

MISSOURI INDEPENDENT  
CONSERVATION CONSULTANTS

# **REINVENTING THE BOONE COUNTY FAIRGROUNDS**

**BOONE COUNTY, MISSOURI**

The following document is a report that includes pertinent information regarding the Boone County Fairground and nearby properties purchased by the County of Boone, Missouri. All information collected within this report was compiled to develop an area Master Plan for the County of Boone by the Missouri Independent Conservation Consultants.

# BOONE COUNTY FAIRGROUNDS MASTER PLAN

Prepared for  
County of Boone, Missouri

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## **❧ EXECUTIVE SUMMARY ❧**

The Boone County Commission approved the purchase of the Boone County Fairgrounds in 1999. The Missouri Independent Conservation Consultants has been contacted to design a comprehensive five-year plan to develop the existing fairgrounds and three tracts in the immediate area. A total of 214 acres are involved in this plan.

Our goal for the area is to create a healthy environment for community participation in sports, outdoor leisure activities, environmental studies, and cultural enrichment. We believe the citizens of northern Boone County would especially benefit from quality recreational opportunities near their neighborhoods. We believe our proposals should adequately meet these community needs.

Specifically, we propose alternatives to increase recreational opportunities by developing a soccer-, softball-, and baseball complex, a 3-D archery range, a practice archery range, and a paintball range. Alternatives designed to provide opportunities for environmental studies include an arboretum, a nature trail, a nature center, and an outdoor classroom. Success of the area will be measured in part by the number of visits annually. We intend to rejuvenate the image of the fair by landscaping around the existing buildings.

The biophysical integrity of the area will be addressed by measures to control soil and stream bank erosion. We also propose to restore the riparian zone along Bear Creek. These measures will benefit the resident wildlife species of the area that could include several endangered and threatened species such as the Topeka Shiner and the striped skunk.

## **❧ OUR MISSION ❧**

The Missouri Independent Conservation Consultants (MICC) is a team of eleven seniors in the School of Natural resources at the University of Missouri-Columbia. Our primary mission is to develop a comprehensive plan for the Boone County Fairground and newly annexed properties for the needs of Boone County citizens and the needs of the natural environment. MICC aspires to achieve an area, which will encompass recreational, educational, and sociological needs of Boone County citizens as well as to restore the integrity of the biophysical environment.

## SECTION 1: PURPOSE AND SIGNIFICANCE

### ~ HISTORY OF THE BOONE COUNTY FAIRGROUNDS ~

The current location of the Boone County Fair is an issue, which has caused quite a bit of controversy. The history of the property begins with it being used as an airport for many years. In the mid 1960's it was known as Cottonwood Airport. During the late 1970's and early 1980's it was closed as an airport to extend the runways to handle twin engine aircraft. This was not done, and it was decided to discontinue its use as an airport completely.

At this time the Boone County Fair was housed on approximately 28 acres on Clinkscales Road in the City of Columbia. The site was originally 80 acres when the fair began but portions were sold off to a shopping center and a middle school. A net of 20 acres remained which housed several permanent structures and many of the temporary structures erected during the fair. Due to adjoining land use and city ordinances for sound and hours of operation, this property was soon to be inadequate.

A new area was desperately needed to house the fair. The Midway area was considered for this. However, due to an unusual land swap the home for the fair would eventually become the old Cottonwood Airport land.

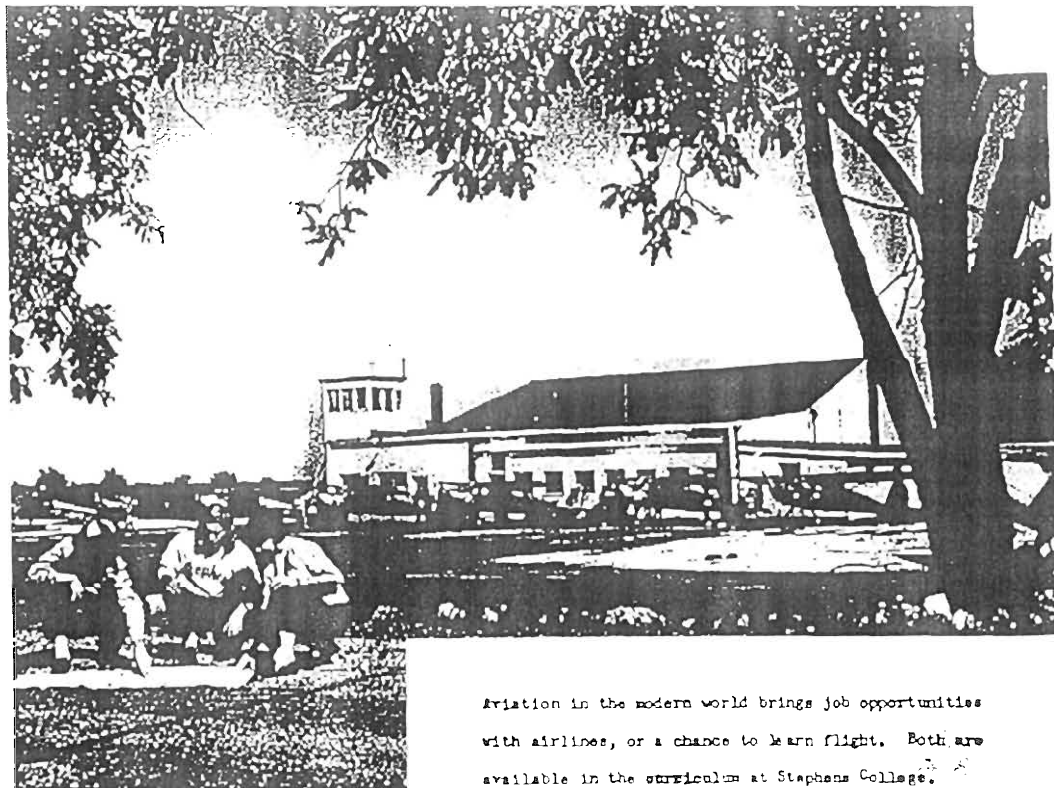


Figure 1: Hangar at old Cottonwood Airport – caption in lower right corner advertising the course in aviation which was part of the curriculum at Stevens College following WWII – State Historical Society of Missouri, Columbia

The city began construction on the area immediately. In 1992 the city erected a \$1.9 million coliseum with heating and cooling systems. Between 1992 and 1997 the fair costs were \$225 thousand with another \$1.5 million loss due to the coliseum. From 1998 until currently the losses have amounted to \$250 thousand.

In 1993, First National Bank's appraisal of \$3.51 million was based on an income of \$308 thousand per year, which the fair has never reached. The fair's debt has been quoted from \$2.6 to \$2.8 million, with \$240 thousand owed to Boone Electric Cooperative for past electric service and \$2.4 million to First National Bank. In order to pay the debt, the Boone County Agricultural and Mechanical Society would have to sell all but the 68 acres the fair is on to the county.

Vicki Russel, the Fair Board President until 2000, stated that the fair has been a break-even operation and that 1999 was no different. Steve Smith, of Williams-Keeper Accountants, said that without the debt and with more careful accounting, the fair could be a break-even enterprise and not a burden to the county. For the area to generate cash flow the area must generate enough income to offset the cost of capital plus other expenses of operation, deferred maintenance, depreciation, and future capital improvements.

### OUR VISION

We visualize the Boone County Fairground as a multiple use area for the citizens of Boone and surrounding counties. We visualize our master plan as a catalyst to maximize the potential of the land. This includes enhancing the visual aesthetics, improving habitats for fish and wildlife, increasing recreational opportunities for the public, and contributing to the overall sustainability of the resources.

#### RATIONALE FOR OUR VISION: BOONE COUNTY'S VISION FOR THE FAIRGROUNDS

A bulk of the land has some potential for recreational type uses. The Boone County Commission visualizes at least part of the area to be used for games such as soccer, football, or baseball. At committee meetings, citizens repeatedly expressed the shortages they were experiencing of fields and the availability of recreational space. Along with this, equestrian needs have also been a need within the county.

County Commissioner Don Stamper had suggested to the Commission several years prior to the county gaining ownership of the area that it would be a great idea for it to be in public ownership. Commissioner Stamper felt that another important reason for the county to acquire ownership of the area is the fact that the City of Columbia is growing at a very accelerated rate in that direction. From a political perspective, Commissioner Stamper felt that the county had one chance to get the land on the public inventory before becoming zoned for housing and commercial businesses.

A task force was appointed by the county to review the possible ownership of the property. Dr. Hardeep Bhular, a Parks, Recreation, and Tourism professor with the University of Missouri-Columbia, was on that task force, as were a number of other



people in the community. Approximately 2,000 Boone County citizens from outside Columbia city-limits were surveyed.

In the winter of 1999 the Boone County User Survey was administered (Appendix A-I). Of the 2000 people surveyed, 677 responded. Of these 677, 478 (71 %) indicated that they would use the recreational facilities at the fairground site. The following are frequencies showing the percentages of respondents that indicated they would use the recreational facilities weekly or biweekly:

Trails: 19%

Playground/Picnic area: 9%

Natural open/Garden space: 6%

Outdoor shooting/Archery range: 6%

Respondents were asked to rank the recreational preferences with first, second, and third (second and third are not incorporated). The results are as follows:

Trails: 8.5%

Outdoor shooting/Archery: 4%

Natural/Garden space: 1%

The county's existing parks and recreation facilities are lacking many of the desires of Boone County citizens (Appendix A-II).

The following recommendations were made by the task force based on these responses. These are 1) that the county should acquire the grounds and 2) that an inventory of the grounds should be produced until which time as a recreational management plan can be developed. An important feature pointed out in favor of county ownership is that the land is bordered by acreage already owned by the county (Appendix A). One of these is a long, thin, 54-acre strip immediately west of the fairground property to the west of Bear Creek. The other is the site of the Boone County Jail, the National Guard Armory (soon to become a fire training facility), a juvenile justice facility and the Reality House facility.

The county's vision is that ultimately the area becomes a great recreational area, accommodating indoor and outdoor recreation. The county has been approached by everything from hockey teams to minor league baseball teams to kids who play football to lacrosse asking for the land to be developed for their use. Currently, a funding source for the area's development has not been identified (Don Stamper, personal communication, 2000). The county is currently seeking help from the Missouri Independent Conservation Consultants and the University of Missouri-Columbia to help make decisions on what should be placed there and, ultimately, cost.

### **~ SPECIFIC GOALS FOR THE BOONE COUNTY FAIRGROUNDS ~**

- 1. Restore integrity to the environment.**
- 2. Provide recreational opportunities.**
- 3. Provide environmental education.**
- 4. Enhancing existing facilities.**

## SECTION 2: RESOURCES

### ❧ BOUNDARIES OF MANAGEMENT AREA ❧

There are six areas that will be discussed for this project. They are:

The Boone County Fairground

See Appendix B-I for 1982 Boone County Survey (1209 and 5126) and 1974 Boone County Survey (3094).

The Riddenhour Tract

See Appendix B-I for 1993 Boone County Survey (4689) and 1991 Boone County Survey (2322).

The Newton Tract

See Appendix B-I for 1982 Boone County Survey (5157).

The Adkins Tract

See Appendix B-I for 1982 Boone County Survey (no number).

The tract housing the Boone County Maintenance facility.

See Appendix B-I for 1995 Boone County Survey (23479).

The tract housing the county jail, armory, juvenile justice facility, and the Reality House facility.

See Appendix B-I for 1995 Boone County Survey (23479).

See Appendix B-II for aerial photo and boundary delineation of each tract.

See Appendix B-III for locations of proposed facilities.

See Appendix B-IV for 1973, 1984, and 1993 plat maps of T49N-R12W.

### RESOURCE INVENTORY:

#### ❧ NATURAL, ABIOTIC RESOURCES ❧

##### GEOLOGY

During the Kansan glacial stage of Pleistocene time, most of Boone County was covered by glacial material. The glacial material deposited ranges in thickness from a few feet to over 100 feet. The thickest region occurs in the north eastern two-thirds of the county, which contains the Boone County Fairgrounds. (Appendix C-I)

##### TOPOGRAPHY

The Boone County Fairgrounds ranges in elevation from 800 feet above sea-level on the upper plain region of the Adkins Tract to 740 feet above sea-level along Bear Creek. The changes in elevation are gradual resulting in gentle slopes. The Fairgrounds is within the Prairie Faunal Region of Missouri. It may be characterized broadly as a flat to rolling plain, nearly as high in elevation as parts of the adjacent Ozark Region. That part of the Prairie Region north of the Missouri River has been subjected to the leveling action

of glaciation. A flat plain, known as the Audrain Prairies, extends northward from Audrain County along the Missouri-Mississippi drainage divide, but it breaks off abruptly into hilly country along streams to the east, south, and west. Much of northwestern Missouri has a gently rolling to undulating surface, while south of the Missouri River the prairie is nearly as level as the Audrain Prairies (Pflieger 1997). (Appendix C-II)

## SOILS

The soil types found on the Boone County Fairgrounds, and the Newton, Atkins, and Redinhour tracts are the result of glaciation during the Kansan glacial stage of Pleistocene time as described above. In places the bedrock is covered to considerable depths by glacial till, and along the Missouri and Mississippi rivers a coarse grained, wind-blown material called loess has been deposited to depths of as much as 150 feet. The soils are deeper and less stony band than those of the Ozarks Region.

The following soils were described in the 1951 Soil Survey and are located within Boone County and can be found on the management area (Appendix C-III).

Dennis silt loam, 3 to 7 percent slopes  
Gara loam, 5 to 9 percent slope, moderately eroded  
Gara clay loam, 5 to 9 percent slopes, severely eroded  
Lindley loam and clay loam, 5 to 8 percent slopes  
Mandeville silt loam, 5 to 8 percent slopes  
Mexico silt loam, 1 to 3 percent slopes  
Mexico silt loam, 2 to 4 percent slopes, moderately and severely eroded  
Mexico silt loam, light-gray variant, 1 to 3 percent slopes  
Racoon silt loam, 1 to 3 percent slopes  
Sapp soils, 3 to 5 percent slopes  
Westerville silt loam.

The most recent soil survey has further classified the soil types present within Boone County. The following are types that can be found on the management area. (Appendix C-IV).

Mexico  
Kenswick  
Hatton  
Leonard  
Weller  
Auxvasse  
Moniteau  
Tanglenook  
Haymond

## SURFACE WATERS

The management area is within the Cedar Creek watershed, the Prairie Faunal Region, and the Hydrologic Unit 10300102110005 (Appendix C-V). Bear Creek, a first order stream, runs through the northern halves of both the Newton and Adkins tracts as well as the whole western side of the Boone County Fairgrounds. Bear Creek is supplied with runoff water from agricultural and residential development near the management area and commercial development farther downstream of the management area. Annual precipitation is about 38 inches with precipitation fairly distributed throughout the year. Large amounts of rainfall usually occur in June and September, with summer and fall being the wettest seasons. (Soil Survey, 1951).

Watershed characteristics include rare to occasional flooding, occurring during winter to spring. Soils generally show limitations for pond and reservoir areas, embankments, and aquifer-fed excavated ponds. Slow perc and high erosion rates are also factors effecting the watershed (Appendix C-VI and C-VII).

Several Missouri Stream Teams performed visual and chemical stream surveys. Their results showed that down stream of the Boone County Fairgrounds to Perche Creek had good water quality from November 1995 to May 1998. During times of low discharge (below 2 cu. ft/sec), high levels of benthic algae relative to the stream volume were produced. In areas of poor water quality there was low macroinvertebrate species richness (less than a rating of 11) (Appendix C-VIII).

The Stream Teams also collected fecal coliform samples. There was no measurable flow at the time of either test. These tests showed counts of 3000bacteria/100ml and 1800bacteria/100ml respectively. Tom Johnson, a Microbiologist with the Columbia Environmental Research Center, states that levels above 200 bacteria/100ml is unacceptable. (Tom Johnson, personal communication 2000). At these same two sites, visible benthic alga counts in situ were 90% and 75% coverage respectively.

Bear Creek within the Boone Country Fairground was sampled on March 12 and 13, 2000 by the Missouri Independent Conservation Consultants. The following parameters were recorded: temperature, dissolved oxygen, conductivity, pH, alkalinity, hardness, ammonia as  $\text{NH}_4$ , ammonia as  $\text{NO}_3\text{-N}$ , turbidity, and flow rate (Appendix C-IX).

Temperature readings were seen to range between 22.6°C and 24.0°C. This is an acceptable range for the presence of macroinvertebrates (Nile Kemble, personal communication 2000).

Dissolved oxygen readings were taken in the field and seen to range from 3.9 to 13.3. All dissolved oxygen readings were acceptable with the exception of Site 2 (Appendix C-IX). (Nile Kemble, personal communication 2000).

The following parameters were measured at the Columbia Environmental Research Center (CERC) using samples which were put on ice and stored at 4°C for <48 hours before reading. Prior to reading these parameters, sample temperatures were allowed to warm to room temperature (approximately 23°C).

Conductivity readings were seen to be similar for all sites sampled and within acceptable range (Nile Kemble, personal communication 2000). Conductivity readings were compared to CERC well water as a standard.

The pH, alkalinity, hardness, ammonia as  $\text{NH}_4$ , ammonia as  $\text{NO}_3\text{-N}$ , and turbidity from each site was also measured from the preserved samples. All readings were well within acceptable range with the exception of the ammonia as  $\text{NH}_4$  from Site 2 where it was (high or low according to the permit) and all of the turbidity readings, with the exception of Site 3, were within limit.

## **RESOURCE INVENTORY:** **MANMADE RESOURCES**

### RESOURCES WITHIN THE MANAGEMENT AREA

The Fairgrounds houses 27 permanent structures. Many of these have water and electricity; the coliseum is the only heated facility. Local, not-for-profit organizations (e.g. 4-H, FFA, Elks) for fundraising during fair events. None of these facilities are currently ADA accessible. Other features include fair display areas, roads, parking, RV hook-ups, and waste stations (Appendix D-I to D-IV).

### RESOURCES WITHIN BOONE COUNTY

Boone County contains many recreational facilities. These facilities provide fields for structured and unstructured recreation. Examples include soccer, baseball, softball, basketball, playgrounds, nature areas, and picnic sites (Appendix A-II).

### RESOURCES LACKING WITHIN BOONE COUNTY

Some desired recreational facilities are rare in the existing parks of Boone County. These include archery and garden/open space. (Appendix A-II). County citizens have also expressed a need for more soccer, softball, and baseball fields. These are supportive reasons for our decisions of projects later in this plan.

## **RESOURCE INVENTORY:** **BIOTIC RESOURCES**

### **FLORA**

#### WOODY VEGETATION

Prairie grasses, broken up by timber in the more hilly sections originally covered the Prairie Region in which the Boone County Fair is housed. Today, nearly all of the grassland and much of the timber are gone, and the Prairie Faunal Region is nearly as intensively cultivated as the Lowlands (Pflieger 1997).

The property is not extensively forested, except along the riparian zones and fence rows, which show more growth than the pastures of fescue. South Bear Creek flows along the north part of both the Adkins and Newton tracts and south along the western side of the Adkins tract until it merges with Hinkson Creek outside the southwest side boarder of the fair ground tract.

The density of the South Bear Creek was dominated by river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), sugar maple (*Acer saccharum*), and northern catalpa (*Catalpa speciosa*). River birch was the most prevalent with a count of 70 individuals and a 34% relative density although they were not the largest individuals in diameter.

Other water tolerant species were present, such as cottonwood (*Populus deltoides*) and sycamore (*Plantanus occidentalis*). The largest tree measured was a cottonwood with a DBH of 42". Both these species are common in riparian areas with intermediate flow and these soils. The Species that occupied the understory were sugar maple (*Acer saccarum*) and eastern redbud (*Cercis canadensis*).

Along Hinkson Creek the number of species that were observed increased with 22 species. The biggest difference was the prevalence of shingle oak (*Quercus imbricaria*) and hackberry (*Celtis occidentalis*), with 27% relative density for 165 individuals and 29% for 183 individuals respectively. Other reality dense species present are American elm (*Ulmus americana*), silver maple (*Acer saccharinum*) and black walnut (*Juglans nigra*), with densities of 12% and 55 estimated.

The Adkins tract is split into the southern and the northern halves. In the southern half, which is most fence rows of tress and other woody species, was dominated by eastern redcedar (*juniperus viginiana*) but the most prevalent species was the woody shrub of multiflora rose (*Rosaceae spp.*) with a density of 60%. Other old-field species that were present were hackberry, black locust (*Robinia psuedoacacia*), honey locust (*Gleditsia tracanthos*) and osage orange (*Maclura pomifera*).

The northern half of the Adkins tract had more species present, 16 verses 8 of the southern half. Which includes a small wooded area within a small watershed. Northern red oak (*Quercus rubra*) and hackberry had the highest densities of 22% and 11% respectively.

The Newton tract is mostly old-field and fence rows that include mostly honey locust, and osage orange, with densities of 29% and 25% respectively. Other species present include eastern redcedar, northern catalpa, and several oak species.

The average size of the DBH of the trees inventoried is 8". The understory of the various plots included many brushy species. The inventories of the tracts of land included in the management area have been compiled for each area (Appendix E-I and E-II).

## NON-WOODY VEGETATION

Three areas were chosen as having the highest diversity at the Boone County Fairgrounds, and each area was sampled. The included map indicates the regions that were sampled. The first site sampled was on the land south of the Highway Department and Fire Department training facilities, off of Oakland Gravel Road (refer to Site #1 on map). This sampling site consisted of an area in diameter of about 50 feet. I located some diverse species and took samples of each, keying each plant out using a key guide

(Mohlenbrock 1986). The second site was along a 20-foot perimeter of the northernmost lagoon just north of the Newton and Adkins tracts (Site #2 on map). The same sampling process was used (finding diverse species, taking a sample, and keying each one out). As for the third site, I sampled diverse species along Bear Creek out 20 feet from each bank of the creek. This sampling run went from the northernmost lagoon southwest along the creek until it reached the other two lagoons on the Newton tract (Site #3 on map). Due to the homogeneity of the species on the property, I also sampled one of the pasture areas, approximately a 50-foot radius on the southern end of the Adkins tract (Site #4 on map), to make a list of the dominant species. The following list for each site shows the sampling results.

On the Highway Department site the following species were identified. All of these species, especially Foxtail, Goldenrod and Multiflora Rose, are indicative of disturbance (grazing, activity of man, etc).

Tall Goldenrod (*Solidago altissima*)  
Foxtail Grass (*Setaria glauca*)  
Multiflora Rose (*Rosa multiflora*)  
Evening Primrose (*Oenothera biennis*)  
Purpletop (*Tridens flavus*)  
Bee Balm (*Monarda fistulosa*)

Along the perimeter of the northernmost lagoon, there were large amounts of Foxtail present, along with the following species. Foxtail, Goldenrod, Multiflora Rose, Pokeweed and Buckbrush all indicate some form of disturbance, and Foxtail and Pokeweed also are typically abundant on waste sites, sites which receive high amounts of nutrients from sewage and/or agricultural runoff.

Tall Goldenrod  
Multiflora Rose  
Bee Balm  
Woodland Sunflower (*Helianthus divaricatus*)  
Pokeweed (*Phytolacca americana*)  
Buckbrush (*Symphoricarpos orbiculatus*)

On the third site sampled (along Bear Creek between the lagoons), species included Multiflora Rose, Buckbrush, Foxtail, Woodland Sunflower, and the following not previously listed species. The Multiflora Rose, Buckbrush, Foxtail, Nodding Wild Rye, and Ground Cherry are all indicative of disturbance, and Foxtail, Queen Anne's Lace, Timothy, and Switchgrass are all typically associated with waste areas.

Gooseberry (*Ribes missouriense*)  
Nodding Wild Rye (*Elymus canadensis*)  
Ground Cherry (*Physalis sp.*)  
Smooth Ironweed (*Vernonia fasciculata*)  
Timothy (*Phleum pratense*)  
Queen Anne's Lace (*Daucus carota*)

Switchgrass (*Panicum virgatum*)  
Bearded Panic Grass (*Panicum boscii*)

Finally, the pasture area yielded Queen Anne's Lace, Multiflora Rose, Smooth Ironweed, along with many variable grasses (Poaceae family) and sunflowers (Asteraceae family).

Common locations of each species mentioned (Any species with native location unmentioned are native to the U.S.):

Tall Goldenrod – Disturbed sites in open woods or prairies  
Foxtail (Yellow foxtail) – Disturbed or cultivated soils and waste areas; preferred food for bobwhite quail  
Multiflora Rose – Native to China; frequently planted and often escaped  
Evening Primrose – Fields, prairies and waste grounds  
Purpletop – Fields and edges of woodlands, along roadsides and in open woods  
Bee Balm – Dry woods, fields, prairies and roadsides  
Woodland Sunflower – Open woods  
Pokeweed – Fields, woods and waste areas  
Buckbrush – Disturbed woods and pastures  
Gooseberry – Woods  
Nodding Wild Rye – Woods, roadsides, dry prairies  
Ground Cherry – Common in disturbed areas  
Smooth Ironweed – Low ground and prairies  
Bearded Panic Grass – Moist prairies, along ponds or creeks, low woodlands  
Switchgrass – Fields, waste grounds, prairies, rocky stream beds, and woods  
Timothy – Native to Europe; waste grounds and fields  
Queen Anne's Lace – Native to Europe; fields, roadsides and waste areas

The dominant plant species on the entire management area is Meadow Fescue (*Festuca pratensis*). Meadow Fescue does not provide a quality habitat for certain wildlife species such as the northern bobwhite quail (*Colinus virginianus*). In fact, the majority of fescue has toxins that cause nutritional problems, problems with reproduction, and numerous diseases in both livestock and domestic animals. However, because of the recommended uses of the land by our group (softball, baseball and soccer fields, along with an archery range), fescue eradication/replacement and habitat enhancements are not issues since the land will be developed. Also, according to a Missouri Department of Conservation website, none of the species sampled above or listed below are endangered.

In order to compare the field data to referenced data, a list of common plant species that occur in habitats similar to those at the Boone County Fairgrounds is included within this report (Appendix E-III).

Aquatic vegetation is generally sparse, but water willow (*Justicia sp.*) occurs where rocky bottoms are present (Pflieger 1997). Because visual inspections were made of the area in late winter, no aquatic vegetation other than epiphytic algae was seen.



## FAUNA

A complete list of the mammal, bird, amphibian, reptile, and fish species that *could* be found in Boone County, Missouri is contained within this report (Appendix E-IV to E-VIII). It is important to note that this list only provides an inventory of species that could be supported within the habitats found in Boone County (Missouri Fish and Wildlife Information System, Missouri Department of Conservation). This list is not specific for the township where the Boone County Fairgrounds are located.

### MAMMALS

Only the specific needs of the state and federally endangered terrestrial species, which are likely to occur on the Boone County Fairgrounds, will be discussed. These species are the Grey Bat (*Myotis grisescens*), the Indiana Bat (*Myotis sodalis*), the Plains Spotted Skunk (*Spilogale putorius interrupta*), the Bald Eagle (*Haliaeetus leucocephalus alascensis*), the Peregrine Falcon (*Falco peregrinus tundrius*), the Northern Harrier (*Circus cyaneus*) and the Barn Owl (*Tyto alba*).

