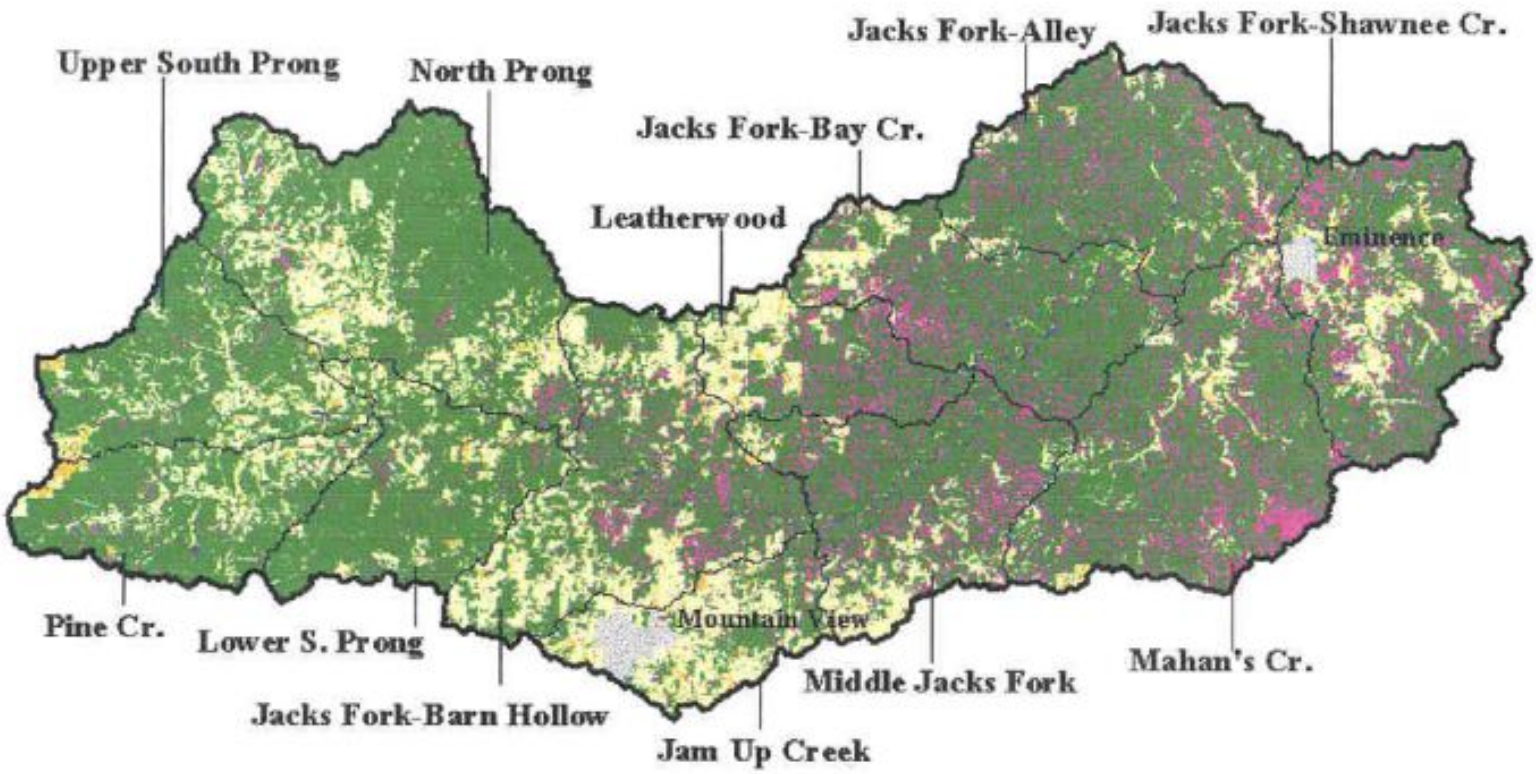
Ecological Subsection Boundary

Land Type Association


Current River Oak Forest Breaks (283)
Current River Oak-Pine Woodland/Forest Hills (278)
Current-Eleven Point Pine-Oak Woodland Dissected Plain (276)
Eminence Igneous Glade/Oak Forest Knobs (302)
Jacks Fork River Oak-Pine Forest Breaks (305)
Mt. View Oak Savanna/Woodland Plain (329)
Summersville Oak Savanna/Woodland Plain (292)
Upper Gasconade Oak Woodland Dissected Plain (246)
Based MoRAP (1997a)

Figure Lu06.

Jacks Fork Watershed
Land Cover/Land Use



4 0 4 8 Miles

Legend

Drainage Unit Boundary

Land Cover/Land Use*

Deciduous Forest and Woodland

N

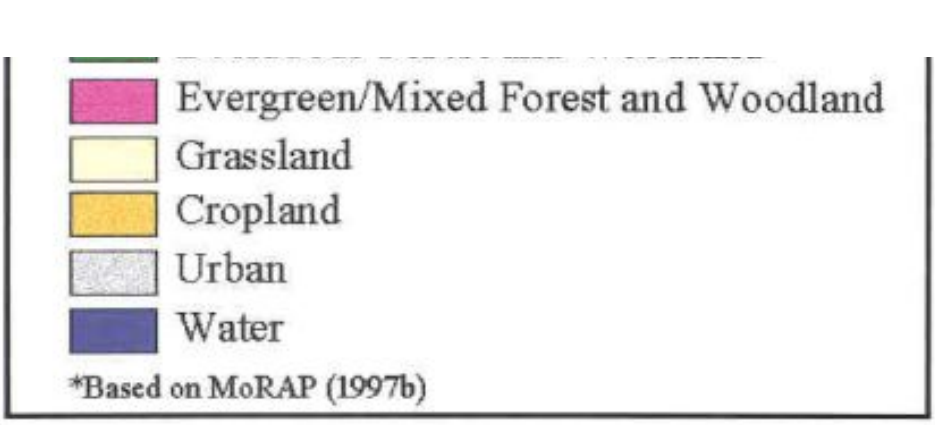
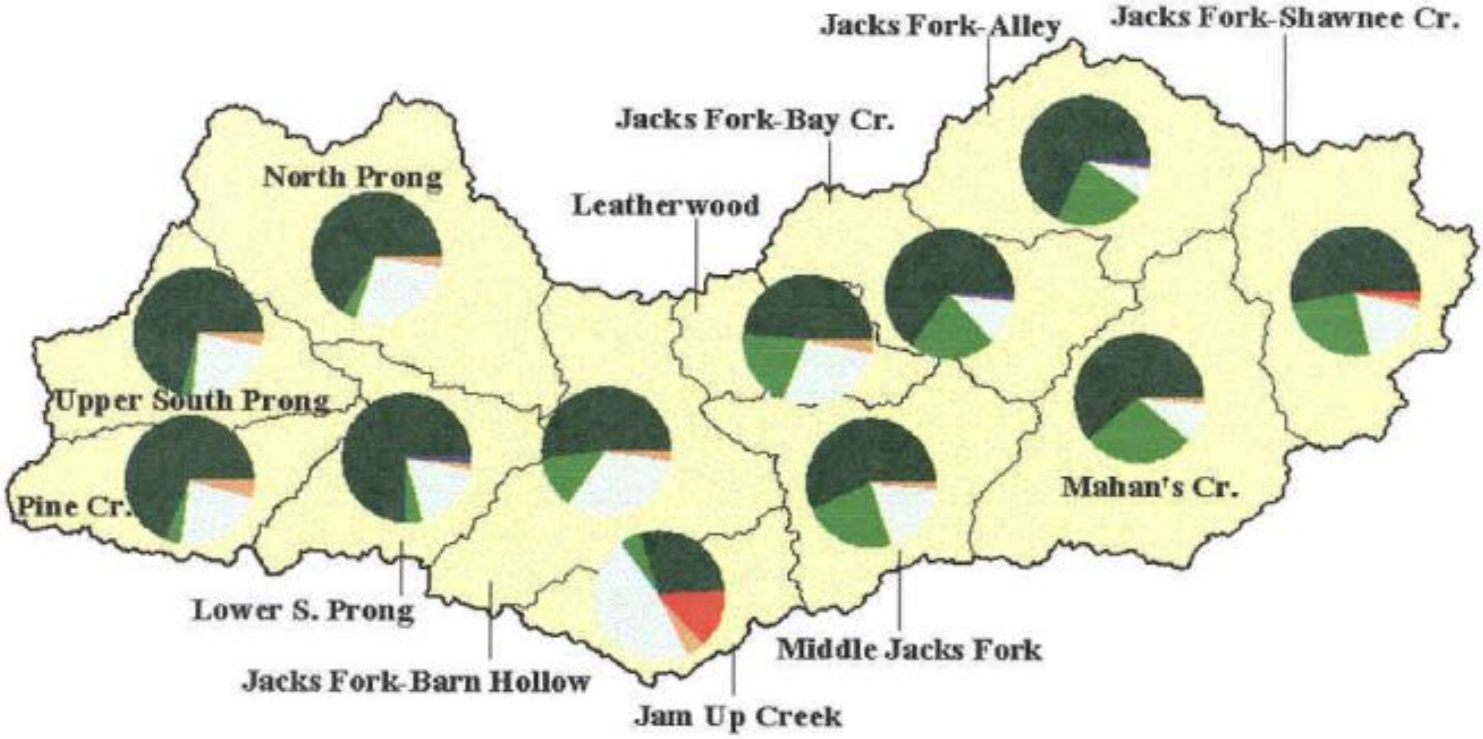

Evergreen/Mixed Forest and Woodland
Grassland
Cropland
Urban
Water
*Based on MoRAP (1997b)

Figure Lu07.