**Grey Bat:** The gray myotis is the only species of bat in Missouri that inhabits caves year and (Schwartz and Schwartz 1995). Since there are no caves and the property the only improvements we could make for this species would be to provide for other biological needs such as insuring a prey base. This species feeds mainly on mosquitoes, caddis flies, and other insects (LaVal et al. 1980). By restoring a riparian waterway improving water quality of the existing stream we will improve the abundance of these arthropods that are important to this species diet.

**Indiana Bat:** The Indiana myotis hibernates in caves during the winter. During the summer months, the Indiana myotis roost under loose tree bark and in hollow trees (Schwartz and Schwartz 1995). It would be important that large snags be present if Indiana bats are to utilize BCFG. However we must weigh the cost of protecting this species that might not even use this area against the potential safety hazards presented by large snags. Indiana bats feed on a variety of flying insects, especially moths. Other than possibly restoring stream quality, most management plans would not need to be altered to assure this species food source (La Val et al. 1980).

**Plains spotted skunk:** Spotted skunks require some cover to escape predators. This cover could be edge habitats with brushy borders, brush or log piles, and heavily vegetated gullies (Crabb 1948). Spotted skunks eat a variety of food ranging from insects and small rodents to eggs and vegetable matter (Crabb 1948). Restoring a riparian waterway would both produce necessary cover and a food source for spotted skunks. A riparian waterway would also serve as a corridor for this species, allowing it to move across an area it otherwise might avoid due to depredation avoidance.

**Bald eagle:** The bald eagle is generally associated with forested habitats located along waterways and reservoirs. Bald eagles winter near open water and around large numbers of wintering waterfowl. The eagle also requires large trees for perching and generally avoids areas with heavy human activity. I do not believe that we need to specifically

manage for the eagle because the human activity in the area would probably limit the possibility of eagles using BCFG for any extended period of time.

**Peregrine Falcon:** Peregrine falcons inhabit grasslands and crop/pasture agriculture. The falcon requires large open areas for hunting. They historically nested on cliffs and are currently found nesting on tall buildings. Due to the lack of suitable nesting sites on BCFG we do not need to manage for resident falcons. However our plans to restore riparian watershed should increase the prey species of the falcon (small birds) and could be beneficial for transient falcons.

**Northern harrier:** The northern harrier needs wetlands, open pastures/crops, and open rangelands. Our plans for BCFG do not provide for the creation of any of these habitats.

**Barn owl:** Barn owls use residential areas, crops, pastures, and rangelands for hunting. They need to have trees with a diameter at breast height of at least 20". There are a few cottonwood (*Populus deltoides*) trees of this size. These trees should be preserved if we desire to increase barn owl habitat. These trees could be girdled to speed up decomposition, which allows for the formation of cavities to be used as nest sites.

## FISH

Minnows are the dominant group of small fishes. Common and characteristic species are: red shiner, redbfin shiner, golden shiner, bigmouth shiner, sand shiner, suckermouth minnow, fathead minnow, and creek chub. The darter group is not diverse in Prairie streams. The johnny darter is the only species that is widespread. The fantail darter, orangethroat darter, logperch, and slenderhead darter are common in some streams. The blackstripe topminnow and western mosquitofish are now more abundant and widespread in the Prairie Region than they were 30 or more years ago. The stonecat is the characteristic madtom of Prairie streams, but the slender madtom, tadpole madtom, and freckled madtom are abundant locally. Certain small fishes are not widespread but are particularly characteristic of the Prairie Region. These are: brassy minnow, common shiner, ghost shiner, Topeka shiner, plains killifish, and trout-perch. The most common large nongame fishes are: gizzard shad, common carp, river carpsucker, quillback, and white sucker. Catfishes are one of the more important groups of large fishes in Prairie streams. The principal catfishes are the black bullhead, channel catfish, and flathead catfish. The most common representatives of the sunfish family are green sunfish, orangespotted fish, bluegill, largemouth bass, and white crappie (Pflieger 1997).

The Missouri Independent Conservation Consultants did sampling along Bear Creek during March. All fish species found in Bear Creek (Appendix E-X) were common in Missouri (Appendix E-IX). (Need to identify sampling sites on a map- Appendix E-XI).

Only the specific needs of the state and federally endangered aquatic species, which are likely to occur on the Boone County Fairgrounds, will be discussed.

**Topika shiner (*Notropis topeka*):** Historically found within Bear Creek, the Topika shiner is now restricted to the Grand, Lamine, Chariton, and Des Moines river basins.

Threatened by habitat destruction, degradation, modification, and fragmentation resulting from siltation (the build up of silt), reduced water quality, tributary impoundment, stream channelization, and stream dewatering, most of which are occurring or have occurred within Bear Creek. The Topika shiner is characteristic of small, low order (headwater), prairie streams with good water quality and cool temperatures. These streams generally exhibit perennial (year round) flow, however, some approach intermittency (periodic flow) during summer. The predominant substrate types within these streams are clean gravel, cobble, and sand. However, bedrock and clay hardpan overlain by a thin layer of silt are not uncommon (need source).

The Topika shiner is primarily a diurnal (daytime) feeder. Prey items include nektonic (independent of currents) insects (Pflieger 1997), chironomids, other diptans, ephemeropterans, cladocerans, and copeopods. Spawning occurs in pool habitats over silt-free green sunfish (*Lepomis cyanellus*) and orangespotted sunfish (*Lepomis humilis*) (Department of the Interior: Fish and Wildlife Service. Endangered and Threatened Wildlife and Plants; Final Rule To List the Topeka Shiner as Endangered <http://endangered.fws.gov/r/fr98654.html> February, 2000.).

The number of known occurrences of Topeka shiner populations nation wide has been reduced by approximately 80 percent, with approximately 50 percent of this decline occurring within the last 25 years. The Topika shiner now inhabits less than 10 percent of its original geographic range. The action most likely impacting the species to the greatest degree in the past is sedimentation and eutrophication resulting from intensive agricultural development (Department of the Interior: Fish and Wildlife Service. Endangered and Threatened Wildlife and Plants; Final Rule To List the Topeka Shiner as Endangered <http://endangered.fws.gov/r/fr98654.html> February, 2000.).

Effective January 14, 1999 because of the above reasons, the Final Rule to List the Topeka Shiner as Endangered, 50 CFR Part 17, DOI, Fish and Wildlife Service, was passed. Recovery of the species primarily involves the conservation of remaining populations and habitats, ensuring their continued survival, and rehabilitation of degraded habitat. Measures involving stream and riparian protection programs, including support from the Fish and Wildlife Service's Partners for Wildlife program, and conservation agreements with various governmental agencies, private entities, and landowners will be essential for the recovery of the species. Additional unoccupied habitat within their range of the Topeka shiner may eventually be considered for improvement and stabilization or possible reintroduction for the species, particularly in areas near isolated populations to create sustainable population complexes (Department of the Interior: Fish and Wildlife Service. Endangered and Threatened Wildlife and Plants; Final Rule To List the Topeka Shiner as Endangered <http://endangered.fws.gov/r/fr98654.html> February, 2000.).

Bear Creek may fit well into this plan due to available resources present needed by the Topika shiner and resources which have been degraded but can be improved. Additionally, remnant populations of Topika shiners remain within Turkey Creek, also in Boone County, Missouri.

## AQUATIC MACROINVERTEBRATES

The following genera of aquatic macroinvertebrates were identified in samples taken by the Missouri Independent Conservation Consultants along Bear Creek within

riffles and leaf packs. Tolerances are reported for each sample site as a whole and relative abundances are reported for each genus (Barry Poulton, personal communication 2000).

Site 1: Chironomidae	Abundant	
Naididae	Common	
Caphidae	Abundant	Tolerant
Site 2: Chironomidae	Abundant	
Caphidae	Abundant	
Physidae	Uncommon	
Tubificidae	Uncommon	
Hydrophilidae	Uncommon	
Tabanidae	??	Tolerant
Site 5: Hydrophilidae	Common	
Rhyacophilidae	Uncommon	
Capnidae	Common	
Chironomidae	Very Abundant	
Polycentropodidae	Uncommon	
Perlidae	Uncommon	
Sphaeridae	Uncommon	
Elmidae	Uncommon	Moderately Sensitive

### THREATS TO BIOTIC RESOURCES

There are numerous threats to the biotic resources. Urbanization and agriculture use has led to an increase in erosion, which increased the turbidity in at least one area Site 2 (Section 2; Resource Inventory: Surface Waters). Murky water can severally affect predatory fish species in Bear Creek. The lagoons on both the Boone County Fairgrounds and Gregory Heights drain into Bear Creek.

The development of Boone County Fairgrounds could also lead to an increase in runoff, but improvements of the riparian zones will compensate for this. Runoff from Gregory Heights lagoon has led to high dissolved oxygen in that area and this can severally affect intolerant fish and macroinvertebrate species. The runoff from the waste piles also is also a threat to the aquatic community in Bear Creek. Although most of the sites sampled by the Missouri Independent Conservation Consultants were within the limits of the parameters (Refer to Surface Waters).

## SECTION 3: GOALS AND OBJECTIVES

### ~ GOALS ~

1. **Restore integrity to the environment.** Many problems were discovered within the area while developing this Management Plan. MICC strongly urges the County of Boone to address these problems for several reasons. First, if these problems are allowed to continue the condition of the environment will only degrade further. Second, there were a significant number of people in Boone County who were in opposition of the county gaining ownership of the area. For the county's public relations with its citizens, it would be of the county's best interest to restore the integrity of the area to a point where the health of the environment and use of the area can be maintained.
2. **Provide recreational opportunities.** As was shown in this proposal, there is a lack of certain recreational opportunities within Boone County to meet the needs of the citizens. As Boone County continues to grow, so too will its needs. For this reason, Boone County needs to continue to provide more of these opportunities to its citizens. If planned correctly, the area can also serve as a juvenile crime reducing force in the county by offering healthy, educational activities for the area's youth. In addition to this, providing recreational opportunities may be able to pay for the cost and maintenance of the area as well as generating revenue for surrounding communities by bringing in visitors from other areas.
3. **Provide environmental education.** With more people moving into urban settings, there will be less opportunities for citizens to experience and learn about the environment. For this reason, it will be necessary for the government on all levels to make available these opportunities to their citizens. By doing this citizens will be able to make educated decisions about environmental issues based on facts rather than myths, scare tactics, or emotions. Children in these urban communities are the natural resource managers of the future. Outdoor classrooms and nature studies will instill in them the need and importance of protecting our environment and natural resources.
4. **Enhancing existing facilities.** To help assure that the area will be a place where people will want to come and spend their recreational time, the existing facilities must be shown some attention. By doing this, the aesthetics, as well as the health, of the area will increase and make visitors feel more comfortable visiting. This should be an area that people want to use.

**GOAL 1:**  
**↻ ENVIRONMENTAL INTEGRITY ↻**

**OBJECTIVE 1: IMPROVE CREEK HABITAT AND WATER QUALITY**

**Strategy 1: Reduce Point-Source Runoff**

Several sources of point-source runoff occur within the Newton and Adkins Tracts of the property, directly impacting the health of Bear Creek. Three sewage lagoons which serve the Gregory Heights Subdivision (NPDES Permit Number MO-0046825) have overflow pipes leading directly into Bear Creek. The uppermost of the three lagoons is currently being taken off line by the Boone County Sewer District to switch Gregory Heights Subdivision over to Columbia City Sewage along with the Fairgrounds. This lagoon has been taken off line following Closure Requirements set forth in Section I of the Missouri Department of Natural Resources Standard Conditions For NPDES Permits, August 15, 1994 (Appendix G-I).

However, upon inspection in March, 2000 it was discovered that hay bales used to retain bio-solids from the drain trench cut within the side of the lagoon wall were gone. This was following a rain event, which likely washed them away. Dissolved oxygen readings were taken (Appendix G-II) above and below where the flushed water entered into Bear Creek (approximately 270 feet through bottom-land mature timber). A significant drop in dissolved oxygen below inflow was seen.

The Boone County Regional Sewer District was contacted regarding this to replace the hay bales. To lessen the risk of future occurrences, the lagoon should be monitored after each severe weather event until the lagoon is fully closed and the residual material is mixed with the soil in accordance with the standards listed above.

We suggest that different actions be taken when closing the remaining two lagoons. Due to their close proximity to the creek we suggest that the effluent be removed by pumping it to effluent waste vehicles and delivered to the Columbia Waste Treatment Facility. The remaining water should be allowed to evaporate and the remaining sludge should be removed and taken to the Columbia Waste Treatment Facility for disposal. After this material is removed to levels acceptable for the permit, the remaining residue should be tilled into underlying soil as with the previous lagoon.

**Strategy 2: Remove Litter Within Watershed**

There are several places though out the BCFG with large amounts of litter, trash, and debris. There are small 'dump sites' located around the buildings on the north portion of the fairgrounds. There is also a dilapidated house on the Newton tract and various trash and rubble within Bear Creek. These sites no only depreciate the aesthetics of the fairgrounds; they also pose safety hazards for visitors.

These sites will need to be cleaned. Most items will have to be removed by hand, a very labor-intensive process. We suggest that the county explore the possibility of using labor from the nearby county jail. This would minimize the capital involved while creating opportunities for prisoners to exercise and enjoy the outdoors. There may also be opportunities for local school groups or Stream Teams to assist in this effort.

### Strategy 3: Reduce Erosion and Restore Riparian Zone

There is a great deal of stream bank erosion throughout the length of the stream within the project area. This increased erosion and degradation of the stream bank is the direct effect of urbanization and agricultural use of the watershed. The new housing and business developments that are occurring in the upper portion of the watershed near Brown Station Road can be attributed to the increased runoff into the stream. Effects of urbanization may be seen by decreased normal stream flow along with increased discharge during times of normal high flow. On site improvements of the riparian buffer zone will be crucial in helping to improve water quality and aquatic habitat in the stream and down stream. However, this success will be limited because of previously mentioned activities that are taking place higher in the watershed.

The riparian buffer that currently surrounds the stream is inadequate for the needs of improved water quality and stream bank stabilization. An increasingly effective riparian buffer zone will be essential in decreasing the impact of the increased runoff that will result from the construction of baseball/softball, soccer/football fields and a parking lot. This increased runoff along with the up stream effects of urbanization could be potentially devastating to the integrity of Bear Creek.

The area of the stream on the northern portion of the Newton tract on the west side of the stream has a sufficient riparian buffer. However, the east side of the stream in the northern portions of this tract shows the greatest erosion due to riparian vegetation which has been removed and replaced with pasture land. The remainder of the streams riparian buffer zone is very poorly developed.

The soil that follows the two creeks (South Bear Creek and Hinkson Creek) is Haymond, which has a slope of 0-3%, is frequently flooded, and is highly erodable. Due to this and the need to abate silt and other contaminants from entering the waterway, it is recommended to establish a riparian buffer along these creeks. The topsoil is considered good and has a good rating for planting all but wetland species plants. The plantings within the riparian zone buffer should take into consideration the occasional flooding and the erodability of the site and expect a higher mortality rate until the buffer has been established.

The most effective riparian buffer strips contain 3 zones of vegetation being planted parallel to the stream. The first zone, located closest to the stream, should be a minimum of 30 ft.-wide containing 4 to 5 rows of trees. The tree species located the closest to the stream should be selected based upon ability to quickly develop deep roots and must be tolerant of wet conditions. Bottomland species adapted to these conditions would include silver maple, willow, cottonwood, green ash, and box elder. The outer area of trees should consist of hardwoods such as black walnut, red and white oak, and white ash. These trees should only be planted if they are in a location where the water table will remain three feet below ground for most of the growing season. So, they should be planted on the uphill side of the bank where there is good drainage and the poorly drained flood areas should be planted with more tolerant species. For maintenance of tree species see Section 2, Objective 2: Maintaining Woody Cover.

The second zone should be developed in two rows of shrubs with increase diversity and wildlife habitat to the ecosystem. The shrubs will also help to slow

floodwaters when the stream leaves its channel. A mixture of species should be planted in blocks. Species such as multiflora rose (*Rosa multiflora*) or river birch (*Betula nigra*).

The final zone is the plantation of warm-season grasses. Switch grass should be the preferred species and planted in a 20-ft. strip where surface runoff is a problem because its dense, stiff stems slow the overland flow of water, allowing infiltration and sediments carried by the water to be deposited in the buffer area. In areas where surface runoff is not a problem other warm-season grasses such as Indian grass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*), and little bluestem (*Andropogon scoparius*). The total width of the proposed riparian buffer should be between 100 and 300-ft. to provide adequate wildlife habitat and travel corridors (Riparian Areas 1997). For maintenance of warm-season grasses see Section 2, Objective 3: Maintaining Non-Woody Cover.

Riparian buffers reduce the potential impact of upland development on the quality of the aquatic ecosystem. This is essential for the continued development that is occurring in Boone County, especially along Brown Station Road. The increased fish and wildlife populations along with a healthy watercourse will increase the recreational opportunities within the area (Riparian Areas 1997).

Funding for this project is proposed to incorporate cost share assistance from the USDA along with other federal and state agencies such as MDC and DNR along with a private groups interested in conserving and restoring riparian areas. Private groups could include local organizations such as the Audubon Society and other local conservation groups interested in restoring wildlife habitat in what will soon be an urbanized area. These groups may assist through donation of money to the project or time that will be required to maintain the habitat.

The riparian buffer strip must be managed and monitored closely to maintain maximum water quality. An annual inspection of the buffer should occur along with inspections immediately following severe weather events for evidence of sediment deposit, erosion, or concentrated flow channels. Any repairs that are needed should be done as soon as possible.

## OBJECTIVE 2: IMPROVE TERRESTRIAL HABITAT

### Strategy 1: Remove Litter

There are several places throughout the BCFG with large amounts of litter, trash, and debris. There are small 'dump sites' located around the buildings on the north portion of the fairgrounds. There is also a dilapidated house on the Newton tract and various trash and rubble within Bear Creek. These sites not only depreciate the aesthetics of the fairgrounds; they also pose safety hazards for visitors.

These sites will need to be cleaned. Most items will have to be removed by hand, a very labor-intensive process. We suggest that the county explore the possibility of using labor from the nearby county jail. This would minimize the capital involved while creating opportunities for prisoners to exercise and enjoy the outdoors. There may also be opportunities for local school groups or Stream Teams to assist in this effort.

### Strategy 2: Maintain Woody Cover



The Missouri Independent Conservation Consultants have chosen to design the new facilities for recreational purposes. We do, however, understand the importance of natural vegetation for aesthetics, habitat, erosion control, and riparian management. Because the majority of woody cover on the Newton and Adkins tracts is in riparian zones, it is very important to maintain areas. The soils in these areas would support introduction of yellow poplar (*Liriodendron tulipifera*), eastern cottonwood (*Populus deltoides*), and American sycamore (*Platanus occidentalis*). These species thrive in riparian environments and would add stability to the soil.

No species changes are needed at this time. The species recommendations are for necessary future additions.

Diversity in the buffer strip should be increased by alternating groups of 10-50 trees and shrubs of each species within a row. This would provide small clumps of one species that would increase specific habitat needs of wildlife (Appendix E-III).

### Strategy 3: Maintain Non-woody Cover

The development of the specialized riparian buffers describe under Strategy 3 of Objective 1 will provide greatly increased wildlife diversity and biological corridors for migrants. These areas are great for migrant songbirds and also promote the development of critical aquatic habitat for native fish species. The outermost zone within the riparian buffer includes warm-season grasses. Switch grass should be the preferred species as described previously. In areas where surface runoff is not a problem other warm-season grasses such as Indian grass, big bluestem, and little bluestem (Riparian Areas 1997)..

After sowing these grasses a bond release of at least 18 months should be required to assure the establishment of these grasses. After their establishment this zone should be burned annually or biannually to promote dense upper plant and root growth. Grasses between the shrubs and trees should be removed once during the growing season by mowing in late fall. This will also help to reduce the rodent habitat and decrease plant damage during the winter months. (Stewards of our Streams 1997).

**GOAL 2:**  
**RECREATION OPPORTUNITIES**

**OBJECTIVE 1: PROVIDE STRUCTURED RECREATION**

Strategy 1: Erect a Softball and Baseball Complex

The 20-acre sports complex is located in the southern part of the Newton and Adkins track. The complex includes six soccer fields for recreational and game settings, one premiere, lighted softball field, and one premiere, lighted baseball field (Appendix H-I). All playing fields will have bleachers for spectators. Within the complex, there is a round building that includes a comfort station and concession stand. There is direct access from the parking lot to all spectator areas from the north and south ends of the complex.

Fields Layouts:

Baseball- 90' Diamond  
350\* 350 Ft. including hooded backstop  
122,000 Sq. Ft.

Softball- 55' Diamond  
275\* 275 Ft.  
75, 625 Sq. Ft.

Soccer- 225\* 360 Ft.  
81,000 Sq. Ft.

The soccer fields will run North-South so that the sun is not directly in either team's eyes during play. To keep blinding eyes for the batter or pitcher the softball and baseball fields are laid out at a 90-degree angle to the sun's daily course. Both the softball and baseball field will be lighted for night play. Each field has 6 light posts, including 6 bulbs on each post. Both the softball and baseball fields will have electronic score boards located behind center field. The slopes on all ball fields will include a 2-4 % range, this provides adequate surface water runoff.

Comfort Station:

The Concession area will be a service to all of the athletic fields and will be placed in a central location making access from all points. Having a round building will make for more counter space and a more open environment. The building will be equipped with two large grills, and a freezer for storage. Two ADA accessible bathrooms will also be included in the facility and will be located on opposite sides of the building, one for men and one for women. A covered picnic shelter will be located to the north of the building and will have four ADA accessible table included. The land on which the building will be built is nearly flat so site work in that facet will not be a major problem.

An itemized list of the materials and their cost per square foot is attached. A diameter of 50 by 50 feet will be the smallest it could be to provide the kind of recreational satisfaction we are aiming to provide this park and community.

#### Maintenance Shed:

There will be a maintenance shed located between the baseball's right field and the softball's left field. A one-lane service road will go from the southern parking lot to the shed, for maintenance workers only. Within the softball and baseball maintenance shed will be the controls for each field's score boards. There will be a smaller maintenance shed located near the soccer fields, with a gated entrance off of the road that leads to the back parking lot. Both maintenance sheds will have first-aid access, and vehicle access to all sport fields for emergencies.

#### Parking Lot and Road Access:

A two-lane road will lead from the coliseum to the southern parking lot of the sports complex. From the fairgrounds, the road will fork, leading to the southern parking lot and around the west side of the complex to an entrance to the northern parking lot. The southern parking lot will hold parking for 150 automobiles and 6 buses. The northern lot will hold parking for 60 automobiles.

150 car lot = one Acre

One parking spot for automobile 200 sq. ft.

One parking spot for a bus = 800 sq. ft.

Turn Radius for a bus = 80 ft./ 160 sq. ft. circle

Road width= 10ft, with 3 ft. shoulder on each side

Service Road width = 15 ft

The sports complex is located in the Atkins and Newton tracts in T49N,R I 2W, Section 29,NI/2, Boone County, MO, directly north of the existing fair complex. The soccer complex will lie within a complex of Keswick-Moniteau-Weller soils. These soils show a wetness and slow surface water percolation. Although prone to standing water during large rain events, the construction of natural grass soccer fields can be modified with greater attention to drainage tiles system and substrate selection under the sod. The softball complex to the east of the soccer fields lie on alternating Keswick-Hatton soils with a small section of Weller soils on the east edge of the property line. These soils have a slope of 1-9%, but the ground has been disturbed in the southeast corner of the tract and may not have the same topsoil characteristics. The soils, similar to the soccer court, have a high level of shrink/swell and frost heaving problems due to the slow percolation of surface water. This suggests that, similar to the Nature Center, any permanent concrete structures, such as the concession/bathroom facilities, be constructed with these precautions in mind. The initial increase in construction cost will be offset by the decrease in repair cost in the future. In addition, the ball fields should include the same excess water removal methods being used in the soccer courts.

The landscaping of the baseball and softball fields will consist of a few dozen eastern white pines that will flank the scoreboards on either side. The ground in the area behind the outfield fence will be covered in mulch and neatly maintained throughout the year.

Around the concession stand will be four Bradford pear trees that will provide ample shade for the visitors as they stand in line and sit and eat. Also providing shade will be many sugar maples that will aid in shading the bleachers and dugout areas. Several small bushes and holly trees will be scattered throughout the complex to fill in areas that are barren which will enhance the aesthetic value of the facility.

The parking lots will be lined with several white oaks and white ash that will provide shade and beauty to the parking lots. Rows of yews will be planted to provide natural barriers between the parking lots and the fields. This will also provide safety to little children who may try and wander away from the ball fields and into the parking lots.

The total construction cost of the new Boone County sports complex will be \$1,197,127.90. This includes everything from construction costs from the six soccer fields, two ball diamonds, roads, concession area, parking lots, etc. The total maintenance per year will be \$12,957.66. This includes field maintenance and up keep. Our annual employee budget, which includes seven workers, will equal \$60,844.00. That includes wages paid to the maintenance workers and concession stand employees. Our plan will be to hire two fulltime maintenance workers for 26,000.00 a year each. Along with the maintenance workers will be five concession employees that will be paid \$5.50 an hour. This gives us an annual total budget of \$73,801.66. This does not include our initial construction costs of the facility.

Our annual projected revenue for the facilities will be \$513,320.00. Our facility will be active from the months of April through September. Our capacity for soccer games will equal an average of 78 games per week. At fifty dollars per field, we estimate an income of \$3,900.00 a week, for a grand total of \$93,600.00. Our capacity for our softball/baseball fields will equal an average of 44 games per week. At eighty dollars per field, we estimate an income of \$84,480.00. Spectators for the events will be an additional income for the complex. At three dollars per person, we estimate \$120.00 per soccer game and \$180.00 per softball/baseball game. This gives us a total of \$414,720.00 for admissions. Our total projected revenue will also include donations for which we estimate will be \$5,000.00 per year. Also, we did not include concession profits because we plan to break even every year.

The total revenue for the facility will be \$513,320.00 per year and our total expenses per year equals \$73,801.66 (Appendix H-II), then our total profit will equal \$439,518.34 annually. That means that within about three years our initial construction of \$1,197,127.90 will be paid in full (Appendix H-III).

### Strategy 2: Erect a Paintball Course

The closest paintball field is Kingdom City, east of Columbia approximately 30 miles. Many people enjoy participating in this sport and this demand is quickly increasing. The paintball field would give the opportunity for people of all ages that like

to hunt, a safe way to experience the sport. The starting and operational costs of paintball fields are low, yet, because of this have a high profit capability with admission prices. In addition, knowledge of the fairground existence and attendance to all fairground activities would also increase (Appendix H-IV).

These are the less desirable aspects of such a project. Difficulties in restricting paintball activities to the designated areas always pose problems without erecting expensive fencing to keep participants in. If the field were to be fenced, there will be the possibility that unruly participants will exceed boundaries. This could create conflicts between paintball users and the other people using the facilities at the fairgrounds. It would be very disturbing and a liability hazard if a paintball user were to shoot at other people in the fairgrounds or other buildings.

A paintball field would require obstacles and structures to be built. These structures would not be appealing to the eye. Even if completely natural items were used, such as log piles and straw bales, these items would be covered with paint of various colors. This would decrease the overall beauty of the area.