Jacks Fork Watershed
Drainage Unit Land Cover



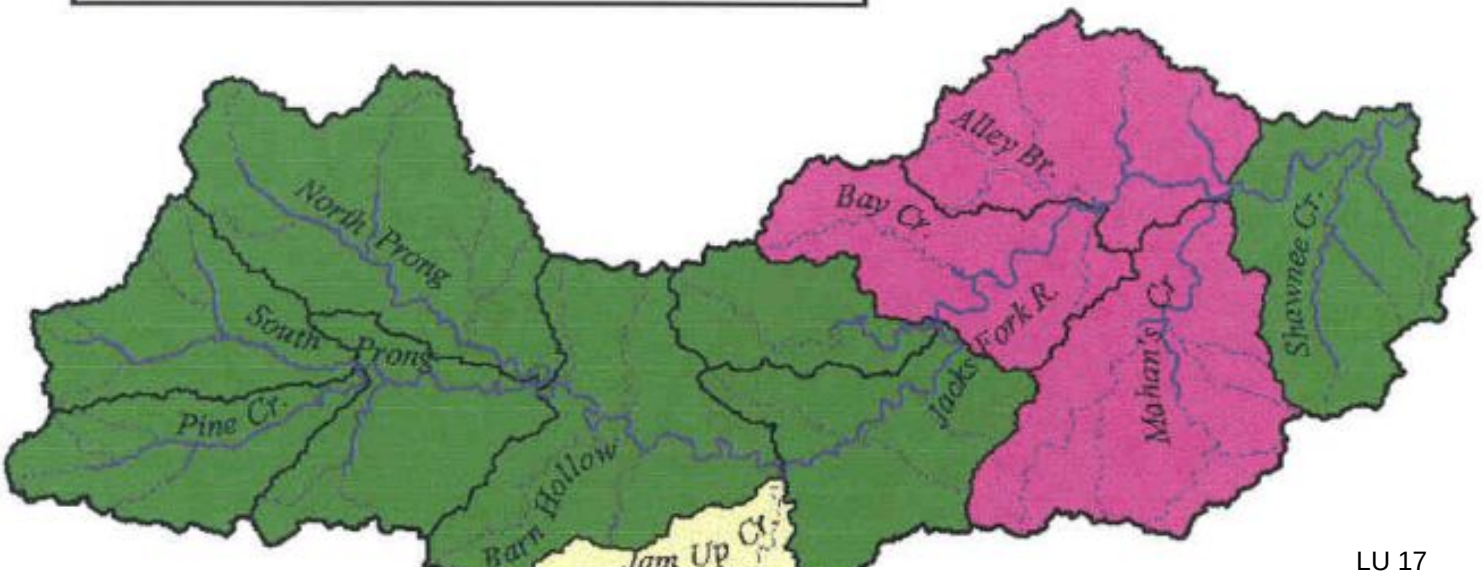
Land Cover

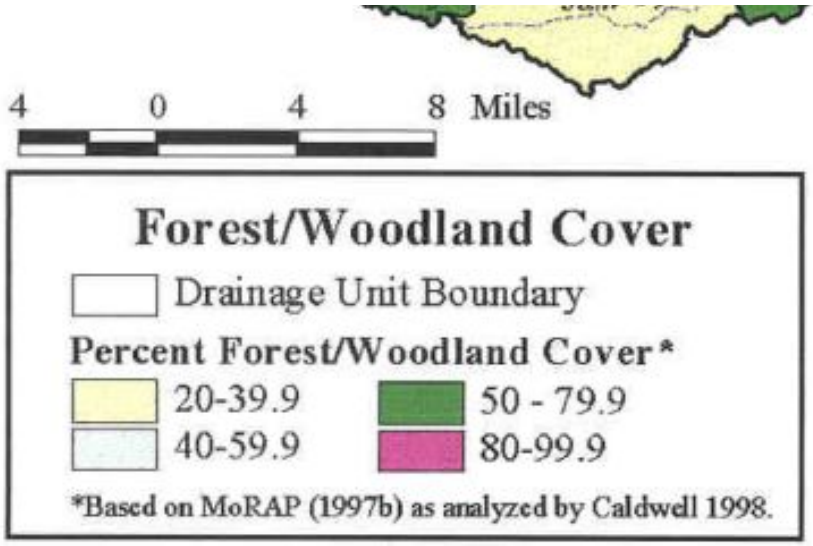
- Drainage Unit Boundary

Percent Land Cover*

Forest	Cropland
Woodland	Urban
Grassland	Water

*Based on MoRAP (1997b) as analyzed by Caldwell 1998.