The use of paintballs might cause citizens to fear that these paintballs are environmentally hazardous. Even though the paint used is non-toxic, Boone County might be perceived as creating an environmental problem. This could decrease the public acceptance of the proposal. For these reasons, we have decided not to recommend a paintball field. We feel that the negative aspects of such a project outweigh the benefits that would be provided.

### Strategy 3: Erect a 3-D Walk-through Archery Course

The proposed archery range would be located in the north half of the Newton Tract (Appendix H-IV). The area would have the potential to house a 24 target 3-D range, large practice range, and Olympic style archer range. The 3-D course would be located in the northwest portion of the tract allowing for the development of a range that would utilize the existing open field and the timber located near Bear Creek. This area was chosen because it is away from the soccer and baseball fields and would not pose any unwanted hazards to the individuals participating in activities in those areas. This area is low in the terrain and is separated by hills from the other areas affording additional protection for potential dangers. The practice range and Olympic style range would be located south of the 3-D course. This location would provide adequate availability from the parking lot developed for the sports complex. The area set aside for the practice range is large enough to host Olympic style archery events held by the Missouri Show-Me Games. This would provide increased convenience to the participants in the archery events for the games, because currently these competitions are held at the Cedar Creek Rod and Gun Club, several miles east of Columbia.

Development and maintenance of the archery ranges would be done by an area archery club such as the Columbia Archers. This would provide them with a permanent venue to hold monthly outdoor 3-D shoots during the summer months. The development of the practice range would provide increased access to practice areas for archers of Boone County who currently have to go to the practice range located at Legion Fields on Route WW in Columbia. The expense for maintenance and upkeep of the range could be

distributed between the archery club, Missouri Department of Conservation and Missouri Department of Natural Resources.

The soils within the 3-D Archery Range will be on a complex of Keswick-Weller. These soils have a slope of 1-6% and have a high degree of erodability. With the higher rating of wetness and the slow percolation of these soils will require on site evaluations of reduction measures. The trails that are incorporated into the range will have to be designed to reduce the possibility of the trail itself becoming a pathway for surface water. If the trail is to be contained with vegetation for the shooting stations this will reduce the off trail foot traffic and the need for erosion control measures outside the path boundaries.

The impacts on the environment should be minimal. Increase activity in the area located around the 3-D range would only occur once a month and the rest of the time the area would remain unused. So, the disturbance of wildlife would only occur for a two-day period each month. No destruction of the current habitat would be required only the removal of a few select trees that poses problems with the development of shooting lanes. Compacting of soil will occur with the development of paths between targets on the range. However, this area is relatively flat so the increase runoff that would be produced should not pose any danger or drastically increase erosion.

## OBJECTIVE 2: PROVIDE AREAS FOR UNSTRUCTURED RECREATION

### Strategy 1: Create a Nature Trail Along Bear Creek

Using the plant inventory, we should find out which ones are dominant and which ones we should use to reclaim disturbed areas. We also need to figure out which trees will be planted, if any. The trail themes we will be implementing are: 1) Natural history and nature study, 2) Water resources and forest ecology, and 3) Physical activity and exercise. There will possibly be wildlife observation, although no special sites will be pointed out along the trail for that. The increase of wildlife habitat through riparian zone improvements will greatly increase the interest in the proposed interpretative trail.

A physical activity course will be incorporated along the trail with signs describing the action at certain stopping points. This will increase the multiple-use aspect of the trail.

To comply with ADA requirements, general use trails need well-packed or hard surfaces and gentle grades. They will also preferably form a loop from start to finish, and be ½ to 2 miles long.

There are different trail formats including loops, horseshoes, and lines. Loops return the user to the starting point without retracing part of the trail. These are good for nature study, day hikes, and use by both horses and hikers. The average length for day-use trails is usually less than 2 miles, but can be longer for other uses. Horseshoe-shaped trails are like loops, except the endpoints are at separated trailheads connected by easily accessible transportation. The line format is good for connecting a trailhead and destination and users can only return to the starting point by retracing their steps.

Preferred soil conditions include sandy and loamy soils with no shallow hardpans. Ridges and high topographic routes tend to be drier, require less construction and

maintenance, and provide panoramic views. Benches or terraces along waterways may be more favorable for trail location than the floodplain along streams. Vegetation along the proposed routes should be evaluated for both aesthetic and environmental protection concerns. Plant diversity is a desirable trail characteristic.

Conditions in favor of route selection:

- Well-drained soils
- Natural openings and scenic vistas
- Open timber and light brush
- Special historical or ecological features
- Access to, and view of, waterways
- Seasonal differences in vegetation
- Safe crossings of roads, railroads, and waterways
- Good access from parking
- Minimal conflict with existing land use

Conditions to avoid in route selection:

- Drainage constraints (wet, flat, or frequently flooded depressions)
- Unstable or fragile soils (erosive or slides)
- Steep slopes, bluffs, and cliffs
- Dense vegetation requiring excessive clearing and maintenance
- Vegetation and wildlife habitats that might be adversely affected
- Cultural and archeological sites that need to be protected
- Timbered areas subject to blowdown, falling limbs, or other dangers
- Old mine areas or other man-made hazards
- Frequent stream crossings
- Existing farmlands

Trail construction involves clearing the vegetation along the right-of-way, cleaning or surfacing the tread (walking surface), and building any planned structures. Labor and costs will be significantly influenced by the selection of tools and materials (Maintaining 21<sup>st</sup> Century Trails <http://www.outdoorlink.com>)(Trail Design <http://www.sfrc.ufl.edu/Extension/pubtxt/for5b.htm>)

### **Surfacing the Trail:**

#### Hard Surfaces

Crushed Stone:	\$40,000 per mile for a 10-foot-wide trail
Asphalt:	\$110, 000 per mile for a 10-foot-wide trail
Concrete:	\$250,000 per mile for a 10-foot-wide trail

#### Soft Surfaces

Ballast:	\$5,000 per mile for a 10-foot-wide trail
Native Soil/Grass:	\$10,000 per mile for a 10-foot-wide trail

Wood Chips: \$12,500 per mile for a 10-foot-wide trail

Gravel: \$15,000 per mile for a 10-foot-wide trail

(Surfacing your Trail <http://www.railtrails.org/surface.htm>)

### Strategy 2: Create an Open Area for Unstructured Recreation

Spontaneous recreation is commonly the most enjoyable. The lower 22 acres of the Riddenhour tract would be maintained for these kinds of activities: kite flying, playing Frisbee, pitch and catch, reading, playing with dogs off leash, and sunbathing. This area would best be landscaped with sod. The evenness of sod will allow for an easy surface to run, play, relax, walk, and dream on.

The Spontaneous Recreation Area will need to be burned and cleared (see Goal 3; Strategy 2: Create an Arboretum with Seasonal Displays). The price of sod includes preparing rough ground to be turf ready. After laying the sod, it is very important that the area be watered everyday. It may be advantageous to have a sprinkler system installed in the Spontaneous Recreation Area and set to a timer to remove any human errors.

Sod for the Spontaneous Recreation Area is priced assuming minor work would need to be done to prep the area before installation. Price includes harvest and installation. Bluegrass sod is \$3.33 per square yard. Fescue is \$3.56 per square yard. Fescue is a very tolerant grass and is good turf, but it is very competitive and may cause problems with the arboretum. The cost of bluegrass sod for 22 acres would be approximately \$1,063,630.00.



### **GOAL 3:** **ENVIRONMENTAL EDUCATION**

#### **OBJECTIVE 1: PROVIDE EDUCATION THROUGH CASUAL LEARNING**

##### **Strategy 1: Create a Nature Center with Educational Displays**

The nature center will take a year to build and it will be built east of the arboretum. The 18,300 sq. ft. nature center will cost approximately \$2.6 million to build. The architect would be Sorkin of Ginsberg and Associates of St. Louis-, MO. The contractor of the facility would be Roy Gittenmeier Contractors Inc. of Bridgeton, Missouri (Missouri Department of Conservation. 2000. Missouri Nature Centers. <http://www.conservation.state.mo.us/areas/cnc/index.shtml> March 11, 2000).

The exhibits for this nature center would cost approximately \$1.2 million. Chase Studios in Cedar Creek, Missouri would do the design of the exhibits and Design and Production in Lorton, Virginia would do fabrication. These are the companies responsible for the exhibits at the Powder Valley Nature Center (MDC) near Kirkwood, Missouri who we modeled this project after. The nature center would contain the following exhibits and facilities, all ADA accessible (Appendix I-I):

An aquarium featuring species and habitat typical of the Prairie Faunal Region (See Section 2: Biotic Resources; Fauna; Fish). This aquarium will be approximately 5 feet high by 20 feet wide by 20 feet long. Typical riparian vegetation can be modeled around the stream course.

A fish exhibit showing the species diversity of Boone County Missouri will be included along with the displays. Descriptions of life history traits as well as interesting facts about more interesting species should be included.

A prairie display should be included depicting pre-establishment prairie flora and fauna from this area.

A soil exhibit will be located between the prairie display and the forest display. A handicap accessible ramp going below ground level showing what a soil profile prior to any development in the area. The display can show information on life within soils with such things as moles, shrews, insects, grass root wads, etc.

A forest display coming up from the other side of the soil display should show replicas of native trees located within this prairie region. This display can explain the importance of these forested areas in protecting waterways and serving as corridors for wildlife. Native wildlife species can be included within the display.

A touch room will be a major attraction within the nature center. This room will allow children and adults to learn about their environment through senses other than sight. This room will also serve as an educational means of learning for

citizens in the community with visual handicaps. Displays such as songbird displays with buttons to push for their calls and descriptions of the birds will stimulate learning through sound. Freshwater muscle shells, furbearer pelts, bird feathers, and other interesting natural materials will be available for learning through touch.

A nature viewing area will include native tree species and non-woody species for attracting wildlife to be viewed through one way glass. Attracting even simple things as grey squirrels (*Sciurus niger*) could be an exciting treat to children who have never been that close to native wildlife before.

A gift shop will offer such things as birders guides which can be used in the Arboretum to bug collecting kits for children, as well as educational materials pertaining to the natural history of Boone County.

Other features of the Nature Center would include a kitchen for staff, three offices for staff, a lounge area for visitors, a display area for work done by students of the Outdoor Classroom Project, an auditorium with a 120 seat capacity (20 handicap accessible seats), a classroom, restrooms, an aquarium maintenance room, and a general maintenance room with doors leading into the nature center and to the outside of the building for deliveries and exterior maintenance supplies.

The operating costs of this nature center would be approximately \$125,000 annually. We would employ a Maintenance Supervisor, three Maintenance Assistants, and a part-time maintenance assistant (who would work 1600 hours per year). Their salaries would total \$90,000 annually. These employees would also work in maintaining the arboretum. In summary, it would take \$3.8 million to establish the nature center and \$125,000 per year to operate the facility. The nature center would be open from 8 am to 5 PM everyday. The nature center would not charge an entrance fee.

The planting and construction of Bear Creek Nature Center and Arboretum will be placed within a Keswick-Leonard-Mexico complex with slopes of 16%. The proposed site has the soil potential of frost heaving and wetness due to the shrink-swell clay content. This may have cost consequences for the building of structures and paths. It is not recommended to construct basements in these soils without further precautionary steps to ensure that fracturing of the foundations does not occur. This same frost heaving and shrink/swell nature is detrimental to certain trail/pathway construction. Therefore, any trails/paths put in this area are recommended to be gravel or wood chip construction to avoid high future repair and maintenance cost.

### Strategy 2: Create an Arboretum with Seasonal Displays

The creation of an arboretum in the Boone County Fairgrounds vicinity would meet a number of community needs. The arboretum would create jobs (maintenance staff, educational staff), after-school activities, educational opportunities, recreation, and promote natural resource awareness. No admission would be charged to view the arboretum or participate in the after-school activities. Operational funds could come

from the nature center budget, grants, the University of Missouri, visiting schools, and gifts or endowments. There are few organized after-school options for children in this area. These opportunities would benefit both the youth in the nearby neighborhoods and the students at MU who would get real world experience. This area could also be a source of community pride.

### Layout and Location

The northern most property is located between a growing subdivision and a large mobile home park. The property is partitioned off into three (Appendix I-I). The proposed arboretum would fill the northwest portion of the property, approximately 22 acres. This site was chosen due to its close proximity to both neighborhoods and its removal from the greater-fairgrounds area. The arboretum will stand alone, not as a part of the fairgrounds. Its location, nearer the neighborhoods, will place it in close vicinity to many school-aged children in need of after-school amusement.

The area would be split into four quarters (see “Arboretum” map). Each quarter would highlight one of the four seasons. To encourage study and enjoyment, the area would contain a road loop, walking trails, benches, picnic areas, a pond, a fountain, and a large gazebo (the outdoor classroom). The perimeter of the arboretum would be composed of a tall hedgerow. Because the property is situated next to private dwellings, precautions need to be taken to keep visitors from wandering into a private yard.

The area is located on soils with slopes between 1% and 9%. These gently rolling hills could easily support ADA trails and provide a beautiful landscape for wildlife watching, exercise, picnics, and education.

### Roads and Trails

A gravel road would encircle the area, guaranteeing access to the elderly and handicapped visitors. This would be a one way road entering and exiting at the same gate. The road is intended for vehicles only, not pedestrian traffic.

The trail system would travel through, and connect, each quarter. A gate in both of the south quarters would allow access to the Spontaneous Recreation Area. The trails and roads would intersect at each picnic area so as to be accessible by foot or car. A two-car turnout at each picnic site would limit the gathering size and keep the noise level to a minimum. The trails would each break off a central trail dissecting the arboretum into two halves. In the center of the arboretum, the trail would encircle a large fountain. In this area, each quarter converges and would make a lovely sitting area. Benches would face toward the center, which promotes interaction among visitors (Parks Textbook) (see “Arboretum” map)

### Pond

A pond is planned for the area between the fall and winter quarters. (see “Arboretum” map) Ponds have an aesthetic quality that cannot be overlooked. The addition of a pond would increase wildlife habitat and create another site for appreciation of nature or meditation. Proposed size is approximately 0.5 acres. This is not intended for

swimming or fishing. It would be a shallow pond (4-5 ft) meant to create an environment for ducks, fish, turtles, etc.

### Spring Display

The southeast quarter is the spring theme. Trees and flowers included in this grouping would be a colorful welcome to warmer weather. This quarter would be composed of mainly ornamental species of trees and many flower species. The upper canopy would include Japanese maple, many species of Magnolia Magnolia sp., dogwood Cornus florida, and downy serviceberry Amelanchier arborea. Flower species would include four colors of columbine, five colors of dianthus, strawberry foxglove, four colors of creeping phlox, daffodils, crocus, and a large tulip bed. The spring flowers will bloom from the very earliest of spring until nearly summer.

The real beauty of the spring quarter would extend from late February until late May or early June. Although the brilliant color will fade in several months, the area will remain green throughout the season.

### Summer Display

The southwest quarter is the summer theme. Trees, native grasses, and flowers here will exhibit the beauty of Missouri's wildflowers and provide a bird and butterfly viewing area. This area will contain fewer tree species and have a more prairie-like atmosphere. Flowers would generally bloom from early May into October.

The summer theme can be implemented in one of two ways, seeding or planting. Seeding is significantly less expensive, but the plants will likely not reach blooming age for three years. Planting nursery-reared stock would provide immediate aesthetic gratification, and the cost would provide immediate monetary gratification to the nursery.

The seeded beds would be composed of a "dry, shallow soil mix" (Missouri Wildflowers Nursery). This mix was chosen due to the erosion of the topsoil in the area. Species would attract wildlife. Contents would include: Coreopsis lanceolata, plains coreopsis Coreopsis tinctoria, pale purple coneflower Echinacea purpurea, yellow coneflower Echinacea paradoxa, rattlesnake master Eryngium yuccifolium, western sunflower Helianthus occidentalis, roundheaded bushclover Lespedeza capitata, prairie blazing star Liatris pycnostachya, bottlebrush blazing star Liatris mucronata, Missouri primrose Oenothera macrocarpa, a palafoxia, purple beard-tongue Penstemon cobaea, white prairie clover Dalea candida, purple prairie clover Dalea purpurea, gray-head coneflower Ratibida pinnata, black-eyed Susan Rudbeckia hirta and Missouri coneflower Rudbeckia missouriensis.

The nursery stock beds would be of two mixtures; one specifically geared to attracting butterflies and the other to attracting hummingbirds. The species planted in the butterfly bed would include: purple coneflower Echinacea purpurea, garden phlox Phlox paniculata, butterfly weed Asclepias tuberosa, lavender aster Aster turbinellus, purple prairie clover Dalea purpurea, Ohio horse mint Blephilia ciliata, downy phlox Phlox pilosa sp. Ozarkana, dutchman's pipevine Aristolochia tomentosa, spice bush Lindera benzoin, rose verbena Glandularia canadensis, prairie blazing star Liatris pycnostachya and eastern blazing star Liatris scariosa. The hummingbird bed would include: fire pink

Silene virginica, columbine Aquilegia canadensis, cardinal flower Lobelia cardinalis, New Jersey tea Ceanothus americanus, wild bergamot Monarda fistulosa, rose verbena Glandularia canadensis, foxglove beard-tongue Penstemon digitalis, tall larkspur Delphinium exaltatum, garden phlox Phlox paniculata, blue sage Salvia azurea, and royal catch fly Silene regia.

Either planting scheme will need to be burned periodically. It is recommended to have a bi-annual burn schedule. The trail could be laid out to bisect the quarter and the halves could be burned in alternating years. The location of this quarter is situated at the farthest point from neighboring residences, to aid in the feasibility of a burning regime.

### Fall Display

The northwest quarter will highlight the brilliant color of Missouri's foliage. Tree species would include: white ash Fraxinus americana, green ash Fraxinus pennsylvanica, American Basswood Tilia americana, river birch Betula nigra, black cherry Prunus serotina, dogwood Cornus florida, downy hawthorn Crataegus mollis, hazelnut Corylus americana, shagbark hickory Carya cordiformis, ironwood Ostrya virginiana, red maple Acer rubrum, sugar maple Acer saccharum, muscledwood Carpinus caroliniana, northern red oak Quercus rubra, white oak Quercus alba, eastern redbud Cercis canadensis, sassafras Sassafras albidum, and downy serviceberry Amelanchier arborea. The charm of this area will be that it will be shady and cool in the summer and brilliantly colored in the fall.

After establishment, this area will take many years to reach its peak. The understory species, such as eastern redbud, dogwood, ironwood, and downy serviceberry, will establish and reach coloring stage in a few years. The canopy species will begin to color in a few years, but will not reach shade height for at least twenty years.

### Winter Display

The northeast quarter is the winter theme. Tree species will include Norway spruce Picea abies, Eastern white pine Pinus strobus, eastern arborvitae Thuja occidentalis, American holly Ilex opaca, Japanese holly Ilex sp., and Pacific yew Taxus brevifolia. Female yew produce beautiful red berries, but they are poisonous. If females were placed in the arboretum, they should not be on the path, rather set as far away as possible while still visible. Trees and shrubs in this area would rely on colorful berries and the textures of each different species to create a lovely theme. This area would also create a shady place to picnic in the summer, but would rely on the smaller species to carry the winter theme until the taller species were more fully grown.

Currently, the Riddenhour property is an old field. The vegetation is mainly weeds and cedars. According to Missouri Wildflowers Nursery, the easiest way to remove the undesirable species is with fire and herbicides. A fire in the late spring, after everything greens up but BEFORE creation of seed, would kill most of the weeds. By this point, the plants have used up their winter reserves for growth and if burned, don't have enough energy to grow further or produce seed. Later in the season, a herbicide application on anything green would remove more vegetation.

The Spring beds require more maintenance than the other themes. These ornamental species need rich soil and fertilizer. Topsoil should be brought in to create the individual flowerbeds. The tree species can be planted in the area's natural soil. Bulbs will need to be planted in the fall because they need the cold temperatures to break dormancy.

The Summer beds will require much less attention during planting. Broadcast seeding in the fall will ensure proper seed depth. The seeds will be planted naturally due to frost heaving over the winter. Many of the wildflower seeds also need the cold winter temperatures to break dormancy. Seeding will produce flowers in three years. Planting nursery stock would produce flowers immediately.

The Fall quarter would require the planting of saplings. And perhaps the laying of sod or direct application of grass seed.

The Winter quarter would require the planting of small trees and bushes or hedges. No sod would need to be planted due to the shed needles which will build up under these plants.

The perimeter hedgerow, of indigo bush would grow 6-8 feet. This barrier would provide a striking blue backdrop to each garden as well as keep wandering visitors out of the neighbors' yards.

It may be advantageous to have a sprinkler system installed in the Spontaneous Recreation Area and set to a timer to remove any human errors.

The start up costs for the Arboretum would be high. Costs for the Arboretum would include removal of the present vegetation (fire and herbicides), seed, bulb, and tree cost, planting, fire-ail and road construction, concrete pads for picnic tables, picnic tables and benches, the fountain, lake construction, the gazebo, and bar-be-que pits. Additional costs for ducks and fish should also be considered.

Seed for the Summer quarter mix cost \$90.00 per pound. Eight to nine pounds will create a continuous bed of flowers. Native grasses can be planted with the wildflowers or around beds for effect. Grasses should be planted at ten pounds to the acre and cost from \$8.00-\$120.00 per pound. With approximately 5 acres set aside for the Summer quarter, the amount of wildflower mix necessary would be 45 pounds, \$4050.00. Planting nursery stock, each butterfly and hummingbird grouping covers 25 square feet and cost \$45.00 per grouping. The 5 acres of planted nursery stock would require 8711 groupings and cost approximately \$392,000.00.

Saplings for the Fall quarter can be acquired more cheaply at the state nursery in Licking, MO. Check for prices. Tree and shrub species for the Winter quarter will vary by garden center. Put the job up for bid.

The hedgerow species cost \$7.50 apiece and cover 5-8 feet. Approximately 915 plants would encircle the area at a cost of \$6864.00.

The proposed gravel roads are 6277 feet in length. Gravel costs \$100 per 16 tons. The road would require 432 tons at a total cost of \$2700.

The proposed mulch trails would have a combined length of 6330 feet. The trail would be 6 feet wide and 6 inches deep. Single group mulch is \$12.00 per half-cubic yard. The total cost would be \$5626.

Picnic tables cost between \$245 and \$500. The plan calls for 7 tables, at a cost of between \$1710 and \$3500. Each picnic table should sit on a concrete pad to decrease

damage to the grass and decrease soil compaction. Concrete costs \$3.00 per square foot, each pad would be 200 square feet, at \$600 per pad. Seven pads would cost \$4200.

The gazebo, the site of the outdoor classroom, would cost approximately \$10,000. The gazebo would be 600 square feet.

Benches cost between \$170 and \$500. The plan calls for 19 benches. The cost would be between \$3230 and \$9500. The fountain would cost \$3000. The half-acre pond would cost \$3500 to excavate.

## OBJECTIVE 2: PROVIDE STRUCTURED ENVIRONMENTAL EDUCATION

### Strategy 1: Create Nature Classes and Shows within the Nature Center

One of the main attractions at the Runge Nature Center (MDC) in Jefferson City, Missouri is Glen Chambers and his otter show. Shows such as these will be showcased in the new Bear Creek Nature Center in it's ADA accessible auditorium. Interpretive shows such as these will be available year round for citizens to attend free of charge. These shows can be advertised by the Missouri Conservationist magazine as well as on COIN community bulletin board for Columbia and Boone County and at county libraries.

Within the Nature Center there will also be classes which can be given by area experts in natural resource related fields as well as area teachers and volunteers. Programs as small as the Audubon Society of Mid-Missouri's Storybook Hour brings in as many as 30 children at a time with advertising done only through their newsletter The Chat and signs posted at Daniel Boone Regional Library in Columbia, Missouri (Heather Willman, Audubon Story Hour Volunteer, personal communication).

### Strategy 2: Create an Outdoor Classroom within the Arboretum

The gazebo is where the real importance of the arboretum lies. The gazebo would be large, circular, and screened. It would be the site for an outdoor classroom and after school activities. The nature center would employ one or two naturalists whose sole responsibilities would be to create opportunities for outdoor education. The elementary, and even secondary schools, would be on a schedule so that school children were always on the premises. Individual classes would ideally get at least four visits to the nature center and arboretum to learn about the attributes of the four seasons, ecology, and wildlife. Another aspect of the program could include the University of Missouri. Students in Parks, Recreation, and Tourism and in Education could participate in work-study to create and run after school activities for the youth in the area. Activities could include crafts, science experiments, or help with homework. Internships over the summer would give the same experiences and exposure to the youth and the students. I believe this aspect would be the most important. It would give students real world experience and give the youth of northern Columbia an alternative to the couch or crime.

## **GOAL 4:** **↻ ENHANCE EXISTING FACILITIES ↻**

### **OBJECTIVE 1: REMOVE UNSIGHTLY AND UNSAFE FEATURES**

#### **Strategy 1: Remove Litter and Buildings in Disrepair**

There are several places though out the BCFG with large amounts of litter, trash, and debris. There are small 'dump sites' located around the buildings on the north portion of the fairgrounds. There is also a dilapidated house on the Newton tract and various trash and rubble within Bear Creek. These sites no only depreciate the aesthetics of the fairgrounds; they also pose safety hazards for visitors.

These sites will need to be cleaned. Most items will have to be removed by hand, a very labor-intensive process. We suggest that the county explore the possibility of using labor from the nearby county jail. This would minimize the capital involved while creating opportunities for prisoners to exercise and enjoy the outdoors. There may also be opportunities for local school groups or Stream Teams to assist in this effort.

### **OBJECTIVE 2: IMPROVE VISUAL ASTHETICS OF EXISTING FACILITIES**

#### **Strategy 1: Landscape Around Fairground Buildings**

The soils on the fairground complex are highly disturbed by the construction history and high traffic when in use. The soils vary greatly and include seven of the nine total soils we are concerned with. The slope varies with 0-9%, level slow drainage to steep and highly erodable. The recommendations of establishing a beautification project with plantings of flowers and trees should be planned with these varying conditions, as well as the urban environments that the plants will contend with in mind. Consider plantings for the potential to abate erosion and resistance/tolerance of harsher conditions. The soil is slow to percolate excess surface water and is susceptible to occasional flooding. Some areas have a frost heaving and shrink/swell problem due to this slow percolation problem. Therefore, if any planter construction is to be made, the precautions to reduce repair costs should be considered.

The entryway to the fairgrounds, off Oakland Gravel Road, needs improvement. Raised flowerbeds should be placed on both sides of the entranceway to catch the eye of people. In the center of the flowerbeds, a sign should be placed that states the current activities of the fairgrounds. Along the backside of the flowerbed, a hedge such as a row of yews, viburnums, or boxwoods should be planted to frame the sign.

Along the edge of the fairgrounds, parallel with Oakland Gravel Road, a row of flowering trees such as Cleveland pears improve the aesthetics. Cleveland pears should be used instead of Bradford pears due to their longevity and wind-firmness.

On either side of Coliseum Boulevard 6-7 single stemmed or clumped flowering trees such as sandcherries should be planted. This species thrives in full sun and would be a fantastic sight as one drives up the entrance.



On the eastern side of the drive, Japanese or little princess holly would make the monument more noticeable to people attending the fairgrounds.

The areas on the south and the east sides of the coliseum should be landscaped as well. On the south side, between the coliseum and the horse barns, flowering, shade trees could be incorporated into the landscaping. Species such as Northern red oaks and green ash can be used for shade and redbuds or Cherokee dogwoods for flowers.

On the eastern side of the Coliseum, daylilies, arborvitaes, or yews could be planted to line the sidewalks. On the eastern side there are three separate areas of grass, separated by the sidewalks. On the outer two sections of grass, shade trees could be planted. A picnic table or bench could be placed below the trees. In the center section a group of clumped species such as magnolias, sandcherries, or redbuds could be planted. On the eastern side of the building, the sidewalk that runs parallel with the building, an area 5-feet wide, could be filled with multicolored river rock and edged with diamond rock. In the rock area between the two sidewalks, a small pool (3'X4') would be placed in the middle of the multicolored rock.

A flagpole needs to be erected on the eastern side of the building displaying the county, state, and federal flags.

#### Strategy 2: Landscape Around the Boone County Jail

Shade trees need to be planted, such as oaks, ashes, maples, or hickories. Underneath the shade trees, benches and tables could be placed to alleviate overcrowding on visitor's day. A few flowering species could be planted to brighten the day of visitors that are going to visit inmates.

## SECTION 4: FINAL PROPOSAL

### ❧ COST-BENEFIT ANALYSIS OF 5 YEAR PLAN ❧

#### ❧ SUMMARY ❧

## ❧ REFERENCE ❧

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## ❧ APPENDIX ❧

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- A-II Table of Current Columbia Recreational Facilities

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- H-I Sports Complex Layout
- H-II Annual Expenses of Soccer and Baseball Fields
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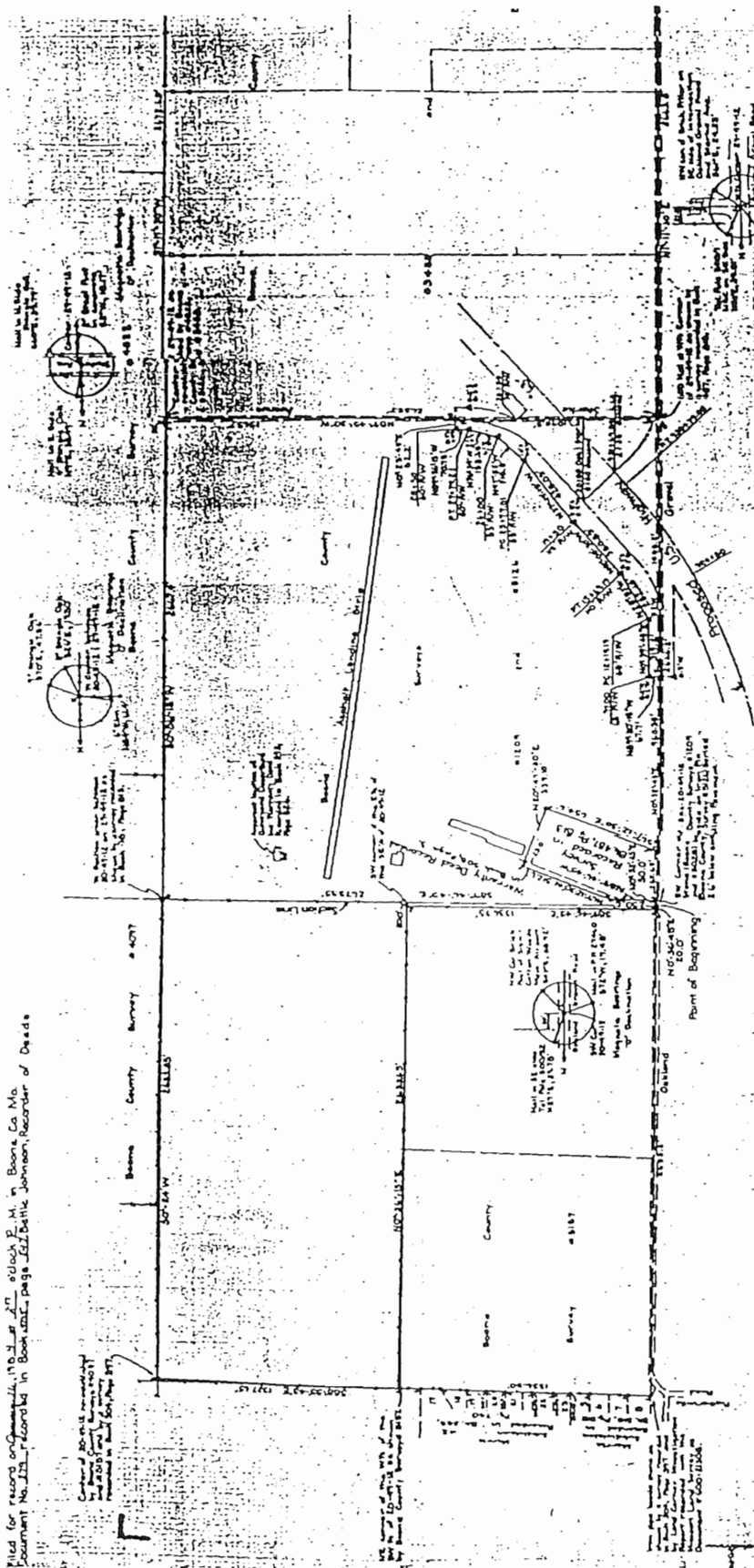
- I-I Nature Center, Arboretum, and Spontaneous Recreation Area

A-II Table of Current Columbia Recreational Facilities

Name	Area	Fitness Course	Shelter	Horseshoes	Basketball	Soccer	Baseball	Softball	Lights	Electricity	Water	Restrooms	Picnic Tables
Again Street Park-School	10 acres	yes	1-non-reservable	yes	1-full size	1-practice	1	1	no	no	no	no	7
Albert-Oakland Park	75 acres	no	3-reservable	no	1	1-practice	2	2	yes	11 outlets	yes	yes	30, 3-ADA
American Legion Park	20 acres	no	1-reservable	no	no	1-practice	2	no	no	no	yes	yes	7, 1-ADA
Bear Creek Park	10 acres	no	1-non-reservable	no	1-full size	no	1	1	no	4-110 volt outlets	no	no	2
Brown Station Park	6.5 acres	no	no	no	no	no	no	no	no	no	no	no	no
Capen Park	30 acres	no	no	no	no	no	no	no	no	no	no	no	no
Cliff Drive Park	1 acre	no	no	no	no	no	no	no	no	no	no	no	yes
Columbia Cosmopolitan Recreation Park	520 acres	no	clubhouse	lighted, multiple	no	18	complex	complex	yes	yes	no	no	no
Cosmo-Bethel Park	40 acres	no	3-reservable	yes, multiple	no	no	1	1	yes	1-220 v, 1-110 v	yes	yes	yes
Douglass Park and Pool - School	8 acres	no	1-non-reservable	yes, multiple	no	no	1	1	yes	1-220 v, 8-110 v	yes	yes	15
Downtown Optimist Park	1 acre	no	1-non-reservable	no	1-half court	no	no	no	no	no	yes	no	2
Fairview Park-School	27 acres	no	1-reservable	no	no	1-practice	1	1	yes	1-220 v, 4-110 v	yes	no	9
Grindstone Nature Area	200 acres	no	1-non-reservable	no	no	no	no	no	no	no	no	no	3
Hickman Municipal Pool	1 acre	no	no	no	no	no	1	no	no	no	yes	no	no
Highpointe Park	9 acres	no	no	no	no	no	no	no	no	no	no	no	no
Indian Hills Park	38 acres	no	1-non-reservable	no	1-full size	no	1	1	yes	1-110 volt outlet	yes	nearby	yes
Kwanis Park	19 acres		2-reservable	no	no	no	no	no	yes	2-220 v, 7-110 v	yes	nearby	25, 1-ADA
Lake of the Woods Recreation Area	148 acres	no	no	no	no	no	no	no	no	no	yes	yes	yes
Lion-Stephens Park	15 acres	yes	1-non-reservable	no	no	no	no	no	no	no	yes	no	7
McKee Street Park	4.5 acres	no	no	no	yes, multiple	no	no	yes	no	no	no	no	no
MKT Nature and Fitness Trail	352 acres	yes	no	no	no	no	no	no	no	no	yes	yes	no
Nifong Park	60 acres	no	1-reservable	no	no	no	no	no	yes	1-220 v, 4-110 v	yes	nearby	17
Oakwood Hills Park	10 acres	yes	no	no	yes	no	no	no	no	no	no	no	yes
Paquin Park	1 acre	no	1-non-reservable	yes, multiple	no	no	no	no	no	no	yes	no	5
Parkade Park-School	3 acres	yes	1-non-reservable	no	yes, multiple	yes	no	no	no	no	no	no	4
Proctor Park	10 acres	no	1-non-reservable	no	no	no	no	no	no	no	no	no	3
Rock Bridge High School		no	no	no	no	no	yes	yes	no	no	no	no	no
Rock Bridge Park	3 acres	no	1-non-reservable	no	1, full size	no	1	1	no	no	no	no	4
Rock Quarry Park	19 acres	no	1-reservable	no	no	no	1	1	yes	1-220 v, 12-110 v	yes	nearby	7, 2-ADA
Rockhill Park	5 acres	no	no	no	no	no	no	no	no	no	no	no	yes
Rothwell Park	5 acres	no	no	no	no	no	no	no	no	no	no	no	yes
Shepard Boulevard Park-School	5 acres	no	1-reservable	no	no	1	no	no	yes	8-110 volt outlets	yes	yes	10, 2-ADA
Twin Lakes Recreation Area	60 acres	no	1-reservable	no	no	no	no	no	yes	2-220 v, 20-110 v	yes	yes	24, 1-ADA
Valleyview Park	8 acres	no	no	no	yes	yes	yes	no	no	no	no	no	no
Village Square Park	4.25 acres	no	1-non-reservable	no	1, half court	no	no	no	no	no	no	no	8, 1-ADA
Woodridge Park	6.5 acres	no	no	no	yes	yes	yes	no	no	no	no	no	no
Worley Street Park	3 acres	no	no	no	1, full size	no	no	no	no	no	yes	no	yes

A-II

	BBQ Grills	Drinking Fountains	Playgrounds	Volleyball	Disc Golf	Pool	Archery	Concessions	Trails	Tennis	T-ball	Fishing	Telephones	Natural Areas	Football	Skateboard Facilities	Golf	Cross Country Sking	Theatre	Garden	Shuffleboard	Lake, Beach, Waterslide
1-ADA double	no	-	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	
3 double	2		2	2 lighted, sand	36 holes	yes	no	no	hard surface	3 lighted	no	no	no	yes, with creek	yes, at the school	no	no	no	no	no	no	no
1 double	1		yes	no	no	no	yes	yes	no	no	no	no	yes	no	no	no	no	no	no	no	no	
1-ADA double	no		yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	
no	no		yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	
no	no		no	no	no	no	no	no	hiking	no	no	no	no	no	no	no	no	no	no	no	no	
no	no		no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	
no	no		yes	12, sand	no	no	no	yes	3	8, lighted	yes	yes	yes	yes, with trail	no	yes	yes	no	no	no	no	no
8-ADA s, 1-ADA d	1, ADA		yes	1, sand	no	no	no	no	no	no	no	yes	no	no	no	no	no	no	no	no	no	no
3 single, 1-ADA	1-ADA		yes	no	no	yes	no	no	no	no	no	no	yes	no	no	no	no	no	no	no	no	
2 single	1-ADA		yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	
1-ADA double	1-ADA		yes	1, sand	no	no	no	no	wooded, hiking	4	yes	no	no	no	no	no	no	no	no	no	no	no
1-ADA double	no		no	no	no	no	no	no	yes	no	no	no	no	yes, with creek	no	no	no	no	no	no	no	
no	yes		no	no	no	yes	no	no	no	4	no	no	no	no	no	no	no	no	no	no	no	
no	no		no	1, sand	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	
1-ADA s, 1-ADA d	1-ADA, 1-standard		yes	1, sand	no	no	no	no	no	no	no	no	no	yes	no	no	no	no	no	no	no	no
3 double, 1-ADA	1-standard		no	no	no	no	no	no	wooded	no	no	no	no	yes	no	no	no	no	no	no	no	
no	yes		no	no	no	yes	no	yes	no	no	no	yes	no	no	no	no	18 ft	no	no	no	no	no
no	1-ADA		yes	no	no	no	no	no	yes, asphalt	no	no	no	no	no	no	no	no	no	no	no	no	no
no	no		yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	
no	yes		no	no	no	no	no	no	yes	no	no	no	no	yes	no	no	no	yes	no	no	no	no
no	1-standard		no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	yes	no	no	no
no	no		yes	no	no	no	no	no	yes	no	no	no	no	yes	no	no	no	no	no	no	no	no
2-ADA single	1-ADA		no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	yes	yes	no
1-ADA double	no		yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
1 single	no		swingset	no	no	no	no	no	no	no	no	no	no	yes, with creek	no	no	no	no	no	no	no	no
no	no		no	no	no	no	no	no	no	yes	no	no	no	no	no	no	no	no	no	no	no	no
no	no		yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
2-ADA double	2-ADA		yes	1, sand	no	no	no	no	yes. Gravel	no	no	no	no	no	no	no	no	no	no	no	no	no
no	no		no	no	no	no	no	no	yes	no	no	no	no	yes	no	no	no	no	no	no	no	no
no	no		no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
1-ADA double	1-ADA		yes	1	no	no	no	no	no	2	no	no	no	no	no	no	no	no	no	no	no	no
4-ADA double	1-ADA		no	no	no	no	no	yes	yes, to MKT	no	no	yes	no	no	no	no	no	no	no	no	yes	no
no	no		yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
1-ADA double	no		yes	no	no	no	no	no	yes	no	no	no	no	yes, with creek	no	no	no	no	no	no	no	no
no	no		yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
no	yes		yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no



Thence leaving said right-of-way line with the west line of 29-44-1E N032-48-7E, 1,603.55 feet to an existing iron pipe at the southwest corner of a survey recorded in Book 4887, Page 851.

Thence with said survey 349.12 to 50° E, 604.4 feet to an existing iron pipe.

Thence N020°47'30"E 339.15 feet to a set iron pipe at the northeast corner of a Warranty Deed recorded in Book 4887, Page 851.

Thence with said deed line N91°12'30"W, 512.4 feet to a set iron pipe.

Thence N069°14'45"W, 250.4 feet to an existing iron pipe on the west line of 29-49-1E.

Thence N003°23'45"E, 300 feet to the Point of Beginning and containing 224-72.86 ACES.

Survey and Plat by Allstate Consultants

Ran C. Shaw L. 6:1809

Subscribed and sworn to before me this 22<sup>d</sup> day of May, 1982.

Chitra P. Singh Notary Public

Vicky M. Shny ,  
My commission expires June 27, 1985.

State of Missouri) ss  
County of Boone

Witness my hand and official seal on  
this 12th day of December 1968  
by James H. Hester Deputy  
Recorder of Deeds

cerity that in April, 1902, I completed a survey for Jere Enterprises, and Dorothy M. Clark of the East half of the Southwest quarter and the south twenty (20) feet of the West half of the Southwest quarter both in Section 201 and the Northwest quarter of Section 28, T26E27R, that portion taken for right-of-way by ECEP for a track shown by a survey recorded in Book 487-1, page 10, and ECEP for a ground described in a Warranty Deed recorded in Book 393, page 526; ALL in Township 43 North, Range 12 West, Boone County, Missouri, and more particularly described as follows:

Beginning at, on an existing obelisk beside one the Southwest corner of 29-49-21, thence with the west line of 29-49-12 N30°W45', 200 feet to a set iron pipe.

Thence S89°W41'45"E, 1334.95 feet to a set iron pipe.

Thence N0°34'-45"E, 1324.65 feet to a set iron pipe on the Earthlink subdivision line.

Thence S86°55'-45"E, 1321.65 feet to a set iron pipe at the center of 20-49-12.

Thence S07°N41', 2433.05 feet to an existing stone at the quarter section corner between 20-49-12 and 29-49-12.

Thence S05°56'-15"W, 2467.4 feet to a set iron pipe at the center of 29-49-21.

Thence with the western subdivision line of 29-49-22 N29°W45'S0°W, 1365.2 feet to a set iron pipe at the right-of-way line of 29's 1/2.

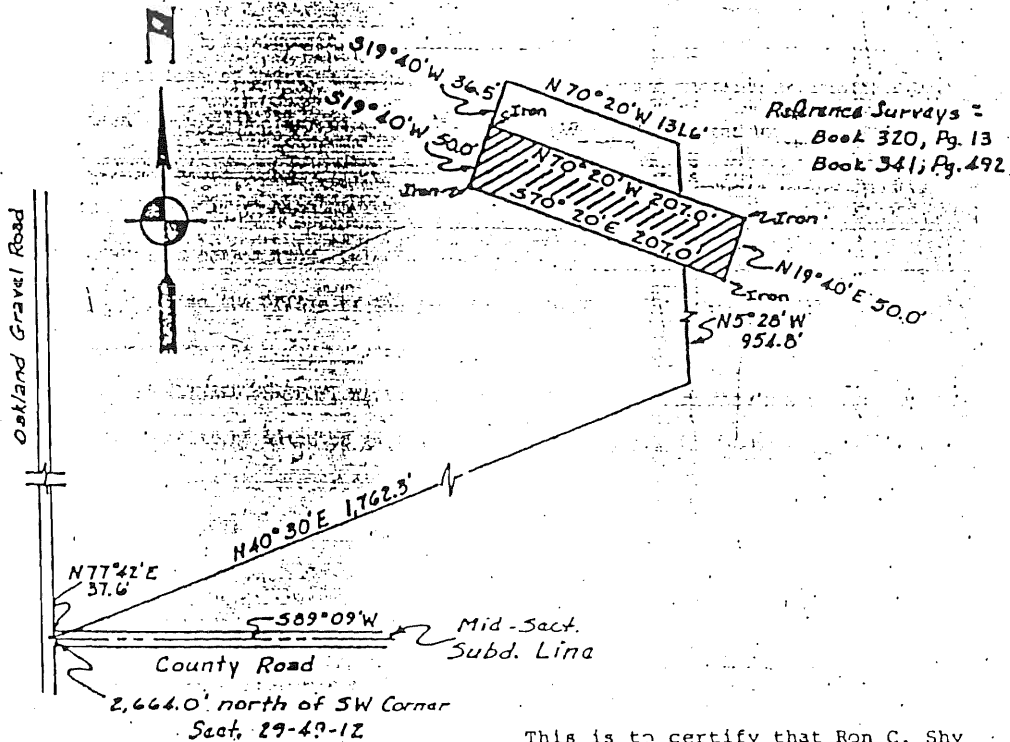
Thence with said right-of-way line N02°33'46"E, 552.2 feet.

Thence N07-39-45 E, 317.2 feet  
Thence N89-28-15 W, 67.7 feet to a set iron pipe on the west line of 29-49-121



Record for record on May 3, 1972 of 24 in Boone Co.  
 Document No. 3194 recorded in Book 400 page 383 Betty Saunders, Recorder of Boone Co.

Survey for Aero Industrial Ent., Inc.



This is to certify that Ron C. Shy made a survey for Aero Industrial Ent., Inc. located in the NW Quarter of Section 29, Township 49 North, Range 12 West, Boone County, Missouri described as follows:

Starting at a point 2,664.0 feet north of the SW corner of Section 29, Township 49 North, Range 12 West, thence N77°42'E, 37.6 feet; thence N40°30'E, 1,762.3 feet; thence N5°28'W, 954.8 feet; thence N70°20'W, 131.6 feet; thence S19°40'W, 36.5 feet to the point of beginning;

thence S19°40'W, 50.0 feet; thence S70°20'E, 207.0 feet; thence N19°40'E, 50.0 feet; thence N70°20'W, 207.0 feet to the point of beginning, the Tract containing 0.238 Acres.

CHECKED AND APPROVED BY:

Subscribed and sworn to before me a Notary Public on this 2nd day of May, 1972

D. E. Hill, M.L.S.

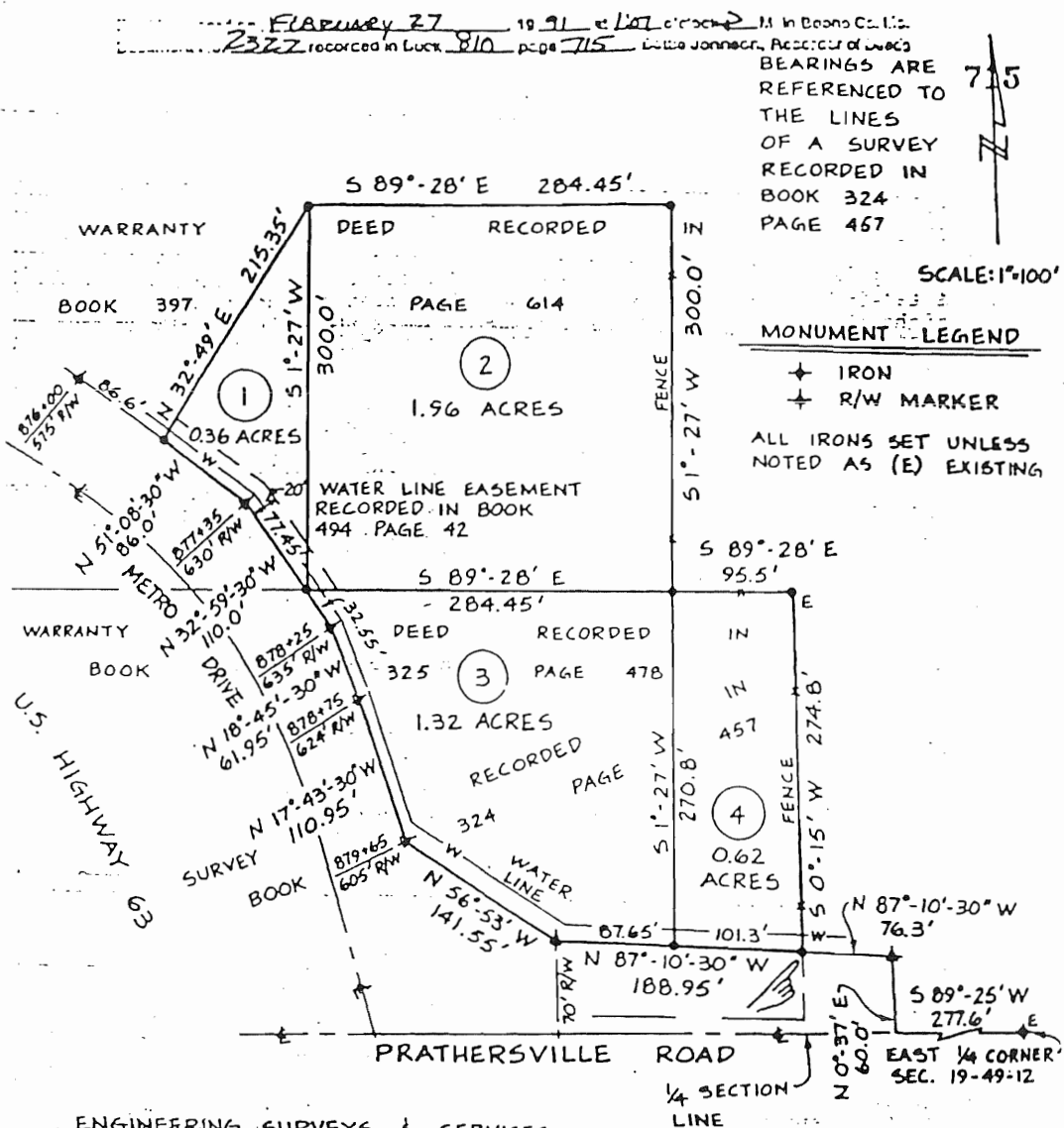
Notary Public  
 My Commission Expires: Sept 3, 1974

State of Missouri )  
 County of Boone )  
 I, the undersigned Recorder of Deeds for said County and State do hereby certify that the foregoing instrument of writing was filed for record in my office on the 3 day of May, 1972 at 10 o'clock and 21 minutes A.M. and is truly recorded in Book 400 page 383.  
 Witness my hand and official seal of the day and year aforesaid.