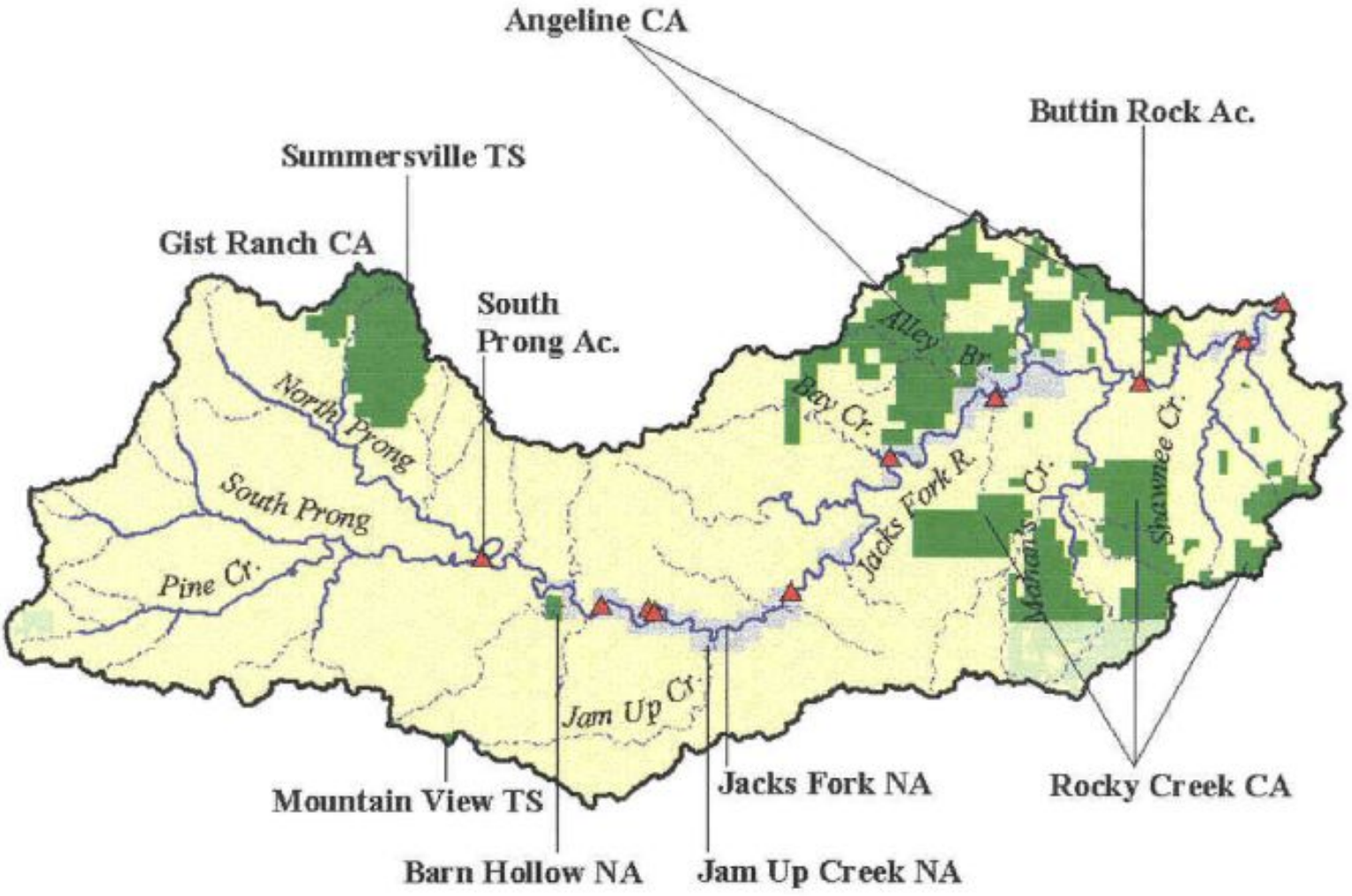



4 0 4 8 Miles
Forest/Woodland Cover
Drainage Unit Boundary
Percent Forest/Woodland Cover*
20-39.9
40-59.9
50 - 79.9
80-99.9
*Based on MoRAP (1997b) as analyzed by Caldwell 1998.


N

Figure Lu08.

Jacks Fork Watershed
Public Land



4 0 4 8 Miles

Legend

- Watershed Boundary
- National Park Service
- Missouri Department of Conservation
- United States Forest Service
- Access

N

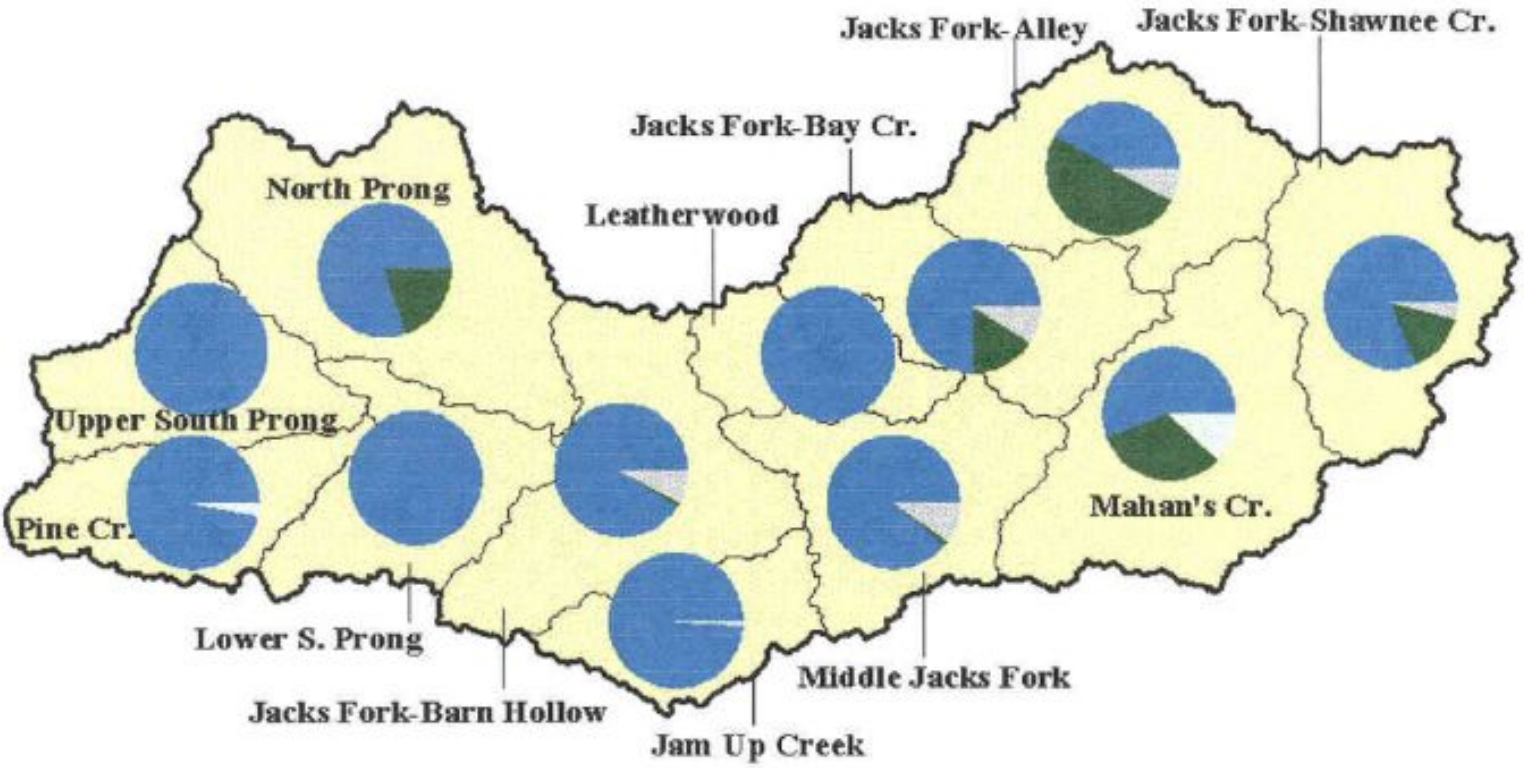
(Only accesses which are not part of a larger area are labeled.)

Ac.-Access
CA-Conservation Area
NA-Natural Area
TS-Tower Site

Map is not a final Authority. Data Subject to Change

Figure Lu09.

Jacks Fork Watershed
Land Ownership



4 0 4 8 Miles

Legend

Drainage Unit Boundary

Land Ownership Percentage

Private

Missouri Department of Conservation

National Park Service

N

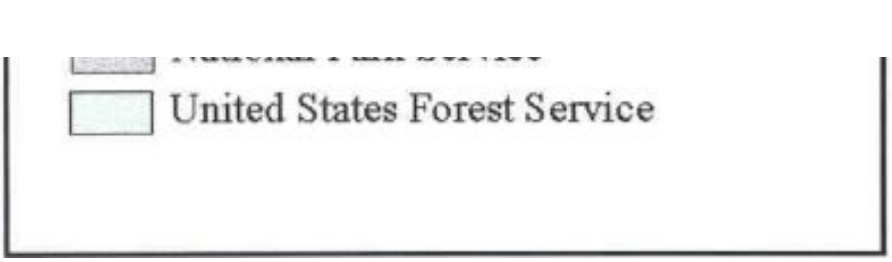

United States Forest Service

Table Lu01. Estimated acres of selected crops harvested in Howell, Shannon, and Texas Counties in 1899 and 1997 (MASS 1999).

Crop	Howell		Shannon		Texas	
	1899 Acres	1996 Acres	1899 Acres	1996 Acres	1899 Acres	1996 Acres
Corn	43,737	<500	22,122	<500	55,471	1,000
Hay	12,857	47,800	5,209	16,500	24,522	6,700
Wheat	29,284	<500	3,668	<500	21,574	<500

Table Lu02. Land cover/ land use change from pre-settlement period conditions (1820's) to the 1970's in the Jacks Fork Watershed, Missouri (Jacobson and Primm 1994).

1820's		1970's		%
Category	**Area sq. miles**	**Category**	**Area sq. miles**	
Shrub and brush rangeland	55.4	Urban/developed	1.6	3
		Pasture/cropland	26.5	48
		Deciduous forest	27.3	49
Deciduous forest	242.0	Pasture/cropland	59.9	25
		Deciduous forest	178.6	75
Evergreen forest	3.5	Deciduous forest	3.5	100
Mixed forest	323.1	Pasture/cropland	34.5	11
		Deciduous forest	281.6	87
		Mixed forest	7.0	2
Barrens	29.2	Pasture/cropland	15.5	53
		Deciduous forest	13.7	47

Table Lu03. Summary of probable qualitative changes to runoff, soil erosion, and riparian erosional resistance on parts of the Ozarks landscape relative to pre-settlement period conditions. Reproduced in whole from Jacobson and Primm (1994).

Period	Uplands	Valley Slopes	Valley Bottoms
Pre-settlement	Baseline	Baseline	Baseline
Early Settlement			
Annual Runoff	Decrease	Slight Increase	N/A
Storm Runoff	Decrease	Slight Increase	N/A
Upland Sediment Yield	Decrease	Slight Increase	N/A
Riparian Erosional Resistance	N/A	N/A	Moderate Decrease
Timber-Boom			
Annual Runoff	Slight Increase	Slight Increase	N/A
Storm Runoff	Slight Increase	Moderate Increase	N/A
Upland Sediment Yield	Slight Increase	Moderate Increase	N/A
Riparian Erosional Resistance	N/A	N/A	Decrease
Post-Timber-Boom			
Annual Runoff	Moderate Increase	Increase	N/A

Storm Runoff	Moderate Increase	Increase	N/A
Upland Sediment Yield	Moderate Increase	Increase	N/A
Riparian Erosional Resistance	N/A	N/A	Substantial Decrease
Recent			
Annual Runoff	Slight Increase	Slight Increase	N/A
Storm Runoff	Slight Increase	Moderate Increase	N/A
Upland Sediment Yield	Slight Increase	Slight Increase	N/A
Riparian Erosional Resistance	N/A	N/A	Decrease

Table Lu04. Descriptions of land type association (LTAs) groups as well as a condensed description of LTAs within the Jacks Fork Watershed. Descriptions are quoted in part or whole from MDC (1997).