Betty Saunders Recorder

By Barbara Spigel Deputy



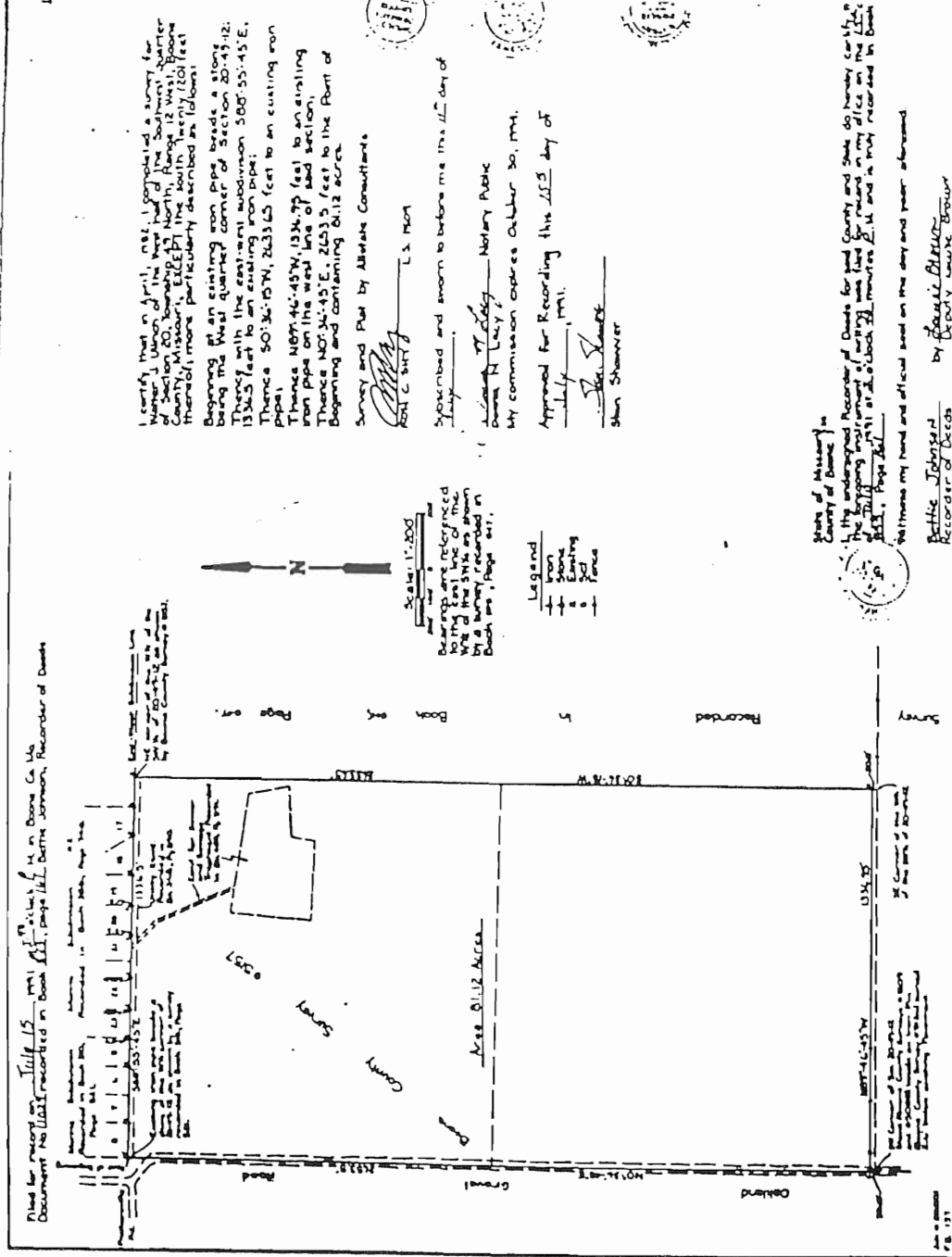


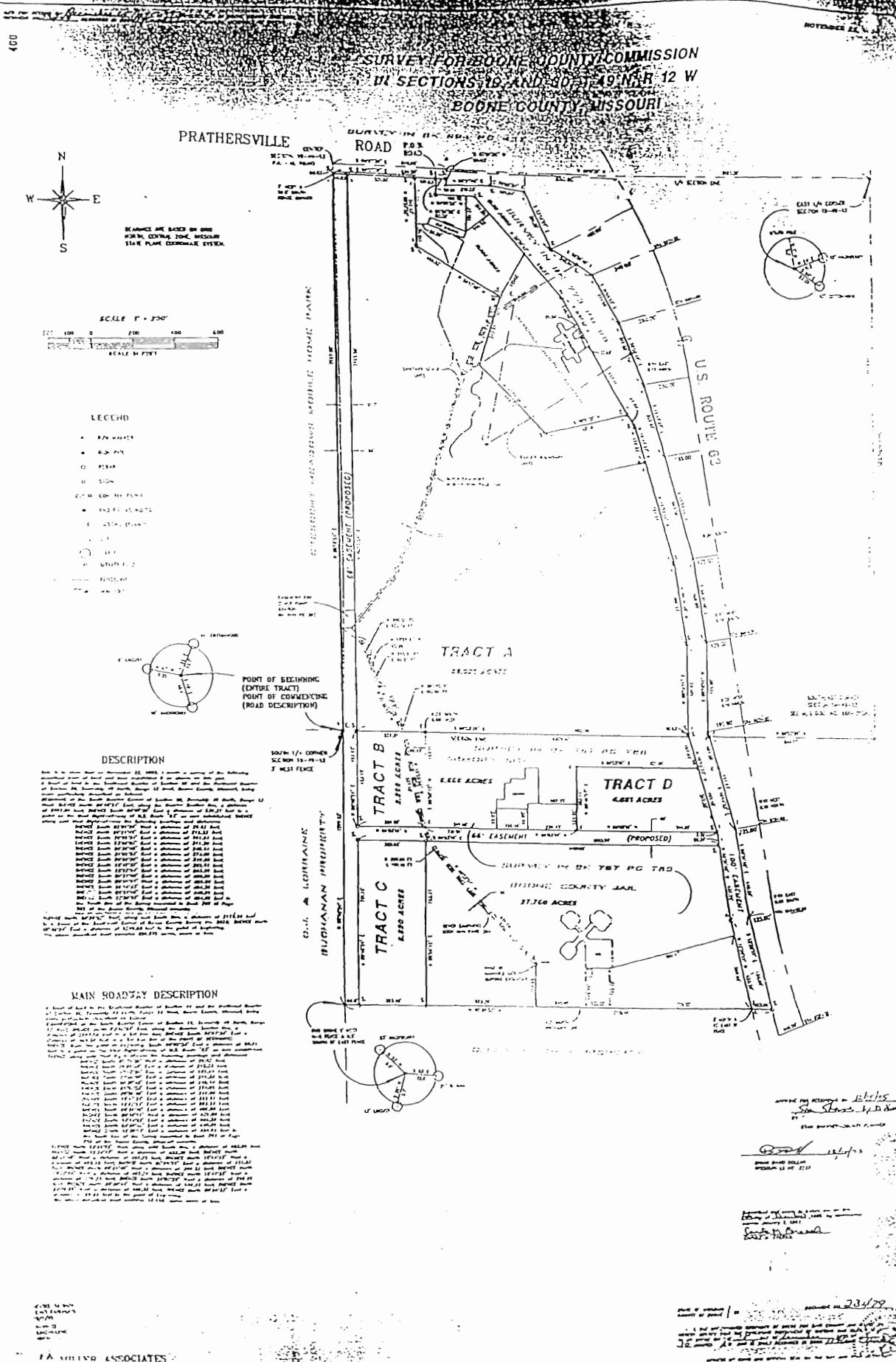
ENGINEERING SURVEYS & SERVICES

BY

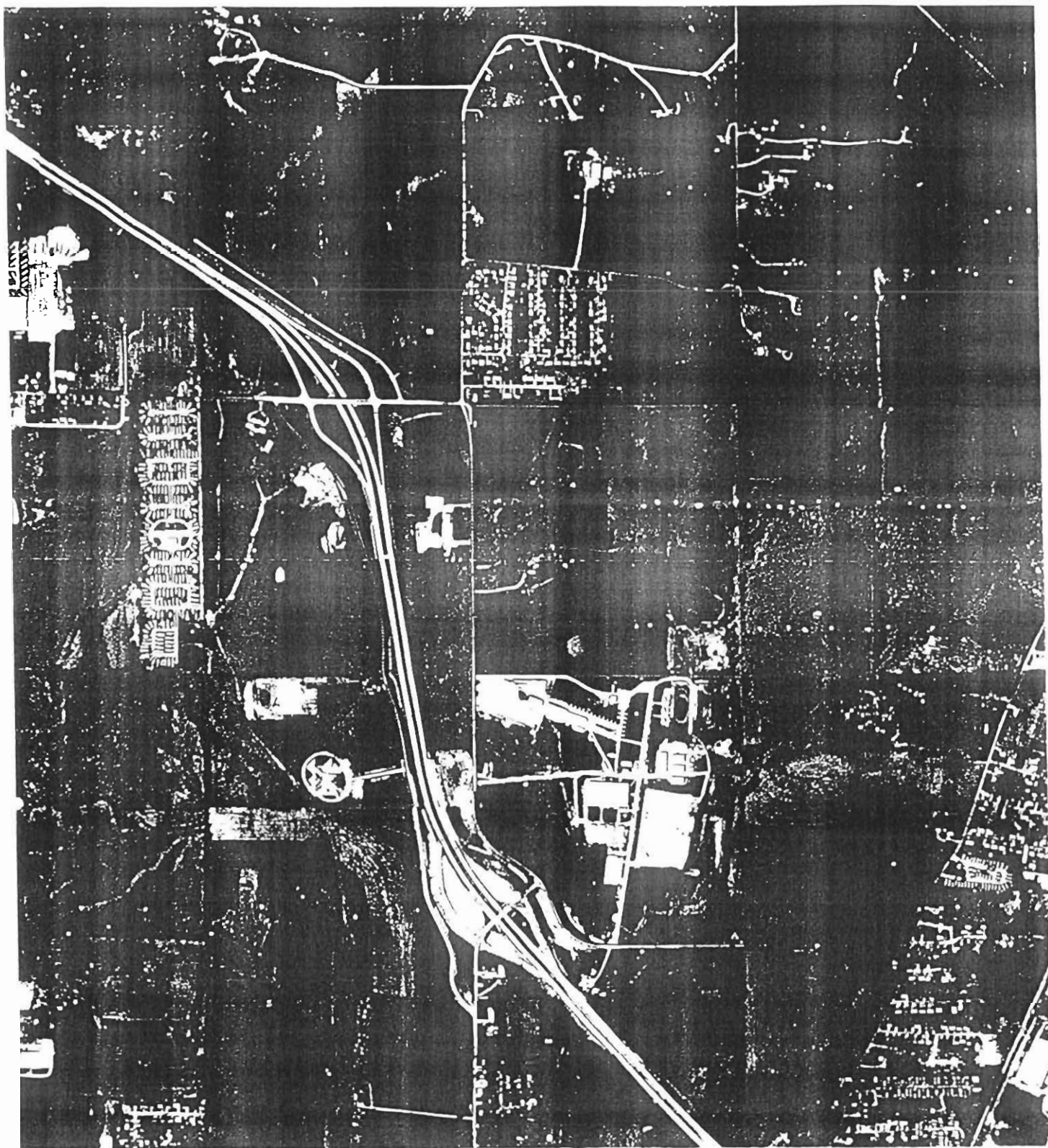


TIMOTHY J. REED  
 REGISTERED LAND SURVEYOR  
 LS - 2089





# Boone County Fairgrounds Boundaries

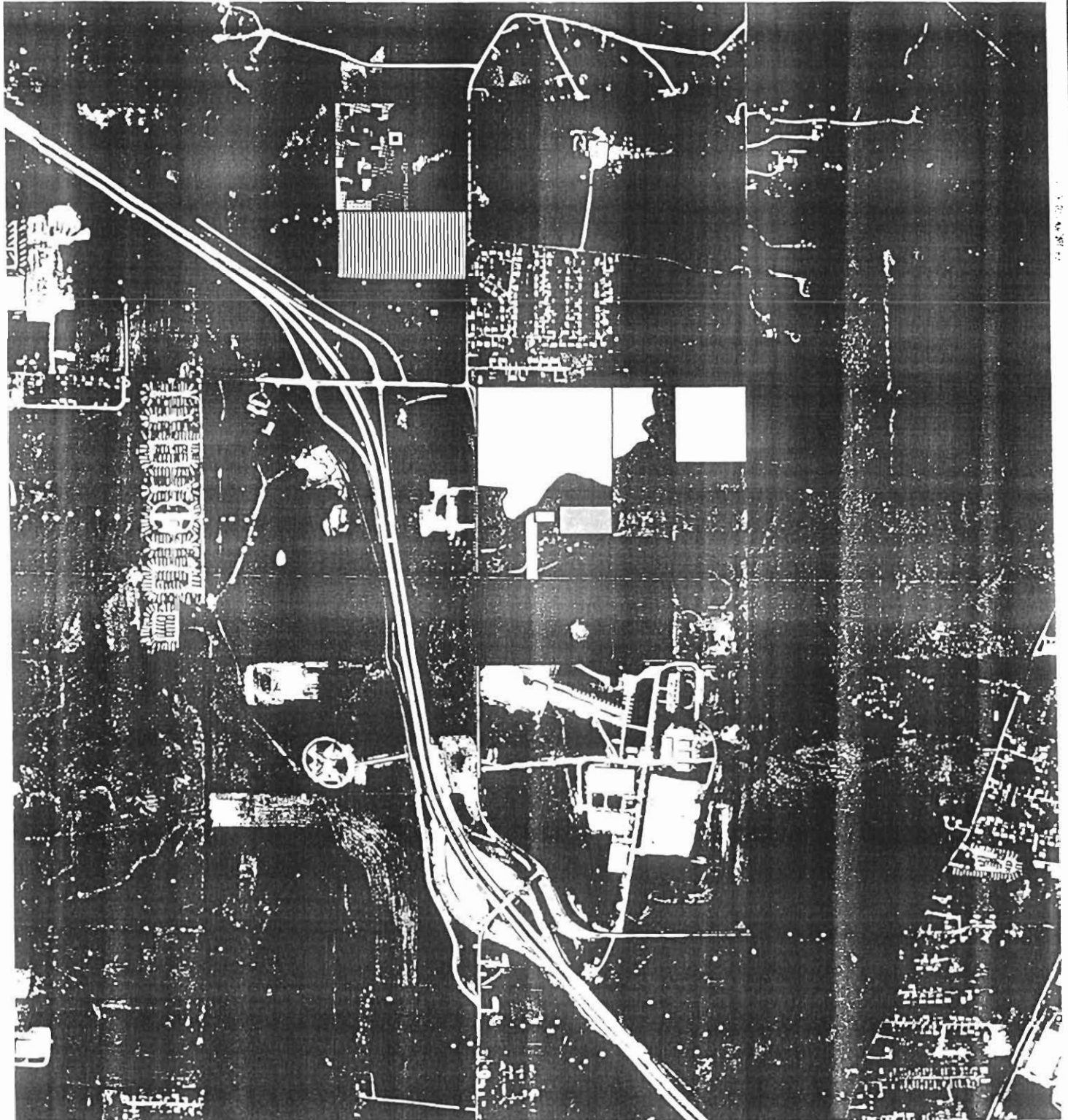


0.3 0 0.3 0.6 Miles



# Boone County Fairgrounds and Annexed Properties

Locations for Proposed Facilities

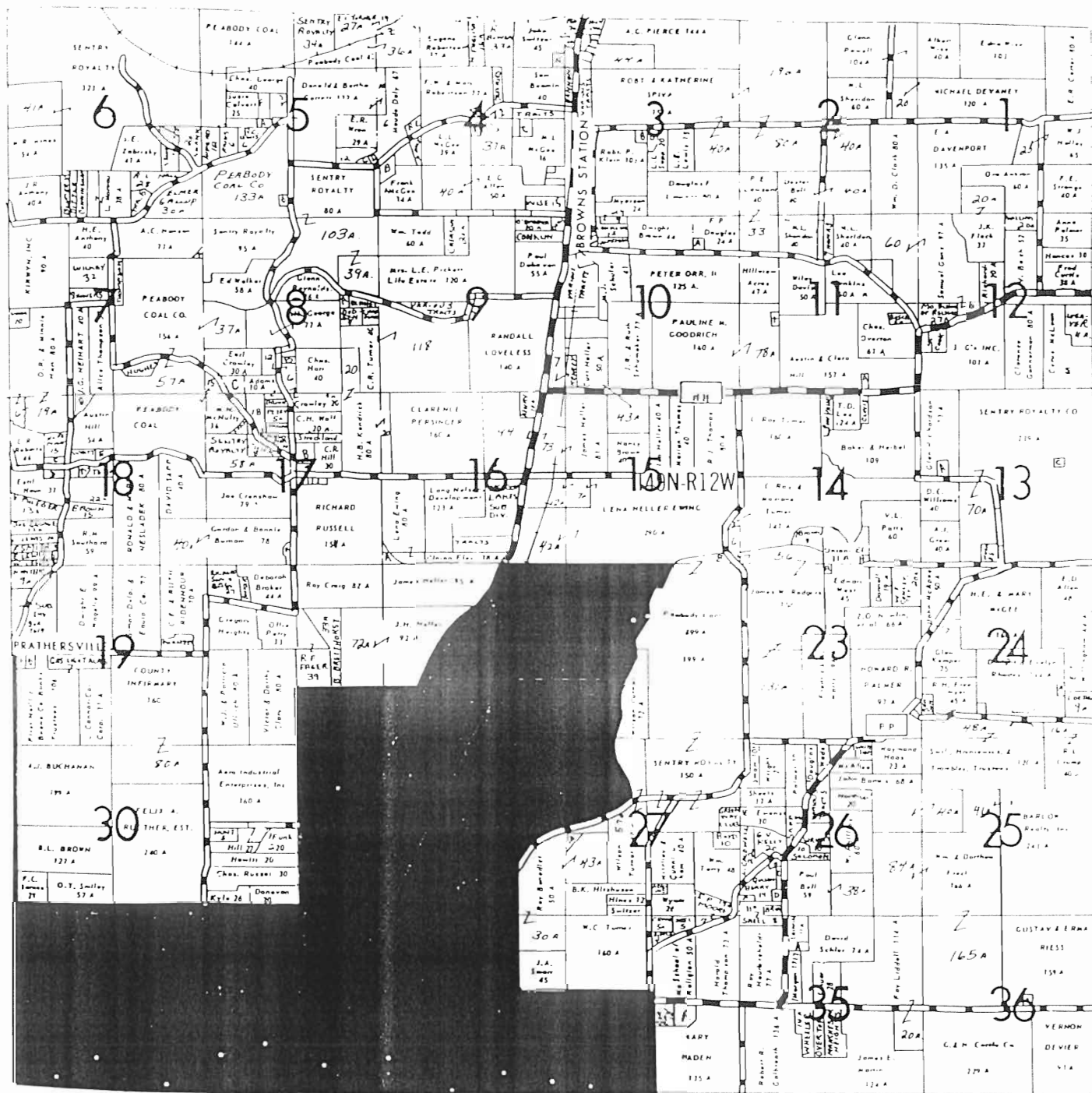


0.3 0 0.3 0.6 Miles

## Arboretum

- fall
- spring
- summer
- water
- benches
- fountain
- gazebo
- phone
- pond

- Boundary
- Spontaneous Rec. Area
- Paintball Field
- Arboretum Trails
- Nature Center (Roads)
- Nature Center
- Practice and 3-D Archery Courses
- Ball Field Complex and Concessions
- Roads

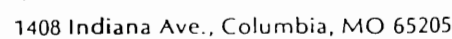


1973  
T49N-R12W

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(Small tracts under 10 acres cannot usually be illustrated on these maps. We show them by letters, such as "A,B,C, etc.," and identify them in the appendix).





SOUTHWEST  
PART  
NORTHEAST  
PART

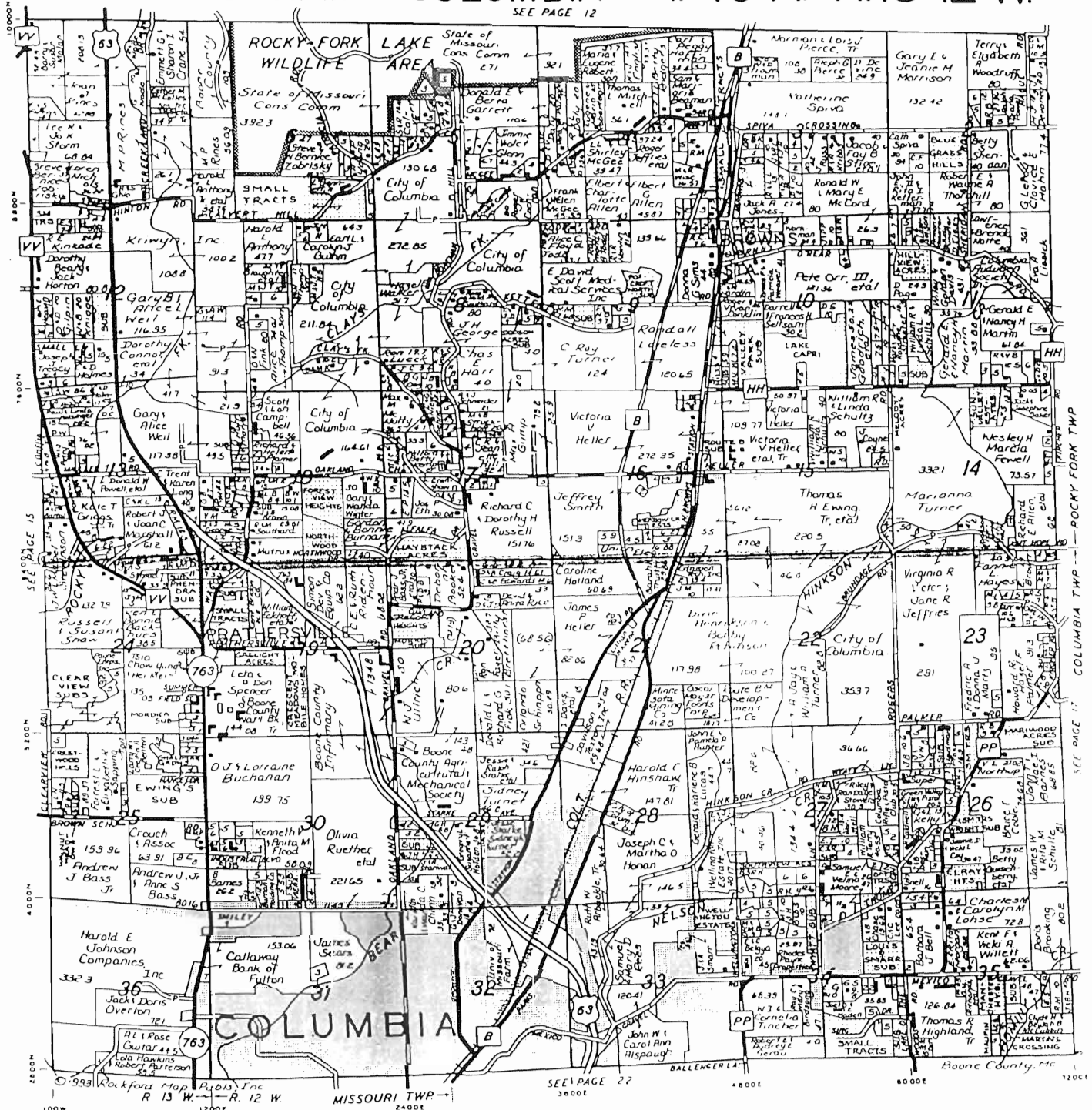
ROCKY FORK 1993

MISSOURI NORTHWEST  
PART

COLUMBIA

T.49 N.-R.13-12 W.

SEE PAGE 12



# BOONE CO. MFA AGRI-SERVICES

- Grain • Feed • Fertilizer
- Farm Supply • Ag Chemicals
- Lawn & Garden
- Power Equipment

**MFA**  
Agri Services

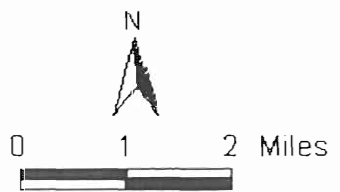
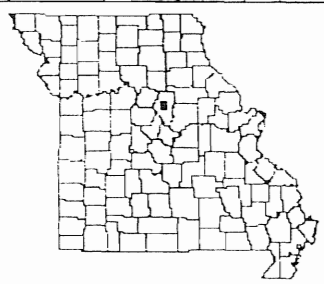
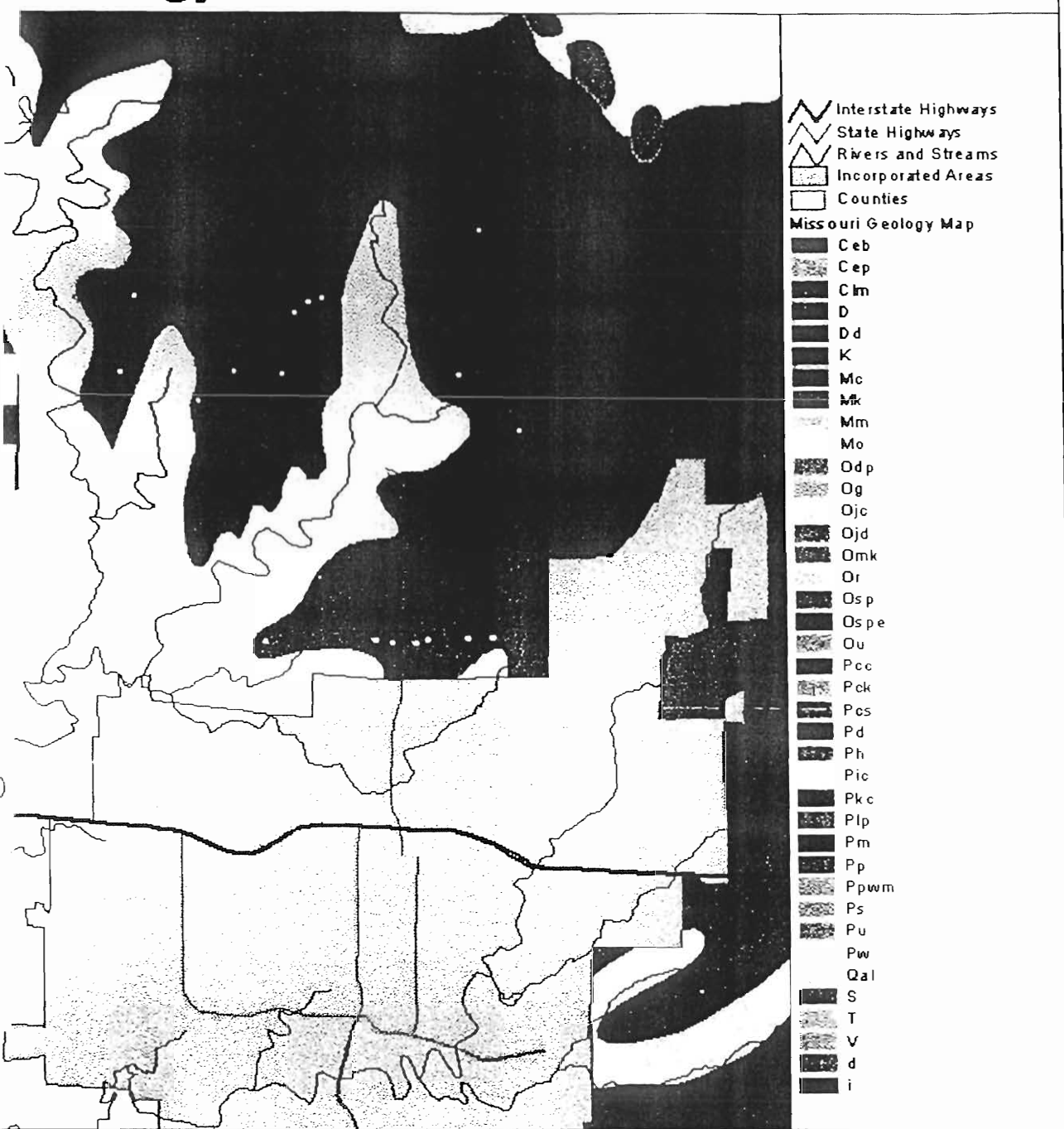


2420 Paris Road  
Columbia, Missouri 65202

314-474-6123

Your Complete Farm Supply Service Center

# Geology of Columiba-Prathersville



Center for Agricultural,  
Resource and  
Environmental Systems  
University of Missouri - Columbia

Prepared By CARES Internet Map Server:  
<http://www.cares.missouri.edu/cwic/>  
Please see above website for data sources.  
Apr 12, 2000

## Soil Classifications from the 1951 Soil Survey

**Dennis silt loam, 3 to 7 percent slopes:** This is a moderately dark colored, medium-textured, gently sloping soil of the uplands. It occurs in areas where the underlying shale and limestone are near the surface and are the soil-forming materials. This soil is well suited to clover and grass. The deep, mellow soil is easily tilled and is highly productive.

**Gare loam, 5 to 9 percent slopes, moderately eroded:** This soil has a finer texture than the Gara loam 5 to 8 percent slopes as a result of the mixing of subsoil with surface layer due to plowing. Most areas of this soil are cultivated. More restrictive use and more intensive management are needed to control erosion on this soil.

**Gara clay loam, 5 to 9 percent slopes, severely eroded:** All of the original surface soil has been removed by erosion, and the plow layer consists mainly of clay loam subsoil. This soil generally has less infiltration of water, more surface runoff, and lower fertility than the less eroded Gara soils. It is less productive and needs more restrictive use and more intensive management.

**Lindley loam and clay loam, 5 to 8 percent slopes:** The texture of the subsoil is clay loam, sandy clay loam, sandy clay, or silty clay. These soils are moderately rolling, and most areas are cultivated. Yields on these soils are low unless fertilizer is applied. Erosion control practices are needed.