Oak Woodland Dissected Plains and Hills Group
Landform: Distinguished by rolling to moderately dissected topography. Local relief is 75-150 feet. Very broad, flat ridges give way to gentle side slopes and broad stream valleys. Karst plains with frequent shallow sinkhole depressions are common. Broad stream valleys most often occupied by losing streams, however occasional seeps do occur and can spread across substantial portions of a valley.
Geology: Commonly underlain by Jefferson City-Cotter dolomites with a common loess cap. Some minor areas underlain by Roubidoux sandstones.
Soils: Soils are variable, ranging from shallow to bedrock and fragipan soils, to deep, cherty and well-drained loams. Tree root growth is often restricted by bedrock, pans or clay mineralogy, especially high in the landscape.
HistoricVegetation: Open woodlands with occasional prairie and savanna openings was the principal vegetation type. Post oak and black oak were the principal woodland tree species. Historic fire likely played an important role in maintaining an open canopy, sparse understory and a dense herbaceous ground flora. More dissected lands likely contained mixed oak woodland and forest. Unique sinkhole ponds, wet prairies and seeps were scattered in the broad valleys and depressions.
Current Conditions: Currently a mosaic of fescue pasture (35-65% cover) and dense, often grazed oak forest. The transition from open grassland to closed forest is abrupt and the patch work blocky. Very few native grasslands or savannas are known, and the dense second growth woodlands have very little ground flora. Most sinkholes, wet prairies and seeps have been drained and heavily grazed. Many roads, towns, cities and businesses are located in these LTAs.
Upper Gasconade Oak Woodland Dissected Plain: Broad divide encompassing the headwaters of the Big Piney and Gasconade River Watersheds.

Table Lu04. Descriptions of land type association (LTAs) groups as well as a condensed description of LTAs within the Jacks Fork Watershed. Descriptions are quoted in part or whole from MDC (1997).

Oak Savanna/Woodland Plains Group
Landform: Very broad flat uplands slope gently to very broad flat drains or solution (karst) depressions. Local relief is less than 75 feet.

Geology: Underlain mainly by Jefferson City-Cotter dolomites with a common loess cap. Minor areas of the Roubidoux formation occur. Headwater streams are nearly all losing.
Soils: Fragipan soils or soils with shallow restrictive clays or bedrock are common, inhibiting tree root growth.
HistoricVegetation: Oak savannas and woodlands with common prairie openings were the predominant historic vegetation. While few prairies were named by original land surveyors, early descriptions portray an open, "oak prairie" landscape. Fire likely played a principal role in maintaining a grassland-open woodland structure. Some sinkhole depressions would have had unique ponds and seeps.
Current Conditions: The largest blocks and greatest acres of grassland (45-65% cover) are currently associated with these LTAs; grasslands are mainly fescue pasture. Less than 40% of these LTAs are timbered, mainly in dense, second growth oak forest (post and black oaks) with common grazing pressure. Very few quality native prairies, savannas, woodlands, sinkhole ponds or seeps are known. Many of the regions roads, towns, and businesses are associated with these LTAs.
Mtn. View Oak Savanna/Woodland Plain: Broad, flat divide between upper Jack's Fork and Eleven Point Rivers. **Summersville Oak Savanna/Woodland Plain**: Broad, flat divide between Upper Current and Jacks Fork River.

Table Lu04. Descriptions of land type association (LTAs) groups as well as a condensed description of LTAs within the Jacks Fork Watershed. Descriptions are quoted in part or whole from MDC (1997).

Oak-Pine Woodland Forest Hills Group
Landform: Mainly broad ridges, moderately sloping (<25%) side slopes, and relatively broad entrenched valleys with local relief between 150-250 feet. Steeper, more dissected areas occur locally near larger stream valleys. Sinkhole depressions are common on broader ridges. Stream valleys vary somewhat from broad and rather shallow, to more deeply entrenched, narrow, and meandering. Many losing streams occur in valleys distant from the main rivers. Cliffs, caves and springs are commonly associated with larger, perennial stream valleys.
Geology: Roubidoux cherty sandstones and dolomites occupy most ridges and upper side slopes, while lower side slopes, especially near major streams are in cherty upper Gasconade dolomite materials.

Soils: Soils are mainly deep, highly weathered and very cherty silt loams with clays at varying depth. Broad ridges may have a loess cap with occasional fragipans, and shallow soils with dolomite bedrock near the surface occur frequently on steeper, exposed slopes.