**Mandeville silt loam, 5 to 8 percent slopes:** This is a light colored medium-texture soil that occurs on upland slopes where the bedrock is near the surface. Many areas of this soil are in pasture. Soil is low in fertility and contains a small amount of organic matter, but it is well drained and responds well to fertilizer.

**Mexico silt loam, 1 to 3 percent slopes:** This is a moderately dark, medium-textured, nearly level prairie soil that occurs in the uplands. Mexico soils are often referred to as claypan soils. The soil is medium in productivity and responds well to lime and fertilizer. Plants that are not limed and fertilized are likely to be damaged by lack of moisture. Prevention of erosion is important on this soil because the subsoil has low fertility. Lime and fertilizers are especially effective in increasing the stands and yields of legumes and grass.

Classification of the Soils  
Boone County

<b>ID#</b>	<b>Map symbol and soil name</b>	<b>Family or higher taxonomic class</b>
50004	77B: Mexico	Aeric Vertic Epiaqualfs, Fine, Montmorillonitic, Mesic
50008	68C2: Keswick	Aquertic Chromic Hapludalfs, Fine, Montmorillonitic, Mesic
60019	59B: Hatton	Typic Hapludalfs, Fine, Montmorillonitic, Mesic
60022	71B2: Leonard	Vertic Epiaqualfs, Fine, Montmorillonitic, Mesic
60026	37B: Weller	Aquertic Chromic Hapludalfs, Fine, Montmorillonitic, Mesic
64004	46: Auxvasse	Aeric Albaqualfs, Fine, Montmorillonitic, Mesic
64005	38: Moniteau	Typic endoaqualfs, Fine-silty, Mixed, Mesic
64006	44A: Tanglenook	Typic Argiaquolls, Fine, Mixed, Mesic
66014	35: Haymond	Fluventic Dystrochrepts, Coarse-silty, Mixed, Mesic

Chemical Properties of the Soils  
Boone County

ID #	Map symbol and soil name	Depth (In)	Clay (Pct)	Cation-exchange capacity (meq/100g)	Soil reaction (pH)	Calcium carbonate (Pct)	Gypsum (Pct)	Salinity (mmhos/cm)	Sodium adsorption ratio
50004	77B: Mexico	0-10	15-27	10.0-18.0	5.1-7.3	----	----	----	----
		10-13	35-50	18.0-26.0	4.5-6.0	----	----	----	----
		13-27	50-60	26.0-30.0	4.5-6.0	----	----	----	----
		27-45	35-50	18.0-26.0	5.1-7.3				
		45-60	27-50	14.0-26.0	5.1-7.3				
50008	68C2: Keswick	0-7	22-27	20.0-25.0	4.5-7.3	----	----	----	----
		7-20	35-60	30.0-50.0	4.5-6.0	----	----	----	----
		20-60	30-40	30.0-36.0	4.5-7.8	0-15	----	----	----
60019	59B: Hatton	0-8	12-27	6.0-12.0	5.1-7.3	----	----	----	----
		8-28	27-48	12.0-25.0	4.5-5.5	----	----	----	----
		28-50	25-35	10.0-20.0	4.5-5.5	----	----	----	----
		50-60	25-35	10.0-20.0	5.1-6.0				
60022	71B2: Leonard	0-8	27-35	16.0-22.0	6.1-7.3	----	----	----	----
		8-26	35-50	20.0-26.0	4.5-6.5	----	----	----	----
		26-60	32-50	18.0-26.0	5.1-7.8	----	----	----	----
60026	37B: Weller	0-8	16-27	15.0-20.0	4.5-7.3	----	----	----	----
		8-35	28-48	30.0-35.0	4.5-6.0	----	----	----	----
		35-62	25-40	25.0-30.0	5.1-6.5	----	----	----	----
64004	46: Auxvasse	0-15	8-16	5.0-8.0	4.5-7.3	----	----	----	----
		15-26	45-60	24.0-32.0	4.5-7.8	----	----	----	----
		26-72	25-40	12.0-20.0	4.5-7.8	----	----	----	----
64005	38: Moniteau	0-8	18-27	10.0-16.0	5.6-7.3	----	----	----	----
		8-17	18-27	9.0-16.0	5.1-7.3	----	----	----	----
		17-32	27-35	19.0-26.0	4.5-6.0	----	----	----	----
		32-64	18-30	9.0-18.0	4.5-6.5				
64006	44A: Tanglenook	0-14	20-27	22.0-27.0	6.1-7.3	----	----	----	----
		14-31	40-50	20.0-25.0	5.6-7.3	----	----	----	----
		31-65	35-50	17.0-25.0	5.6-7.3	----	----	----	----
66014	35: Haymond	0-7	10-20	4.0-15.0	5.6-7.8	----	----	----	----
		7-22	10-18	10.0-16.0	5.6-7.8	----	----	----	----
		22-60	5-26	3.0-16.0	6.1-7.8	----	----	----	----

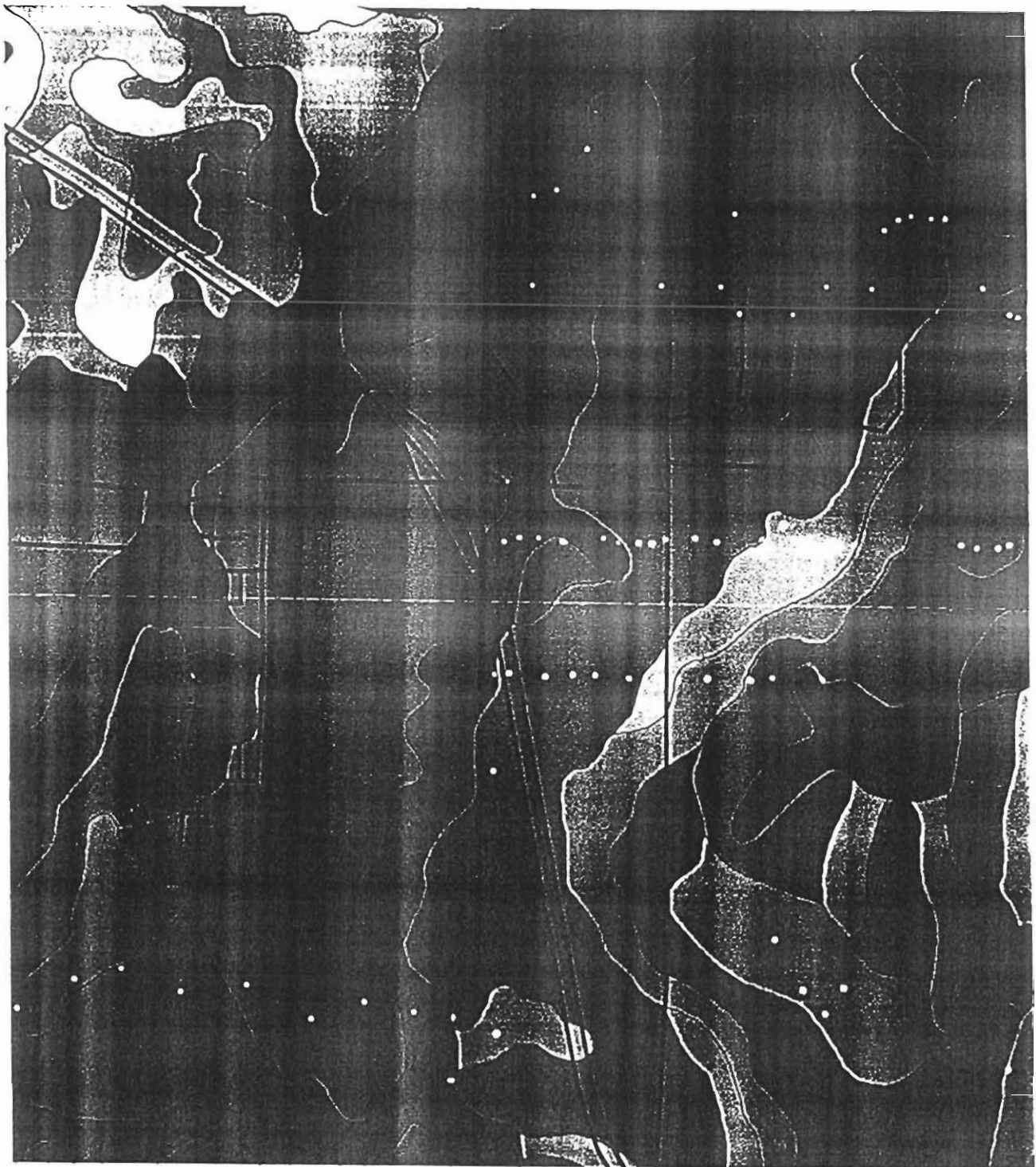
Physical Properties of Soils  
Boone County

ID#	Map symbol and soil name	Depth (In)	Clay (Pct)	Moist bulk density (g/cc)	Permeability (in/hr)	Available water capacity (In/in)	Shrink- swell potential	Organic matter (Pct)	Erosion factors			Wind erodibility group	Wind erodibili index
									K	Kf	T		
50004	77B: Mexico	0-10	15-27	1.20-1.40	0.60-2.00	0.22-0.24	Low	2.0-4.0	0.43	0.43	3	6	48
		10-13	35-50	1.25-1.45	0.20-0.60	0.12-0.16	High	0.5-1.0	0.32	0.32			
		13-27	50-60	1.25-1.45	0.00-0.06	0.08-0.12	High	0.0-0.5	0.32	0.32			
		27-45	35-50	1.25-1.45	0.06-0.20	0.12-0.16	High	0.0-0.5	0.32	0.32			
		45-60	27-50	1.25-1.45	0.00-0.06	0.12-0.18	High	0.0-0.5	0.32	0.32			
50008	68C2: Keswick	0-7	22-27	1.45-1.50	0.60-2.00	0.17-0.22	Moderate	1.0-2.0	0.37	0.37	3	6	48
		7-20	35-60	1.55-1.60	0.06-0.20	0.11-0.15	High	0.0-0.5	0.37	0.37			
		20-60	30-40	1.60-1.75	0.20-0.60	0.12-0.16	Moderate	0.0-0.5	0.37	0.37			
60019	59B: Hatton	0-8	12-27	1.35-1.45	0.60-2.00	0.22-0.24	Low	1.0-2.0	0.43	0.43	3	6	48
		8-28	27-48	1.30-1.40	0.06-0.20	0.11-0.18	Moderate	0.5-1.0	0.32	0.32			
		28-50	25-35	1.45-1.65	0.00-0.06	0.10-0.15	Moderate	0.0-0.5	0.43	0.43			
		50-60	25-35	1.35-1.50	0.06-0.20	0.11-0.18	Moderate	0.0-0.5	0.43	0.43			
60022	71B2: Leonard	0-8	27-35	1.20-1.40	0.20-0.60	0.22-0.24	Moderate	0.5-2.0	0.37	0.37	3	7	38
		8-26	35-50	1.20-1.35	0.06-0.20	0.10-0.12	High	0.0-0.5	0.37	0.37			
		26-60	32-50	1.25-1.40	0.06-0.20	0.11-0.14	High	0.0-0.5	0.37	0.37			
60026	37B: Weller	0-8	16-27	1.35-1.45	0.60-2.00	0.22-0.24	Low	2.0-3.0	0.37	0.37	3	6	48
		8-35	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High	0.0-0.5	0.43	0.43			
		35-62	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High	0.0-0.5	0.43	0.43			
64004	46: Auxvasse	0-15	8-16	1.30-1.45	0.60-2.00	0.22-0.24	Low	0.5-1.0	0.43	0.43	3	5	56
		15-26	45-60	1.35-1.50	0.00-0.06	0.09-0.11	High	0.5-1.0	0.43	0.43			
		26-72	25-40	1.35-1.50	0.20-0.60	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
64005	38: Moniteau	0-8	18-27	1.20-1.40	0.60-2.00	0.21-0.23	Low	1.0-2.0	0.37	0.37	5	6	48
		8-17	18-27	1.20-1.40	0.60-2.00	0.20-0.22	Low	0.5-1.0	0.43	0.43			
		17-32	27-35	1.30-1.50	0.20-0.60	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
		32-64	18-30	1.25-1.45	0.20-0.60	0.20-0.22	Low	0.0-0.5	0.43	0.43			
64006	44A: Tanglenook	0-14	20-27	1.25-1.30	0.60-2.00	0.21-0.25	Low	2.0-4.0	0.37	0.37	5	6	48
		14-31	40-50	1.40-1.45	0.06-0.20	0.10-0.13	High	1.0-2.0	0.32	0.32			
		31-65	35-50	1.40-1.50	0.06-0.20	0.10-0.18	High	0.5-1.0	0.32	0.32			
66014	35: Haymond	0-7	10-20	1.30-1.50	0.60-2.00	0.20-0.24	Low	1.0-3.0	0.49	0.49	5	5	56
		7-22	10-18	1.30-1.50	0.60-2.00	0.20-0.24	Low	0.5-2.0	0.55	0.55			
		22-60	5-26	1.30-1.50	0.60-2.00	0.14-0.22	Low	0.0-1.0	0.43	0.49			

Soil Features  
Boone County

ID#	Map symbol and soil name	Bedrock		Cemented pan		Subsidence		Potential frost action	Risk of corrosion	
		Depth (In)	Hardness	Depth (In)	Kind	Initial (In)	Total (In)		Uncoated steel	Concrete
50004	77B: Mexico	>60	----	----	----	----	----	Moderate	High	Moderate
50008	68C2: Keswick	>60	----	----	----	----	----	High	High	Moderate
60019	59B: Hatton	>60	----	----	----	----	----	High	High	Moderate
60022	71B2: Leonard	>60	----	----	----	----	----	High	High	Moderate
60026	37B: Weller	>60	----	----	----	----	----	High	High	High
64004	46: Auxvasse	>60	----	----	----	----	----	Moderate	High	High
64005	38: Moniteau	>60	----	----	----	----	----	High	High	High
64006	44A: Tanglenook	>60	----	----	----	----	----	High	High	Moderate
66014	35: Haymond	>60	----	----	----	----	----	High	Low	Low





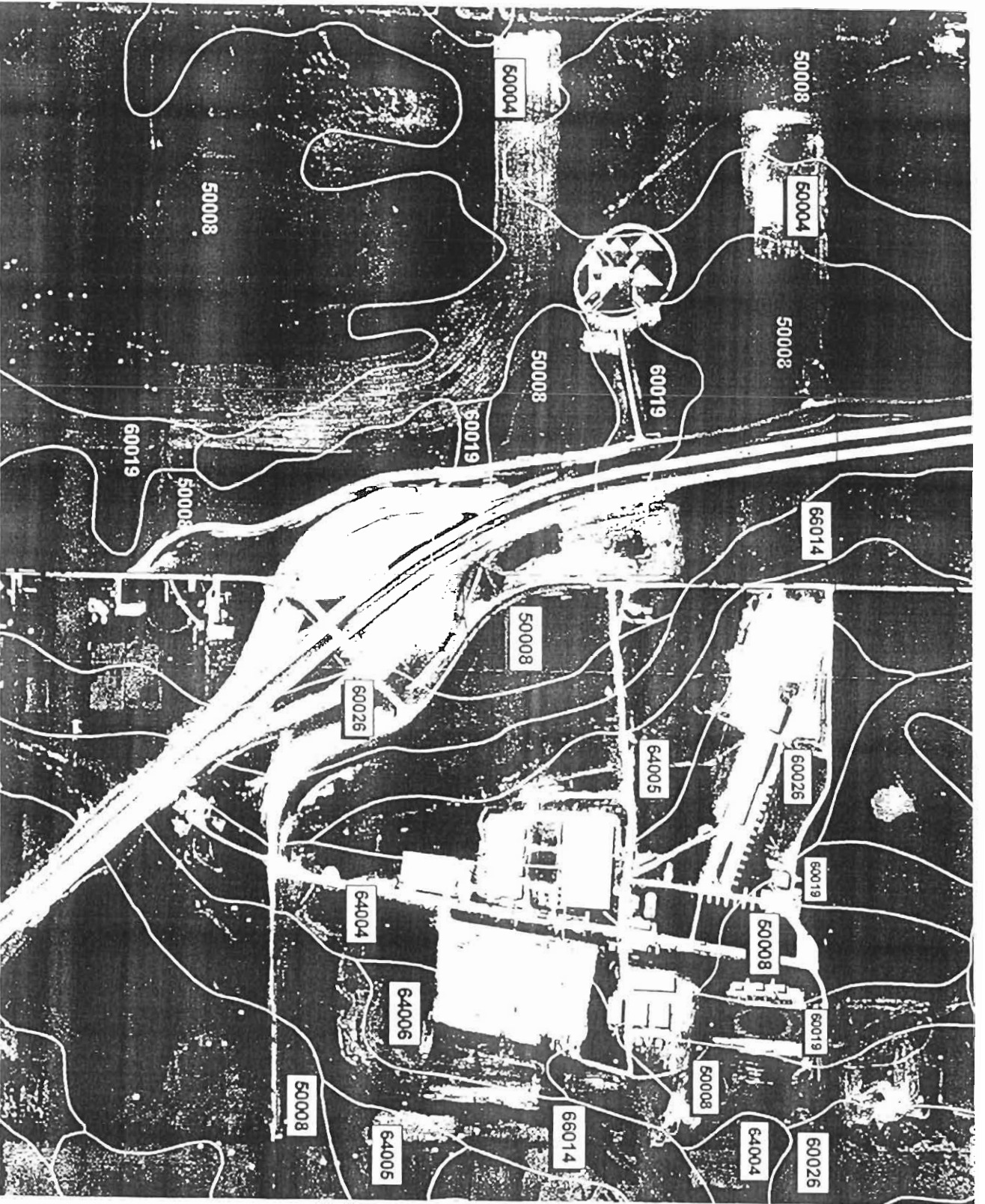
View1

ALVAH BTL LOAM, 0 TO 2 PERCENT SLOPES, RARELY FLOODED  
 BRIDLE CLAY (NEAR) COMPLEX, 20 TO 45 PERCENT SLOPES, VERY STONY  
 FREEBURG BTL LOAM, 2 TO 5 PERCENT SLOPES  
 HITCHCOCK BTL LOAM, 2 TO 5 PERCENT SLOPES, (RIDGE)  
 HAYMOND BTL LOAM, 0 TO 3 PERCENT SLOPES, (FREQUENTLY FLOODED)  
 KEOKUK BTL LOAM, 8 TO 9 PERCENT SLOPES, (FLOODED)

KEOKUK BTL LOAM, 8 TO 14 PERCENT SLOPES, (FLOODED)  
 KEOKUK URBAN LAND COMPLEX, 5 TO 10 PERCENT SLOPES  
 LEWISBURG CHANNERY BTL CLAY LOAM, 9 TO 10 PERCENT SLOPES  
 LEWISBURG BTL CLAY LOAM, 2 TO 8 PERCENT SLOPES  
 LEWISBURG BTL LOAM, 2 TO 8 PERCENT SLOPES, (FLOODED)  
 MEXICO BTL LOAM, 1 TO 3 PERCENT SLOPES, (FLOODED)  
 MOUNTAIN BTL LOAM, 0 TO 3 PERCENT SLOPES, (OCCASIONALLY FLOODED)

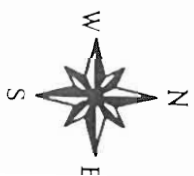
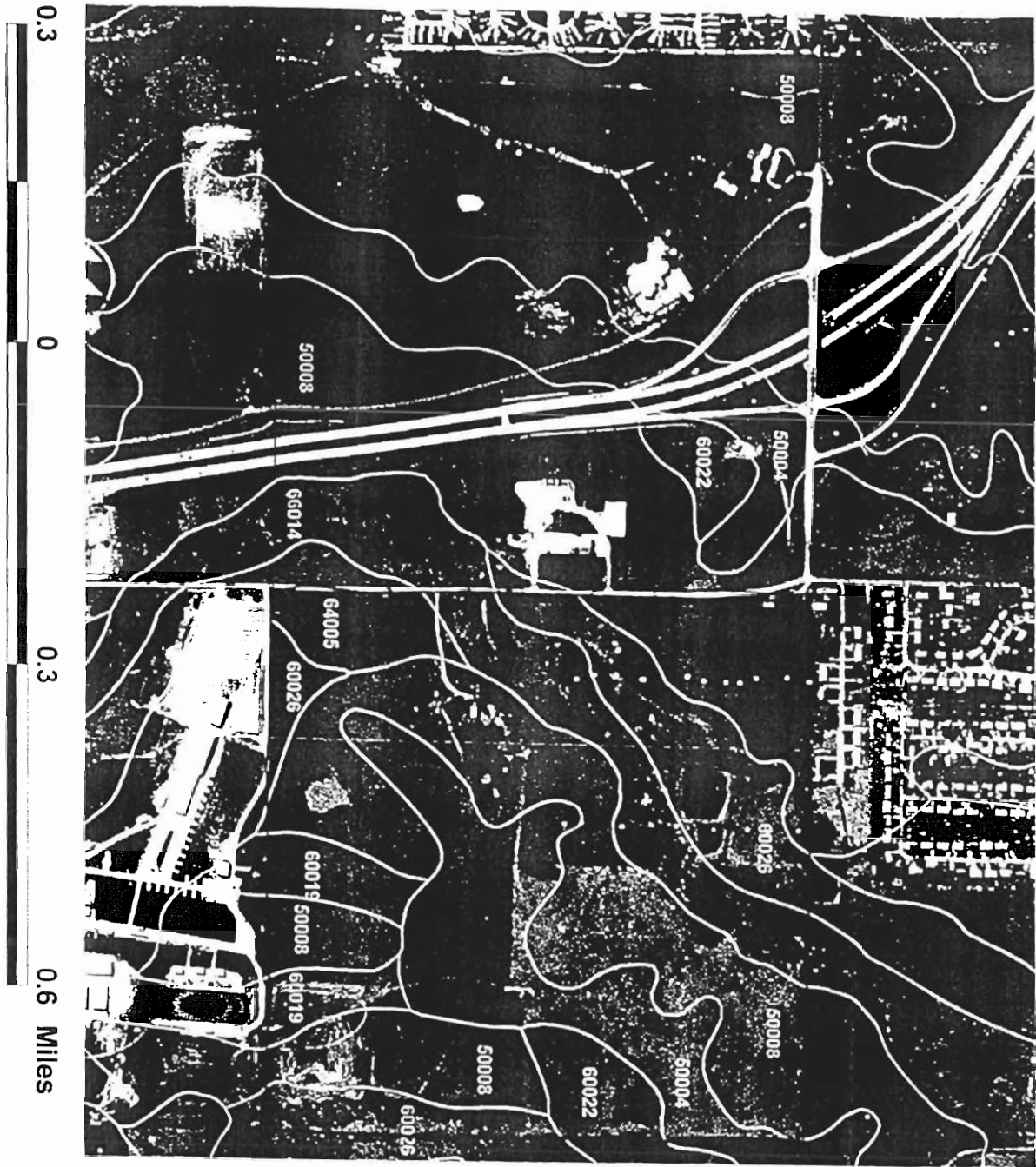
TANGLE HOOK BTL LOAM, 1 TO 3 PERCENT SLOPES, (RARELY FLOODED)  
 URBAN LAND HARVESTER COMPLEX, 2 TO 8 PERCENT SLOPES  
 WHEELER CLAY LOAM, 5 TO 14 PERCENT SLOPES  
 WHEELER BTL LOAM, (BENCH) 2 TO 5 PERCENT SLOPES  
 WHEELER BTL LOAM, 0 TO 2 PERCENT SLOPES, (FREQUENTLY FLOODED)  
 WINSTON BTL LOAM, 20 TO 35 PERCENT SLOPES

0.3 0 0.3 0.6 Miles

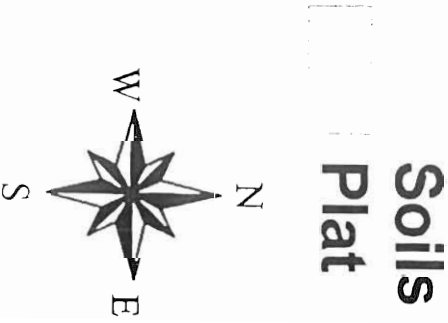
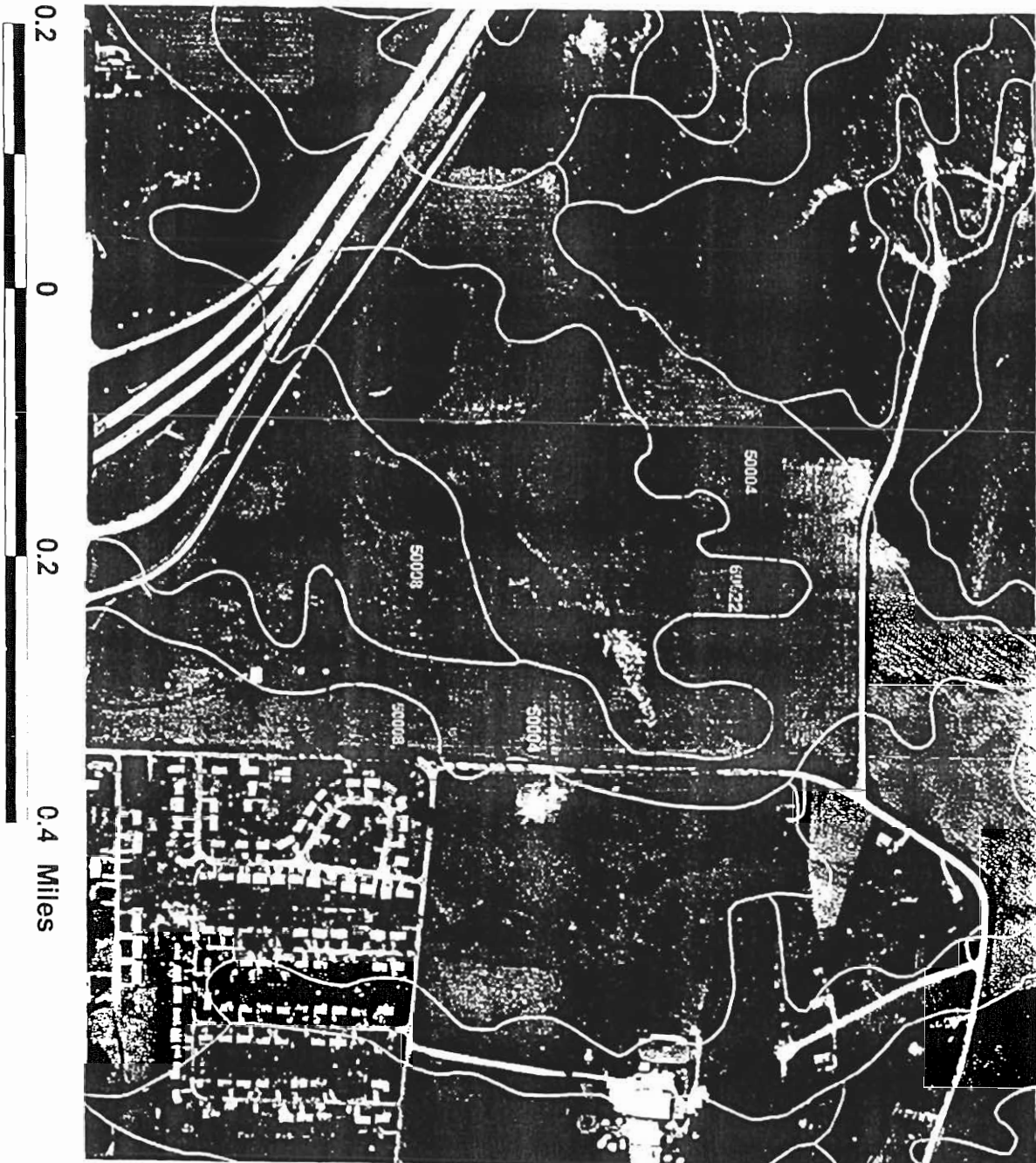