Historic Vegetation: Pine and mixed oak-pine woodland originally dominated the more gently sloping upland surface associated with the Roubidoux Formation. Early descriptions portray an open, grassy and shrubby understory in these woodlands, a condition related to the prevalence of fire in the historic landscape. Oak and oak-pine forest occupied lower slopes and more dissected, hilly parts of these landscapes, as well as the wider and more well-drained bottom. Bottoms with richer alluvial soils and more abundant water likely were forested in mixed hardwood timber. Dolomite glade and open savanna/woodland complexes were common on exposed slopes with shallow soils. Sinkhole ponds and fens were dotted occasionally throughout.

Current Conditions: Mainly forested in second growth oak and oak-pine forests; forest cover ranges from sixty to over 80%. Most forests are rather dense, near even-age second growth, with very little woodland ground flora. The occurrence of shortleaf pine in these forests has diminished from its original extent, today having only 20-30% of the forest cover containing a substantial component (>25%) of pine. Even age stands dominated by scarlet, black, and white oak are common, oak die back is a common problem. Much of the existing timber land is associated with public land ownership. Cleared pasture lands occupy many of the broad stream valleys and highest, flattest ridges. Many glades and woodlands suffer from woody encroachment, and sinkhole ponds and fens have been drained or severely overgrazed. An exceptional proportion of state-listed species sites are associated with the streams, springs, caves, cliffs, fens, and sinkhole ponds in this group.

Current River Oak-Pine Woodland Forest Hills: Hills associated with the Current and Jacks Fork Rivers, excluding steep breaks.

Table Lu04. Descriptions of land type association (LTAs) groups as well as a condensed description of LTAs within the Jacks Fork Watershed. Descriptions are quoted in part or whole from MDC (1997).

Pine-Oak Woodland Dissected Plains

Landform: Broad, flat to gently rolling plains which give way to moderately dissected and sloping lands associated with the headwaters of major drainages. Valleys are broad and local relief 100-150 feet. Clusters of karst sinkholes are common. Streams are mainly headwater streams with flashy, intermittent flow.

Geology: Underlain by cherty sandstone and dolomite of the Roubidoux Formation with frequent loess deposits on the flatter uplands.

Soils: Soils are formed principally in cherty sandstone and dolomite residuum from the Roubidoux Formation. Soils are mainly deep, cherty, and highly weathered, low base soils. However occasional fragipans and shallow to bedrock soils do occur. Most soils are extremely well drained and droughty.

HistoricVegetation: Originally covered in woodlands of shortleaf pine and mixed pine oak with an open understory of dense grass and shrub ground cover. Post oak woodlands occupied occasional loess covered flats and unique sinkhole ponds dotted the landscape.

Current Conditions: Over 75% of this group are currently forested in dense, even-age oak and oak-pine forest. Only 20% of these forests have a strong pine component. However, the proportion of forests containing shortleaf pine is the highest in this group. Dense stands of near even age scarlet, black, and post oak occur in the place of pine. Understories are dense, woodland ground flora sparse, and oak die-back common. A substantial component of these forested lands are publicly owned. Approximately 20% of this group is currently pasture, which often occupies the broad valley bottoms or karst plains. Most sinkhole ponds have been drained, dozed or severely overgrazed. Headwater streams are subject to grazing and bank erosion.

Current-Eleven Point Pine-Oak Woodland Dissected Plain: High, flat to rolling divide between Current and Eleven Point Rivers; most extensive acreage of this group.

North Fork Pine-Oak Woodland Dissected Plain: Flat to rolling landscape along the eastern edge of the North Fork Hills; uncertain boundary.

Table Lu04. Descriptions of land type association (LTAs) groups as well as a condensed description of LTAs within the Jacks Fork Watershed. Descriptions are quoted in part or whole from MDC (1997).

Oak and Oak-Pine Forest Breaks

Landform: Distinguished by local relief over 300 feet, narrow ridges, steep side slopes and mainly narrow sinuous valleys. Cliffs, caves, and springs are common.

Geology: Thick caps of Roubidoux Sandstone on ridges and upper slopes streams cut into the Lower Gasconade Dolomite.

Soils: Soils formed from Roubidoux and Upper Gasconade materials.

HistoricVegetation: Originally forested in oak pine, oak and mixed hardwood forest types. Scattered glades and open woodlands would have occurred on exposed slopes and ridges, especially in areas of shallow soil. Relatively small fen openings occasionally filled narrow tributary valleys.

Current Conditions: A high percentage of public land (45%) is associated with this group. Because of the large amount of public land, as well as the steep topography, this group is still mostly forested(88%) in second growth oak, oak-pine and mixed hardwood timber. Open areas are confined to valleys, so bottomland forest is less than originally. Dolomite glades are largely overgrown with eastern red cedar, and many fens have been drained or heavily grazed. Numerous rare or endangered species, some restricted to this group, are associated with the streams, springs, caves, cliffs, and fens in these landscapes. The rivers have been recognized as national treasures and are an important recreational resource in the region.

Current River Oak Forest Breaks:Cuts into Eminence dolomite. Consequently, unique benches occur on the Gunter sandstone, and extensive areas of more productive, higher base soils with oak and mixed hardwood communities occur here.

Jacks Fork River Oak-Pine Forest Breaks: Extremely abrupt, narrow and sinuous valley with outstanding cliff communities, some harboring very unique flora.

Table Lu04. Descriptions of land type association (LTAs) groups as well as a condensed description of LTAs within the Jacks Fork Watershed. Descriptions are quoted in part or whole from MDC (1997).

Igneous Knobs

Landform: Characterized by prominent, broadly rounded knobs which rise 500 to 600 feet above the middle Current River Valley. The knobs range from less than half to over 5 miles across and contain 58 distinct summits. Mainly broad, gently sloping knob tops give way to gentle to very steep sideslopes (10 to more than 35%). Narrow igneous shut-ins are common. Moderately broad, inter-knob basins with low gradient streams are often abruptly restricted by these shut-ins.

Geology: The knobs are composed of Precambrian age ryolite interconnected with Cambrian-age Eminence dolomite.

Soils: Soils mainly consist of shallow to moderately deep and cobbly loams on the upper slopes and tops of the rhyolite knobs. Very deep, cherty silt loams predominate on the sedimentary areas between the knobs.

HistoricVegetation: Extensive igneous glades and open oak woodlands encircled the tops of most knobs, while oak and oak-pine forests covered the side slopes. Scattered dolomite glades, woodlands and fens were associated with shallow soils on the Eminence dolomite, sometimes filling low slopes and valley bottoms.

Current Conditions: Igneous glades and open woodlands are largely overgrown with eastern red cedar, winged elm and other woody invaders. Over 90% of this LTA is forested in second growth oak and oak-pine timber. Much of the forest land is publicly owned. Clearing for pasture has occurred in the broader valleys (15% of LTA). Few high quality dolomite glades or fens are known.

Eminence Igneous Glade/Oak Forest Knobs: The only LTA in this group.

Table Lu05. Percent land use for drainage units within the Jacks Fork Watershed. Data is based on MoRAP Phase 1 Land Cover (1997b) as analyzed by Caldwell (1998).

Unit	FOR	WDL	GRS	CRP	URB	WAT
Pine Creek	68.9	4.2	23.0	3.6	0	0.3
Lower South Prong	75.3	3.8	18.4	2.2	0	0.2
Upper South Prong	70.6	3.1	22.8	3.2	0	0.2
North Prong	66.4	3.7	28.1	1.6	0	0.1
Jack Fork-Barn Hollow	51.7	12.7	32.8	2.2	<0.1	0.6
Middle Jacks Fork	56.6	22.8	18.7	1.0	0	0.9
Jam Up Creek	29.7	4.5	47.3	4.7	13.7	<0.1
Jacks Fork-Bay Creek	65.4	21.7	11.2	0.8	0	0.9
Leatherwood	48.5	20.4	27.5	3.0	0	0.5
Mahan's Creek	61.4	27.7	10.1	0.7	0	0.1
Jacks Fork-Alley	68.2	23.3	7.3	0.7	0	0.4
Jacks Fork-Shawnee Creek	52.6	25.9	16.8	1.8	2.4	0.4
Watershed	**60.8**	**15.3**	**20.8**	**1.9**	**0.8**	**0.3**

FOR =Forest, **WDL**=Woodland, **GRS**=Grassland, **CRP**=Cropland, **URB**=Urban, **WAT**=Water

Table Lu06. Public lands within the Jacks Fork Watershed. For areas only partially within the watershed, total acreage is given in parenthesis.

Name	Owner[1]	Acres2	Permanent Stream (miles)3
Angeline CA	MDC	16,812.5 (37,246.1)	0.8
Barn Hollow NA	MDC	250.4	0
Buttin Rock Access	MDC	10.9	0.2
Jacks Fork NA	NPS	855.8	4.1
Jam Up Cave NA	NPS	149.1	0.5
Gist Ranch CA	MDC	7,400.9 (11,346.1)	0
Mountain View TS	MDC	30.8 (64.8)	0
Ozark National Scenic Riverways	NPS	8,854.7	28.3
Rocky Creek CA	MDC	15,709.6 (37,658.7)	0.2
South Prong Access	MDC	31.2	0.1
Summersville TS	MDC	31.2	0
Mark Twain National Forest	USFS	4,161.8 (7,056.4)	0
Total	-	**55,330.5 (87,418.6)**	**36.2**

Note: This table is not a final authority. Data subject to change.

[1]Owner: MDC=Missouri Department of Conservation

NPS=National Park Service

USFS=United States Forest Service

[2]Estimates are approximate.

[3]Estimates are approximate.

Table Lu07. Percentages of public land ownership within drainage units of the Jacks Fork Watershed.

Unit	MDC	NPS	USFS	Total
Pine Creek	0.0	0.0	3.0	3.0
Lower South Prong	<0.1	0.0	0.0	<0.1
Upper South Prong	0.0	0.0	0.0	0.0
North Prong	19.8	0.0	0.0	19.8
Jack Fork-Barn Hollow	0.5	8.4	0.0	8.9
Middle Jacks Fork	1.0	10.0	0.0	11.0
Jam Up Creek	0	0.9	0.0	0.9
Jacks Fork-Bay Creek	16.0	9.0	0.0	25.0
Leatherwood	0.0	0.0	0.0	0.0
Mahan's Creek	32.4	0	12.0	44.4
Jacks Fork-Alley	49.9	7.9	0.0	57.8
Jacks Fork-Shawnee Creek	15.3	4.0	0	19.3
Watershed	**14.1**	**3.6**	**1.6**	**19.3**

MDC=Missouri Department of Conservation

NPS=National Park Service

USFS=United States Forest Service