Soils  
Plat





Soils  
Plat





Construction Materials  
Boone County

ID#	Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
50004	77B: Mexico	Poor: shrink-swell, low strength	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
50008	68C2: Keswick	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
60019	59B: Hatton	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: thin layer
60022	71B2: Leonard	Poor: shrink-swell, low strength, wetness	Improbable: excess fines	Improbable: excess fines	Poor: thin layer, wetness
60026	37B: Weller	Poor: Shrink-swell, low strength	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
64004	46: Auxvasse	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: thin layer
64005	38: Moniteau	Poor: low strength, wetness	Improbable: excess fines	Improbable: excess fines	Poor: wetness
64006	44A: Tanglenook	Poor: shrink-swell, low strength, wetness	Improbable: excess fines	Improbable: excess fines	Poor: too clayey, wetness
66014	35: Haymond	Good	Improbable: excess fines	Improbable: excess fines	Good

Recreational Development  
Boone County

ID#	Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
50004	77B: Mexico	Severe: wetness, percs slowly	Severe: percs slowly	Severe: wetness, percs slowly	Moderate: wetness	Moderate: wetness
50008	68C2: Keswick	Severe: wetness	Moderate: wetness, percs slowly	Severe: slope, wetness	Severe: erodes easily	Moderate: wetness
60019	59B: Hatton	Severe: percs slowly	Severe: percs slowly	Severe: percs slowly	Slight	Slight
60022	71B2: Leonard	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness
60026	37B: Weller	Moderate: wetness, percs slowly	Moderate: wetness, percs slowly	Moderate: slope, wetness, percs slowly	Severe: erodes easily	Slight
64004	46: Auxvasse	Severe: flooding, wetness, percs slowly	Severe: percs slowly	Severe: wetness, percs slowly	Moderate: wetness	Moderate: wetness
64005	38: Moniteau	Severe: flooding, wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness
64006	44A: Tanglenook	Severe: flooding, wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness
66014	35: Haymond	Severe: flooding	Slight	Moderate: flooding	Slight	Moderate: flooding

Wildlife Habitat  
Boone County

ID#	Map symbol and soil name	Potential for habitat elements								Potential as habitat for --			
		Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Shrubs	Wet- land plants	Shallow water areas	Open- land wildlife	Wood- land wildlife	Wet- land wildlife	Range- land wildlife
50004	77B: Mexico	Fair	Good	Good	Good	Good	---	Poor	Very poor	Good	Good	Very poor	---
50008	68C2: Keswick	Fair	Good	Fair	Good	Fair	---	Very poor	Poor	Fair	Good	Very poor	---
60019	59B: Hatton	Fair	Good	Good	Good	Good	---	Poor	Very poor	Good	Good	Very poor	---
60022	71B2: Leonard	Fair	Good	Good	Good	Good	---	Poor	Very poor	Good	Good	Very poor	---
60026	37B: Weller	Good	Good	Fair	Fair	Fair	---	Poor	Poor	Good	Fair	Poor	---
64004	46: Auxvasse	Fair	Good	Poor	Good	Good	---	Good	Fair	Fair	Good	Fair	---
64005	38: Moniteau	Fair	Fair	Fair	Fair	Fair	---	Good	Fair	Fair	Fair	Fair	---
64006	44A: Tanglenook	Poor	Fair	Poor	Fair	Poor	---	Good	Good	Poor	Fair	Good	---
66014	35: Haymond	Good	Good	Fair	Good	Good	---	Poor	Poor	Good	Good	Poor	---

Woodland Management and Productivity  
Boone County

ID#	Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Suggested trees to plant
			Erosion hazard	Equipment Limitation	Seedling mortality	Wid-throw hazard	Plant competition	Common trees	Site index (m3/ha)	Volume of wood fiber	
50004	77: Mexico										
50008	68C2: Keswick	3C	Slight	Slight	Moderate	Severe	Slight	White oak Northern red oak	55 55	3 3	Sugar maple, red pine, eastern white pine
60019	59B: Hatton	3C	Slight	Slight	Moderate	Moderate	Slight	White oak Black oak	56 61	3 3	Norway maple, white ash, white oak, scarlet oak, bur oak, black oak
60022	71B2: Leonard										
60026	37B: Weller	3C	Slight	Slight	Severe	Severe	Slight	White oak	55	3	Sugar maple, black walnut, red pine, eastern white pine
64004	46: Auxvasse	4W	Slight	Severe	Moderate	Severe	Severe	Northern red oak Silver maple Green ash Pin oak	76	4	Silver maple, green ash, sweetgum, yellow-poplar, eastern cottonwood, white oak, pin oak
64005	35: Haymond	8A	Slight	Slight	Slight	Slight	Severe	Black walnut Yellow-poplar White oak	70 100 90	— 8 5	White ash, black walnut, yellow-poplar, eastern white pine, black cherry, white oak, northern red oak, black locust
64005	38: Moniteau	4W	Slight	Severe	Moderate	Moderate	Severe	Pin oak	70	4	Silver maple, green ash, sweetgum, eastern cottonwood, white oak, pin oak, black oak
64006	44A: Tanglenook	2W	Slight	Severe	Moderate	Moderate	Severe	Silver maple Eastern cottonwood	80 90	2 7	Silver maple, hackberry, green ash, American sycamore, eastern cottonwood, pin oak



Building Site Development  
Boone County

ID #	Map symbol and soil name	Shallow excavations	Dellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
50004	77B: Mexico	Severe: wetness	Severe: wetness, shrink-swell	Severe: wetness, shrink-swell	Severe: wetness, shrink-swell	Severe: low strength, shrink-swell	Moderate: wetness
50008	68C2: Keswick	Severe: wetness	Severe: wetness, shrink-swell	Severe: wetness	Severe: wetness, shrink-swell	Severe: shrink-swell, low strength	Moderate: wetness
60019	59B: Hatton	Severe: wetness	Moderate: wetness, shrink-swell	Severe: wetness	Moderate: wetness, shrink-swell	Severe: low strength, frost action	Slight
60022	71B2: Leonard	Severe: wetness	Severe: wetness, shrink-swell	Severe: wetness, shrink-swell	Severe: wetness, shrink-swell	Severe: shrink-swell, low strength, wetness	Severe: wetness
60026	37B: Weller	Severe: wetness	Severe: shrink-swell	Severe: wetness, shrink-swell	Severe: shrink-swell	Severe: shrink-swell, low strength, frost action	Slight
64004	46: Auxvasse	Severe: wetness	Severe: flooding, wetness	Severe: flooding, wetness	Severe: flooding, wetness	Severe: shrink-swell, low strength	Moderate: wetness
64005	38: Moniteau	Severe: wetness	Severe: flooding, wetness	Severe: flooding, wetness	Severe: flooding, wetness	Severe: low strength, wetness, flooding	Severe: wetness
64006	44A: Tanglenook	Severe: wetness	Severe: flooding, wetness, shrink-swell	Severe: flooding, wetness, shrink-swell	Severe: flooding, wetness, shrink-swell	Severe: low strength, wetness, shrink-swell	Severe: wetness
66014	35: Haymond	Moderate: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding, frost action	Moderate: flooding

Source:

Missouri Field Office Technical Guide (FOTG)

11/11/2011 11:00 AM 2501 Edwards Ave. St. Louis, MO 63103-1400  
http://www.missouri.gov/soil/soilindex.html

Water Features  
Boone County

ID#	Map symbol and soil name	Hydrologic group	Flooding			High water table and ponding				
			Frequency	Duration	Months	Water table depth (ft)	Kind of water table	Months	Ponding duration	Maximum ponding depth (ft)
50004	77B: Mexico	D	None	-----	-----	1.0-2.5	Perched	NOV-MAY	-----	-----
50008	68C2: Keswick	C	None	-----	-----	1.0-3.0	Perched	NOV-JUL	-----	-----
60019	59B: Hatton	C	None	-----	-----	2.0-3.0	Perched	NOV-MAY	-----	-----
60022	71B2: Leonard	D	None	-----	-----	0.5-1.5	Perched	NOV-MAY	-----	-----
60026	37B: Weller	C	None	-----	-----	2.0-4.0	Perched	NOV-JUL	-----	-----
64004	46: Auxvasse	D	Rare	-----	-----	1.0-2.0	Perched	NOV-MAY	-----	-----
64005	38: Moniteau	C/D	Occasional	Brief	NOV-MAY	0.0-1.0	Apparent	NOV-MAY	-----	-----
64006	44A: Tanglenook	D	Rare	-----	-----	0.0-1.5	Apparent	NOV-APR	-----	-----
66014	35: Haymond	B	Occasional	Brief	JAN-MAY	>6.0	-----	-----	-----	-----

Water Management  
Boone County

ID#	Map symbol and soil name	Limitations for –			Features affecting–			
		Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grass waterways
66014	35: Haymond	Moderate: seepage	Severe: piping	Severe: no water	Deep to water	Erodes easily, flooding	Erodes easily	Erodes easily
60026	37B: Weller	Moderate: slope	Moderate: hard to pack, wetness	Severe: no water	Percs slowly, frost action, slope	Slope, wetness, percs slowly	Erodes easily, wetness	Erodes easily, percs slowly
64005	38: Moniteau	Slight	Severe: wetness	Severe: slow refill	Flooding, frost action	Wetness, erodes easily	Erodes easily	Erodes easily
64006	44A: Tanglenook	Slight	Severe: wetness	Severe: slow refill	Percs slowly, frost action	Wetness, percs slowly	Erodes easily, wetness, percs slowly	Wetness, erodes easily, percs slowly
64004	46: Auxvasse	Moderate: seepage	Severe: piping, wetness	Moderate: slow refill	Flooding, frost action	Wetness, erodes easily, flooding	Erodes easily, wetness	Erodes easily
60019	59B: Hatton	Moderate: slope	Moderate: wetness	Severe: no water	Percs slowly, frost action, slope	Wetness, percs slowly, slope	Erodes easily, wetness	Erodes easily, percs slowly
50008	68C2: Keswick	Moderate: slope	Moderate: wetness	Severe: no water	Percs slowly, frost action, slope	Slope, wetness, percs slowly	Erodes easily, wetness	Wetness, erodes easily
60022	71B2: Leonard	Moderate: slope	Severe: wetness	Severe: no water	Percs slowly, frost action, slope	Slope, wetness, percs slowly	Erodes easily, wetness	Wetness, erodes easily
50004	77B: Mexico	Slight	Moderate: hard to pack, wetness	Severe: no water	Percs slowly	Wetness, percs slowly	Erodes easily, wetness, percs slowly	Wetness, erodes easily, percs slowly

## **Missouri Stream Teams Which Sampled Along Bear Creek**

Rebecca. Scledler's group on 11/5/95

Jim and Ian Czarnezki's group on 4/25/96

Urban Storm Water group on 9/30/97

Charles Lann's group on 9/30/97

Rock Bridge High School Stream Team on 9/10/97

Mudsuckers' group on 9/1/97 and 10/27/97

ABC Labs on 10/23/97

Diane and Mitch Hughey on 10/20/97

Public Works Employees on 2/28/98 and 5/15/98

Water quality data for Bear Creek on Boone County Fairgrounds Property

Site Name	Date	Time	DO mg/L	Air Temp °C	Sample Temp °C	Conductivity uS/cm	pH	Alkalinity	Hardness	NH4	Turbidity NTU
Above upper lagoon	3/12/00	1:00 PM	13.3	18.8	8.3						
At break in dam of upper lagoon	3/12/00	1:10 PM	3.9	20.8	15.6						
At discharge of upper lagoon	3/12/00	1:20 PM	8.5	13.2	12.5						
Below all three lagoons	3/12/00	1:20 PM	8.5	13.2	12.4						
Below western service bridge	3/12/00	4:30 PM	12.6	20.8	12.6						
Above upper lagoon	3/13/00	4:00 PM			23.2	693	7.98	196	262	0.0607	1.8
At break in dam of upper lagoon	3/13/00	4:00 PM			23.2	670	7.48	214	452	5.98	17
At break in dam of upper lagoon	3/13/00	4:00 PM						325*			
At discharge of upper lagoon	3/13/00	4:00 PM			22.9	654	8.01	194	262	0.045	2
Below all three lagoons	3/13/00	4:00 PM			22.9	648	8.04	198	254	0.0238	11
Below all three lagoons	3/13/00	4:00 PM								0.0856*	
Below western service bridge	3/13/00	4:00 PM			22.6	1249	7.77	144	370	0.0783	16

\* Second run. Accept second run, disregard first reading due to technical error.

All samples were <0.25 NO<sub>3</sub>-N. The 11 mg/L Standard read 11mg/L.

**Buildings within T049R012W Sec29NW4**

Horse barns (4):	3 @ 60 ft x 120 ft 1 @ 72 ft x 120 ft Each with 56, 1-2 horse stalls ADA accessible: NO
Cow Palace:	60 ft x 120 ft ADA accessible: NO
Show Palace:	ADA accessible: NO
Sheep Shelter:	72 ft x 120 ft ADA accessible: NO
Hog Shelter:	60 ft x 120 ft ADA accessible: NO
Outside Arena:	150 ft x 100 ft 13 bleachers holding 300 people each General use: the rodeo ADA accessible: NO
Coliseum:	Total area: 88,000 square feet Amenities: heated dirt arena (115'x235'), 2 restrooms with showers, 5 public telephones, sound room, gift shop, concession stand, main office, show office, storage, a 22,000 sq.ft. multipurpose room. facility is available for activities such as animal, antique, craft and gun shows, and concerts. ADA accessible: NO
4-H Foundation:	60 ft x 120 ft General Use: ADA accessible: NO
FFA Building:	58 ft x 71 ft General use: FFA storage ADA accessible: NO
Sunrise Optimist (2):	24 ft x 40 ft General Use: concession stand ADA accessible: NO

Midway Optimist: 24 ft x 40 ft  
General Use: concession stand  
ADA accessible: NO

Elks Cocession: Total Area: 30 ft x 50 ft  
General Use: concession  
ADA accessible: NO

Pork Producers: Total Area: 30 ft x 50 ft  
General Use: concession stand  
ADA accessible: NO

General Concession: Total Area: 30 ft x 50 ft  
ADA accessible: NO

Grandstands: Total Area: 150 ft x 400 ft  
2,400 person capacity  
Multiple use  
ADA accessible: NO

Shop/Helicopter Bldg: 100 ft x 120 ft  
General Use: general storage  
ADA accessible: NO

Shower House: 30 ft x 50 ft  
Amenities: 3 showers  
ADA accessible: NO

Restrooms (2): 24 ft x 40 ft  
Amenities:  
ADA accessible: NO

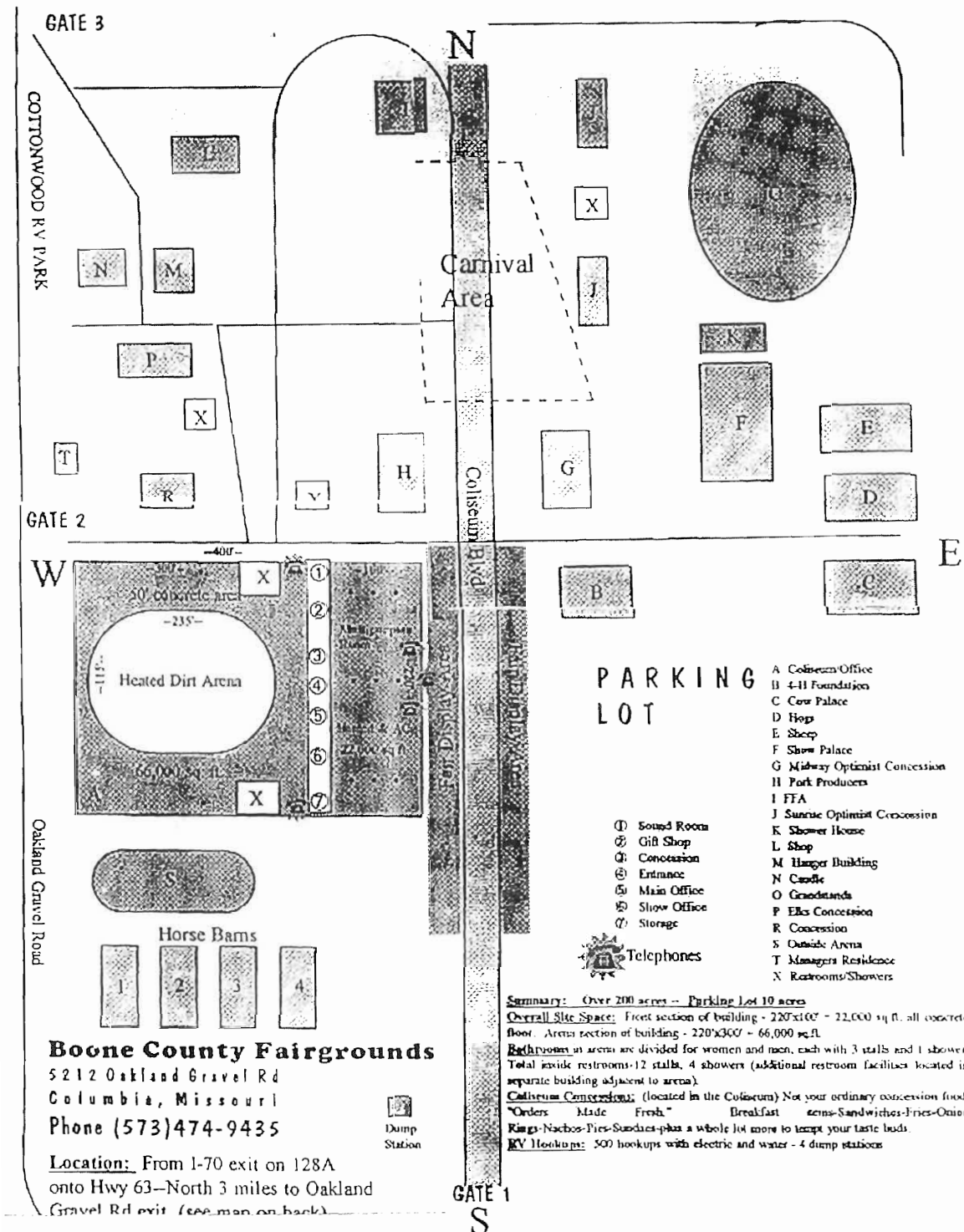
Hangar: 60 ft x 350 ft  
General Use: storage and rental use  
ADA accessible: NO

MFA Building: 75 ft x 220 ft.  
General Use:  
ADA accessible: NO

Managers Residence: Double-wide trailer home  
General Use: Housing  
ADA accessible: NO

Source:  
Personal Communication with George Harris, Fairgrounds Manager  
April, 2000

## Map of the Boone County Fairgrounds





## **Display Areas within T049R012W Sec29NW4**

Fair Display Area (2): Total Area: Approximately 350 foot areas directly east of the coliseum along Coliseum Boulevard.  
General Use: parking, special events, RV rallies, balloon raises, etc.  
ADA accessible: YES

Carnival Area: Area: Runs along the northeast and northwest sections of the fairgrounds along the northern end of Coliseum Boulevard and fills the open space from the Hangar to the Sunrise Optimist Concession.  
General Use:

ADA accessible: YES

## Roads and Parking within T049R012W Sec29NW4

- Main Fair Parking: Total Area: 10 acres  
Description: Gravel lot east of the coliseum and surrounded partially by a 9 foot chain link fence.  
ADA accessible: NO
- Cottonwoods RV Park: Total Area:  
Description: 500 spaces with water and electric hookups.  
ADA accessible: ??
- Coliseum Boulevard: Length: Approximately 1/2 mile.  
Description: A paved road extending north south within the fairground and passing between the coliseum and the parking lot.  
ADA accessible: N/A
- Oakland Gravel Road: Description: A paved county maintained road which serves as the western boundary of the fair property.  
ADA accessible: N/A
- Western service road: Length: Approximately 1/4 mile  
Description: A gravel road connecting Oakland Gravel Road and Coliseum Boulevard north of the Coliseum. This service road crosses Bear Creek via a newly constructed bridge.  
ADA accessible: N/A
- Remaining roads: Length: Undetermined  
Description: Gravel and dirt roads which branch off of Coliseum Boulevard.  
ADA accessible: N/A

Source:  
Personal Communication with George Harris, Fairgrounds Manager  
April, 2000

## **Waste and Sewage within Management Area**

Solid Waste station: Location: At south end of Coliseum Boulevard.  
Size: Approximately 3000 square feet.  
Description: Concrete pad on which are several commercial dumpsters and other trash containers.  
Removal:

RV Waste station (4): Locations: Within Cottonwoods RV Park  
Size:  
Capacity:  
Removal:

\*\*\*need to describe the three lagoons.

**Stand A - South Bear Creek**

Common name	Scientific name	Count	Relative density
Cottonwood	<i>Populus deltoides</i>	2	1.0%
shingle oak	<i>Qercus imbricaria</i>	4	2.0%
Hackberry	<i>Celtis occidentalis</i>	4	2.0%
American elm	<i>Ulmus americana</i>	15	7.3%
eastern redbud	<i>Cercis canadensis</i>	1	0.5%
green ash	<i>Fraxinus pennsylvanica</i>	31	15.1%
black cherry	<i>Prunus serotina</i>	3	1.5%
Sycamore	<i>Platanus occidentalis</i>	6	2.9%
Honeylocust	<i>Gleditsia triancanthos</i>	5	2.4%
Shagbark hickory	<i>Carya ovata</i>	1	0.5%
eastern redcedar	<i>Juniperus virginiana</i>	8	3.9%
sugar maple	<i>Acer saccharum</i>	27	13.2%
river birch	<i>Betula nigra</i>	70	34.1%
Northern catalpa	<i>Catalpa speciosa</i>	23	11.2%
osage orange	<i>Maclura pomifera</i>	5	2.4%
<b>Total</b>		205	100.0%

## E-I Woody Vegetation within Management Area (continued)

**Stand B - Hinkson Creek**

Common name	Scientific name	Count	Relative density
cottonwood	<i>Populus deltoides</i>	3	0.5%
shingle oak	<i>Qercus imbricaria</i>	165	27.0%
hackberry	<i>Celtis occidentalis</i>	183	29.9%
American elm	<i>Ulmus americana</i>	75	12.3%
eastern redbud	<i>Cercis canadensis</i>	1	0.2%
green ash	<i>Fraxinus pennsylvanica</i>	10	1.6%
black cherry	<i>Prunus serotina</i>	20	3.3%
silver maple	<i>Acer saccharinum</i>	54	8.8%
sycamore	<i>Platanus occidentalis</i>	15	2.5%
bitternut hickory	<i>Carya cordiformis</i>	18	2.9%
honeylocust	<i>Gleditsia triacanthos</i>	11	1.8%
black locust	<i>Robinia pseudoacacia</i>	4	0.7%
persimmon	<i>Diospyros virginiana</i>	2	0.3%
chinkapin oak	<i>Quercus meuhlenbergii</i>	5	0.8%
slippery elm	<i>Ulmus rubra</i>	4	0.7%
black walnut	<i>Juglans nigra</i>	33	5.4%
shagbark hickory	<i>Carya ovata</i>	1	0.2%
sugarberry	<i>Celtis laevigata</i>	3	0.5%
swamp white oak	<i>Quercus bicolor</i>	1	0.2%
eastern redcedar	<i>Juniperus virginiana</i>	2	0.3%
sugar maple	<i>Acer saccharum</i>	1	0.2%
boxelder	<i>Acer negundo</i>	1	0.2%
<b>Total</b>		612	100.0%

**Stand C - Adkins tract (southern half)**

Common Name	Scientific Name	Count	Relative Density
Slippery elm	<i>Ulmus rubra</i>	1	0.7%
Osage orange	<i>Maclura pomifera</i>	1	0.7%
rose	<i>Roseaceae</i>	87	60.4%
Eastern redcedar	<i>Juniperus virginiana</i>	33	22.9%
Honeylocust	<i>Gleditsia triacanthos</i>	2	1.4%
Black locust	<i>Robinia pseudoacacia</i>	8	5.6%
Hackberry	<i>Celtis occidentalis</i>	9	6.3%
White oak	<i>Quercus alba</i>	3	2.1%
<b>Total</b>		144	100.0%

E-I Woody Vegetation within Management Area (continued)

**Stand D - Adkins tract (northern half)**

Common name	Scientific name	Count	Relative density
White oak	<i>Quercus alba</i>	3	1.9%
White ash	<i>Fraxinus americana</i>	18	11.3%
Swamp white oak	<i>Quercus bicolor</i>	3	1.9%
Hackberry	<i>Celtis occidentalis</i>	35	22.0%
Black cherry	<i>Prunus serotina</i>	9	5.7%
Eastern redbud	<i>Cercis canadensis</i>	10	6.3%
Eastern redcedar	<i>Juniperus virginiana</i>	1	0.6%
Scotch pine	<i>Pinus sylvestris</i>	1	0.6%
Shingle oak	<i>Quercus imbricaria</i>	6	3.8%
Shagbark hickory	<i>Carya ovata</i>	16	10.1%
American elm	<i>Ulmus americana</i>	16	10.1%
Green ash	<i>Fraxinus pennsylvanica</i>	1	0.6%
Burr oak	<i>Quercus macrocarpa</i>	7	4.4%
Sycamore	<i>Platanus occidentalis</i>	12	7.5%
Northern red oak	<i>Quercus rubra</i>	19	11.9%
Black walnut	<i>Juglans nigra</i>	2	1.3%
<b>Total</b>		159	100.0%

**Stand E - Newton Tract**

Common Name	Scientific Name	Count	Realtive Density
Eastern redcedar	<i>Juniperus virginiana</i>	5	6.3%
Northern catalpa	<i>Catalpa speciosa</i>	3	3.8%
Honeylocust	<i>Gleditsia triacanthos</i>	23	29.1%
Osage Orange	<i>Maclura pomifera</i>	20	25.3%
Sycamore	<i>Platanus occidentalis</i>	12	15.2%
Northern red oak	<i>Quercus rubra</i>	3	3.8%
Black oak	<i>Quercus velutina</i>	2	2.5%
Sugarberry	<i>Celtis laevigata</i>	1	1.3%
Black cherry	<i>Prunus serotina</i>	1	1.3%
Shingle oak	<i>Quercus imbricaria</i>	4	5.1%
Black locust	<i>Robinia pseudoacacia</i>	1	1.3%
American elm	<i>Ulmus Americana</i>	4	5.1%
<b>Total</b>		79	100.0%

In the Dry-Mesic Bottomland forests, common species include:

White Oak (*Quercus alba*)  
Northern Red Oak (*Quercus rubra*)  
Black Walnut (*Juglans nigra*)  
Flowering Dogwood (*Cornus florida*)  
Hop Hornbeam (*Ostrya virginiana*)  
Sycamore (*Platanus occidentalis*)  
Ohio Buckeye (*Aesculus glabra*)  
Leatherwood (*Dirca palustris*)  
Blue Beech (*Carpinus caroliniana*)  
Hazelnut (*Corylus americana*)  
Shrubby St. John's Wort (*Hypericum spathulatum*)  
Sedge (*Carex jamesii*)  
False Wild Garlic (*Nothoscordum bivalve*)  
Figwort (*Scrophulariamarilandica*)  
Elephant's-foot (*Elephantopus carolinianus*)  
Tall Bellflower (*Campanula americana*)  
Wild Senna (*Cassia marilandica*)  
Yellow Giant Hyssop (*Agastache nepetoides*)

In Mesic Bottomland forests, common species include:

Sugar Maple (*Acer saccharum*)  
Bitternut Hickory (*Carya cordiformis*)  
Hackberry (*Celtis occidentalis*)  
White Oak  
Persimmon (*Diospyros virginiana*)  
Ohio Buckeye  
Black Walnut  
Spicebush (*Lindera benzoin*)  
Bluebells (*Mertensia virginica*)  
Pale Violet (*Viola striata*)  
White Trout Lily (*Erythronium albidum*)  
Adam and Eve Orchid (*Aplectrum hyemale*)  
Fragile Fern (*Cystopteris fragilis* var. *protrusa*)  
False Rue Anemone (*Isopyrum bitermatum*)

In Mesic prairie habitats, species include:

Big Bluestem (*Andropogon gerardii*)  
Indian Grass (*Sorghastrum nutans*)  
Prairie Dropseed (*Sporobolus heterolepis*)  
Nodding Wild Rye (*Elymus canadensis*)  
Culver's-root (*Veronicastrum virginicum*)  
Gray-head Coneflower (*Ratibida pinnata*)  
Compass Plant (*Silphium laciniatum*)  
Cup Plant (*Silphium perfoliatum*)  
Cream Wild Indigo (*Baptisia leucophaea*)  
Velvety Gaura (*Gaura parviflora*)  
Phlox (*Phlox pilosa*)

In Wet-Mesic prairie habitats, species include:

Big Bluestem  
Bluejoint Grass (*Calamagrostis canadensis*)  
Cord Grass (*Spartina pectinata*)  
Switchgrass  
Sawtooth Sunflower (*Helianthus grosseserratus*)  
Prairie Blazing Star (*Liatris pycnostachya*)  
False Dragonhead (*Physostegia virginiana*)  
Common Cinquefoil (*Potentilla simplex*)  
Beard-tongue (*Penstemon digitalis*)  
Rattlesnake Master (*Eryngium yuccifolium*)  
Sedge (*Carex bicknellii*)  
Gama Grass (*Tripsacum dactyloides*)  
Dwarf St. John's Wort (*Hypericum mutilum*)  
Rush (*Juncus interior*)  
Sneezeweed (*Helenium flexuosum*)



# POTENTIAL MAMMAL SPECIES OF THE AREA

Common Name	Scientific Name
BADGER	<i>TAXIDEA TAXUS TAXUS</i>
BAT, BIG BROWN	<i>EPITESICUS FUSCUS FUSCUS</i>
BAT, EVENING	<i>NYCTICEIUS HUMERALIS HUMERALIS</i>
BAT, HOARY	<i>NYCTERIS CINEREA CINEREA</i>
BAT, RED	<i>NYCTERIS BOREALIS BOREALIS</i>
BEAVER	<i>CASTOR CANADENSIS CAROLINENSIS</i>
BOBCAT	<i>FELIS RUFUS RUFUS</i>
CHIPMUNK, EASTERN	<i>TAMIAS STRIATUS GIESEUS</i>
COYOTE	<i>CANIS LATRANS FRUSTOR</i>
DEER, WHITE-TAILED	<i>ODOCOILEUS VIRGINIANUS</i>
FOX, GRAY	<i>UROCYON CINEREOARGENTEUS</i>
FOX, RED	<i>VULPES VULPES FULVA</i>
GOPHER, PLAINS POCKET	<i>GEOMYS BURSARIUS MISSOURIENS</i>
LEMMING, SOUTHERN BOG	<i>SYNAPTOMYS COOPERI</i>
MINK	<i>MUSTELA VISON LETIFERA</i>
MOLE, EASTERN	<i>SCALOPUS AQUATICUS MACHRINOIDES</i>
MOUSE, DEER	<i>PEROMYSCUS MANICULATUS</i>
MOUSE, FULVOUS HARVEST	<i>REITHRODONTOMYS FULVESCENS</i>
MOUSE, GOLDEN	<i>OCHROTOMYS NUTTALLI</i>
MOUSE, HOUSE	<i>MUS MUSCULUS DOMESTICUS</i>
MOUSE, WESTERN HARVEST	<i>REITHRODONTOMYS MEGALOTIS</i>
MOUSE, WHITE-FOOTED	<i>PEROMYSCUS LEUCOPUS</i>
MUSKRAT	<i>ONDATA ZIBETHICUS</i>
MYOTIS, GRAY	<i>MYOTIS GRISESCENS</i>
MYOTIS, INDIANA	<i>MYOTIS SODALIS</i>
MYOTIS, LITTLE BROWN	<i>MYOTIS LUCIFUGUS LUCIFUGUS</i>
MYOTIS, NORTHERN	<i>MYOTIS SEPTENTRIONALIS</i>
OPOSSUM, VIRGINIA	<i>DIDELPHIS VIRGINIANA VIRGINIANA</i>
OTTER, RIVER	<i>LUTRA CANADENSIS LATAIXINA</i>
PIPISTRELLE, EASTERN	<i>PIPISTRELLUS SUBFLAVUS</i>
RABBIT, EASTERN COTTONTAIL	<i>SYLVILAGUS FLORIDANUS ALACER</i>
RACCOON	<i>PROCYON LOTOR HIRTUS</i>
RAT, EASTERN WOOD	<i>NEOTOMA FLORIDANA</i>
RAT, HISPID COTTON	<i>SIGMODON HISPIDUS</i>
RAT, NORWAY	<i>RATTUS NORVEGICUS NORVEGICUS</i>
SHREW, LEAST	<i>CRYPTOTIS PARVA PARVA</i>
SHREW, SHORT-TAILED	<i>BLARINA HYLOPHAGA</i>
SKUNK, PLAINS SPOTTED	<i>SPILOGALE PUTORIUS INTERRUPTAI</i>
SKUNK, STRIPED	<i>MEPHITIS MEPHITIS AVIA</i>
SQUIRREL, FOX	<i>SCIURUS NIGER RUFIVENTER</i>
SQUIRREL, FRANKLIN'S GROUND	<i>SPERMOPHILUS FRANKLINII</i>
SQUIRREL, GRAY	<i>SCIURUS CAROLINENSIS CAROLINENSIS</i>
SQUIRREL, SOUTHERN FLYING	<i>GLAUCOMYS VOLANS</i>

## CONTINUED:

Common Name	Scientific Name
VOLE, PRAIRIE	<i>MICROTUS OCHROGASTER</i>
WEASEL, LONG-TAILED	<i>MUSTELA FRENATA PRIMULINA</i>
WOODCHUCK	<i>MARMOTA MONAX MONAA</i>

Source:

Missouri Fish and Wildlife Information System (MOFWIS)

<http://www.conservaion.state.mo.us/egi-bin/mofwis/search.cgi>

Accessed 2/17/00

## FEDERAL AND STATE LISTED SPECIES

Common Name	Scientific Name
BAT, GREY	<i>MYOTIS GRISESCENS</i>
BAT, INDIANA	<i>MYOTIS SODALIS</i>
BITTERN, AMERICAN	<i>BOTAURUS LENTIGINOSUS</i>
CHUB, FLATHEAD	<i>PLATYGORIO GRACILIS</i>
EAGLE, BALD	<i>HALIAEETUS LEUCOCEPHALUS</i>
FALCON, PEREGRINE	<i>FALCO PEREGRINUS TUNDRIUS</i>
HARRIER, NORTHERN	<i>CIRCUS CYANEUS</i>
OWL, BARN	<i>TYTO ALBA</i>
SHINER, TOPEKA	<i>NOTROPIS TOPEKA</i>
SKUNK, PLAINS SPOTTED	<i>SPILOGALE PUTORIUS INTERRUPTA</i>
STURGEON, LAKE	<i>ACIPENSER FULVESCENS</i>
STURGEON, PALLID	<i>SCAPHIRHYNCHUS ALBUS</i>
TERN, INTERIOR LEAST	<i>STERNA ANTILLARUM ATHALASSOS</i>

Source:

Missouri Fish and Wildlife Information System (MOFWIS)

<http://www.conservation.state.mo.us/egi-bin/mofwis/search.cgi>

Accessed 2/17/00

# POTENTIAL REPTILE SPECIES OF THE AREA

Common Name	Scientific Name
COACHWHIP, EASTERN	<i>MASTICOPHIS FLAGELLUM FLAGELLUM</i>
COPPERHEAD, OSAGE	<i>AGKISTRODON CONTORTRIX PHAEOGASTER</i>
KINGSNAKE, PRAIRIE	<i>LAMPROPELTIS CALLIGASTER CALLIGASTER</i>
KINGSNAKE, SPECKLED	<i>LAMPROPELTIS GETULA HOLBROOKI</i>
LIZARD, EASTERN COLLARED	<i>CROTAPHYTUS COLLARIS COLLARIS</i>
LIZARD, NORTHERN FENCE	<i>SCELOPORUS UNDULATUS HYACINTHINUS</i>
LIZARD, WESTERN SLENDER GLASS	<i>OPHISAURUS ATTENUATUS ATTENUATUS</i>
RACER, EASTERN YELLOWBELLY	<i>COLUBER CONSTRICTOR FLAVIVENTRIS</i>
RATTLESNAKE, TIMBER	<i>CROTALUS HORRIDUS</i>
SKINK, BROADHEAD	<i>EUMECES LATICEPS</i>
SKINK, FIVE-LINED	<i>EUMECES FASCIATUS</i>
SKINK, GROUND	<i>SCINCELLA LATERALIS</i>
SLIDER, RED-EARED	<i>TRACHEMYS SCRIPTA ELEGANS</i>
SNAKE, BLACK RAT	<i>ELAPHE OBSOLETA OBSOLETA</i>
SNAKE, EASTERN GARTER	<i>THAMNOPHIS SIRTALIS SIRTALIS</i>
SNAKE, EASTERN HOGNOSE	<i>HETERODON PLATIRHINOS</i>
SNAKE, GREAT PLAINS RAT	<i>ELAPHE GUTTATA EMORYI</i>
SNAKE, MIDLAND BROWN	<i>STORERIA DEKAYI WRIGHTORUM</i>
SNAKE, NORTHERN REDBELLY	<i>STORERIA OCCIPITOMACULATA</i>
SNAKE, PRAIRIE RINGNECK	<i>DIADOPHIS PUNCTATUS ARNYI</i>
SNAKE, RED MILK	<i>LAMPROPELTIS TRIANGULUM SYSPILA</i>
SNAKE, RED-SIDED GARTER	<i>THAMNOPHIS SIRTALIS PARIETALIS</i>
SNAKE, ROUGH GREEN	<i>OPHEODRYS AESTIVUS</i>
SNAKE, WESTERN EARTH	<i>VIRGINIA VALERIAE ELEGANS</i>
SNAKE, WESTERN RIBBON	<i>THAMNOPHIS PROXIMUS PROXIMUS</i>
SNAKE, WESTERN WORM	<i>CARPHOPHIS AMOENUS VERMIS</i>
SOFTSHELL, MIDLAND SMOOTH	<i>APALONE MUTICA MUTICA</i>
SOFTSHELL, WESTERN SPINY	<i>APALONE SPINIFERA HARTWEGI</i>
TURTLE, COMMON SNAPPING	<i>CHELYDRA SERPENTINA SERPENTINA</i>
TURTLE, FALSE MAP	<i>GRAPTEMYS PSEUDOGEOGRAPHICA</i>
TURTLE, ORNATE BOX	<i>TERRAPENE ORNATA ORNATA</i>
TURTLE, THREE-TOED BOX	<i>TERRAPENE CAROLINA TRIUNGUIS</i>
TURTLE, WESTERN PAINTED	<i>CHRYSEMYS PICTA BELLII</i>

Source:

Missouri Fish and Wildlife Information System (MOFWIS)

<http://www.conservation.state.mo.us/egi-bin/mofwis/search.cgi>

Accessed 2/17/00

# POTENTIAL FISH SPECIES OF THE AREA

## Common Name

## Scientific Name

BASS, LARGEMOUTH	<i>MICROPTERUS SALMOIDES</i>
BASS, SMALLMOUTH	<i>MICROPTERUS DOLOMIEU</i>
BASS, SPOTTED	<i>MICROPTERUS PUNCTULATUS</i>
BASS, STRIPED	<i>MORONE SAXATILIS</i>
BASS, WHITE	<i>MORONE CHRYSOPS</i>
BASS, YELLOW	<i>MORONE MISSISSIPPIENSIS</i>
BLUEGILL	<i>LEPOMIS MACROCHIRUS</i>
BUFFALO, BIGMOUTH	<i>ICTIOBUS CYPRINELLUS</i>
BUFFALO, BLACK	<i>ICTIOBUS NIGER</i>
BUFFALO, SMALLMOUTH	<i>ICTIOBUS BUBALUS</i>
BULLHEAD, BLACK	<i>AMEIURUS MELAS</i>
BULLHEAD, YELLOW	<i>AMEIURUS NATALIS</i>
CARP, BIGHEAD	<i>HYPOPHthalmichthys nobilis</i>
CARP, COMMON	<i>CYPRINUS CARPIO</i>
CARP, GRASS	<i>CTENOPHARYNGODON IDELLA</i>
CARPSUCKER, RIVER	<i>CARPIODES CARPIO</i>
CATFISH, BLUE	<i>ICTALURUS FURCATUS</i>
CATFISH, CHANNEL	<i>ICTALURUS PUNCTATUS</i>
CATFISH, FLATHEAD	<i>PYLODICTIS OLIVARIS</i>
CATFISH, WHITE	<i>AMEIURUS CATUS</i>
CHUB, CREEK	<i>SEMOTILUS ATROMACULATUS</i>
CHUB, FLATHEAD	<i>PLATYGOBIO GRACILIS</i>
CHUB, SICKLEFIN	<i>MACRHYBOPSIS MEEKI</i>
CHUB, SILVER	<i>MACRHYBOPSIS STORERIANA</i>
CHUB, SPECKLED	<i>MACRHYBOPSIS AESTIVALIS</i>
CHUB, STURGEON	<i>MACRHYBOPSIS GELIDA</i>
CRAPPIE, BLACK	<i>POMOXIS NIGROMACULATUS</i>
CRAPPIE, WHITE	<i>POMOXIS ANNULARIS</i>
DARTER, BLACKSIDE	<i>PERCINA MACULATA</i>
DARTER, FANTAIL	<i>ETHEOSTOMA FLABELLARE</i>
DARTER, JOHNNY	<i>ETHEOSTOMA NIGRUM</i>
DARTER, ORANGETHROAT	<i>ETHEOSTOMA SPECTABIL</i>
DARTER, SLENDERHEAD	<i>PERCINA PHOXOCEPHALA</i>
DRUM, FRESHWATER	<i>APLODINOTUS GRUNNIENS</i>
EEL, AMERICAN	<i>ANGUILLA ROSTRATA</i>
GAR, LONGNOSE	<i>LEPISOSTEUS OSSEUS</i>
GAR, SHORTNOSE	<i>LEPISOSTEUS PLATOSTOMUS</i>
GOLDEYE	<i>HIODON ALOSOIDES</i>
HERRING, SKIPJACK	<i>ALOSA CHRYSOCHLORIS</i>
KILLIFISH, PLAINS	<i>FUNDULUS ZEBRINUS</i>
LAMPREY, CHESTNUT	<i>ICHTHYOMYZON CASTANEUS</i>
LOGPERCH	<i>PERCINA CAPRODES</i>
MADTOM, SLENDER	<i>NOTURUS EXILIS</i>

## CONTINUED:

Common Name	Scientific Name
MADTOM, TADPOLE	<i>NOTURUS GYRINUS</i>
MINNOW, BLUNTNOSE	<i>PIMEPHALES NOTATUS</i>
MINNOW, FATHEAD	<i>PIMEPHALES PROMELAS</i>
MINNOW, PLAINS	<i>HYBOGNATHUS PLACITUS</i>
MINNOW, SUCKERMOUTH	<i>PHENACOBIOUS MIRABILIS</i>
MINNOW, WESTERN SILVERY	<i>HYBOGNATHUS ARGYRITIS</i>
MOSQUITOFISH, WESTERN	<i>GAMBUSIA AFFINIS</i>
PADDLEFISH	<i>POLYODON SPATHULA</i>
PIKE, NORTHERN	<i>ESOX LUCIUS</i>
QUILLBACK	<i>CARPIODES CYPRINUS</i>
REDHORSE, GOLDEN	<i>MOXOSTOMA ERYTHRURUM</i>
REDHORSE, SHORthead	<i>MOXOSTOMA MACROLEPIDOTUM</i>
SAUGER	<i>STIZOSTEDION CANADENSE</i>
SHAD, ALABAMA	<i>ALOSA ALABAMAE</i>
SHAD, GIZZARD	<i>DOROSOMA CEPEDIANUM</i>
SHAD, THREADFIN	<i>DOROSOMA PETENENSE</i>
SHINER, BIGMOUTH	<i>NOTROPIS DORSALIS</i>
SHINER, COMMON	<i>LUXILUS CORNUTUS</i>
SHINER, EMERALD	<i>NOTROPIS ATHERINOIDES</i>
SHINER, GHOST	<i>NOTROPIS BUCHANANI</i>
SHINER, GOLDEN	<i>NOTEMIGONUS CRYSOLEUCAS</i>
SHINER, REDFIN	<i>LYTHRURUS UMBRATILIS</i>
SHINER, RED	<i>CYPRINELLA LUTRENSIS</i>
SHINER, RIVER	<i>NOTROPIS BLENNIUS</i>
SHINER, ROSYFACE	<i>NOTROPIS RUBELLUS</i>
SHINER, SAND	<i>NOTROPIS STRAMINEUS</i>
SHINER, SILVERBAND	<i>NOTROPIS SHUMARDI</i>
SHINER, TOPEKA	<i>NOTROPIS TOPEKA</i>
SILVERSIDE, BROOK	<i>LABIDESTHES SICCULUS</i>
SMELT, RAINBOW	<i>OSMERUS MORDAX</i>
STONECAT	<i>NOTURUS FLAVUS</i>
STONEROLLER, CENTRAL	<i>CAMPOSTOAM ANOMALUM</i>
STURGEON, LAKE	<i>ACIPENSER FULVESCENS</i>
STURGEON, PALLID	<i>SCAPHIRHYNCHUS ALBUS</i>
STURGEON, SHOVELNOSE	<i>SCAPHIRHYNCHUS PLATORYNCHUS</i>
SUCKER, BLUE	<i>CYCLEPTUS ELONGATUS</i>
SUCKER, NORTHERN HOG	<i>HYPENTELIUM NIGRICAN</i>
SUCKER, WHITE	<i>CATOSTOMUS COMMERSONI</i>
SUNFISH, GREEN	<i>LEPOMIS CYANELLUS</i>
SUNFISH, LONGEAR	<i>LEPOMIS MEGALOTIS</i>
SUNFISH, ORANGESPOTTED	<i>LEPOMIS HUMILIS</i>
SUNFISH, REDEAR	<i>LEPOMIS MICROLOPHUS</i>

## CONTINUED:

Common Name	Scientific Name
TOPMINNOW, BLACKSTRIPE	<i>FUNDULUS NOTATUS</i>
TROUT-PERCH	<i>PERCOPSIS OMISCOMAYCUS</i>
WALLEYE	<i>STIZOSTEDION VITREUM VITREUM</i>
WARMOUTH	<i>LEPOMIS GULOSUS</i>

Source:

Missouri Fish and Wildlife Information System (MOFWIS)

<http://www.conservation.state.mo.us/egi-bin/mofwis/search.cgi>

Accessed 2/17/00

streams and those with high gradients or continuous strong flow. They are more often found in quiet pools rather than riffles.. and they prefer sand substrates.

Golden Redhorse (*Moxostoma erythrurum*) – They prefer warmer waters, low currents, and are tolerant of turbidity and intermittent flow. They are most abundant in moderately clear, unpolluted streams having large, permanent pools and well-defined rocky or gravelly riffles.



STATE OF MISSOURI  
G-1 Missouri Department of Natural Resources Standard Conditions  
DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION



## MISSOURI STATE OPERATING PERMIT

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo. as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended,

Permit No. MO-0046825

Owner: Boone County Regional Sewer District (BCSD)

Owner's Address: 1314 North 7th Street, Columbia, MO 65201

Operating Authority: N/A

Operating Authority's Address: N/A

Facility Name: BCSD, Gregory Heights Subdivision

Facility Address: Oakland Gravel Road, Columbia, MO 65207

Legal Description: SE 1/4, NW 1/4, Sec. 20, T49N, R12W, Boone County

Receiving Stream & Basin: Bear Creek (Perche Creek/Little Boone Femme Basin) (10300102-28-03) (U)

Is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein:

### FACILITY DESCRIPTION

Outfall #001 - Two cell aerated primary lagoon/sludge is retained in lagoon. Design population equivalent is 150. Design flow is 20,000 gallons per day. Design sludge production is 2.3 dry tons/year. Actual flow is 20,000 gallons/day. Actual sludge production is 2.3 dry tons/year.

Outfall #002 - Two cell lagoon/sludge is retained in lagoon. Design population equivalent is 290. Design flow is 30,000 gallons per day. Design sludge production is 4.3 dry tons/year. Actual flow is 18,000 gallons/day. Actual sludge production is 2.7 dry tons/year.

This permit authorizes only wastewater discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System; it does not apply to other regulated areas. This permit may be appealed in accordance with Section 644.051.6 of the Law.

October 24, 1996

Effective Date

October 23, 2001

Expiration Date

MO 780-0041 (10-93)

John A. Young  
Director, Division of Environmental Quality

Director of Staff, Clean Water Commission

C. SPECIAL CONDITIONS

1. Report as no-discharge when a discharge does not occur during the report period.
2. This permit may be reopened and modified or alternatively revoked and reissued, to incorporate new or modified effluent limitations or other conditions, if the result of a wasteload allocation study, toxicity test, or other information indicates changes are necessary to ensure compliance with Missouri's Water Quality Standards.
3. This permit may be modified, or alternatively revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C), and (D), 304(b)(2) and 307(a)(2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:
  - (a) Contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or
  - (b) Controls any pollutant not limited in the permit.

The permit as modified or reissued under this paragraph shall also contain any other requirements of the Act then applicable.

4. General Criteria. The following water quality criteria shall be applicable to all waters of the state at all times including mixing zones. No water contaminant, by itself or in combination with other substances, shall prevent the waters of the state from meeting the following conditions:
  - (a) Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses;
  - (b) Waters shall be free from oil, scum and floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses;
  - (c) Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses;
  - (d) Waters shall be free from substances or conditions in sufficient amounts to result in toxicity to human, animal or aquatic life;
  - (e) There shall be no significant human health hazard from incidental contact with the water;
  - (f) There shall be no acute toxicity to livestock or wildlife watering;
  - (g) Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community;
  - (h) Waters shall be free from used tires, car bodies, appliances, demolition debris, used vehicles or equipment and solid waste as defined in Missouri's Solid Waste Law, section 260.200, RSMo, except as the use of such materials is specifically permitted pursuant to section 260.200-260.247.

5. Changes in Discharges of Toxic Substances

The permittee shall notify the Director as soon as it knows or has reason to believe:

- a. That any activity has occurred or will occur which would result in the discharge of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels:"
  - (1) One hundred micrograms per liter (100 ug/L);
  - (2) Two hundred micrograms per liter (200 ug/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/L) for 2,5 dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;
  - (3) Five (5) times the maximum concentration value reported for the pollutant in the permit application;
  - (4) The level established in Part A of the permit by the Director.
- b. That they have begun or expect to begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which was not reported in the permit application.

6. Permittee will cease discharge by connection to areawide wastewater treatment system within 90 days of notice of its availability.

Sludge and Biosolids Use For Domestic Wastewater Treatment Facilities

- (a) Permittee shall comply with the pollutant limitations, monitoring, reporting, and other requirements in accordance with the attached permit Standard Conditions.

STANDARD CONDITIONS FOR NPDES PERMITS  
ISSUED BY  
THE MISSOURI DEPARTMENT OF NATURAL RESOURCES  
MISSOURI CLEAN WATER COMMISSION  
Revised  
October 1, 1980

**PART I — GENERAL CONDITIONS**

**SECTION A — MONITORING AND REPORTING**

**1. Representative Sampling**

A. Samples and measurements taken as required herein shall be representative of the nature and volume, respectively, of the monitored discharge. All samples shall be taken at the outfall(s), and unless specified, before the effluent joins or is diluted by any other body of water or substance.

B. Monitoring results shall be recorded and reported on forms provided by the Department, postmarked no later than the 28th day of the month following the completed reporting period. Signed copies of these, and all other reports required herein, shall be submitted to the respective Department Regional Office, the Regional Office address is indicated in the cover letter transmitting the permit.

**2. Schedule of Compliance**

No later than fourteen (14) calendar days following each date identified in the "Schedule of Compliance", the permittee shall submit to the respective Department Regional Office as required therein, either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements, or if there are no more scheduled requirements, when such noncompliance will be corrected. The Regional Office address is indicated in the cover letter transmitting the permit.

**3. Definitions**

Definitions as set forth in the Missouri Clean Water Law and Missouri Clean Water Commission Definition Regulation 10 CSR 20-2.010 shall apply to terms used herein.

**4. Test Procedures**

Test procedures for the analysis of pollutants shall be in accordance with the Missouri Clean Water Commission Effluent Regulation 10 CSR 20-7.015.

**5. Recording of Results**

A. For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

- (i) The date, exact place, and time of sampling or measurements;
- (ii) The individual(s) who performed the sampling or measurements;
- (iii) The date(s) analyses were performed;
- (iv) The individual(s) who performed the analyses;
- (v) The analytical techniques or methods used; and
- (vi) The results of such analyses.

B. The Federal Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

C. Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

**6. Additional Monitoring by Permittee**

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Monitoring Report Form. Such increased frequency shall also be indicated.

**7. Records Retention**

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time.

**SECTION B — MANAGEMENT REQUIREMENTS**

**1. Change in Discharge**

A. All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant not authorized by this permit or of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit.

B. Any facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants shall be reported by submission of a new NPDES application at least sixty (60) days before such changes, or, if they will not violate the effluent limitations specified in this permit, by notice to the Department at least thirty (30) days before such changes.

**2. Noncompliance Notification**

A. If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Department with the following information, in writing within five (5) days of becoming aware of such condition:

- (i) A description of the discharge and cause of noncompliance, and
- (ii) The period of noncompliance, including exact dates and times or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

B. Twenty-four hour reporting. The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

**3. Facilities Operation**

Permittees shall operate and maintain facilities to comply with the Missouri Clean Water Law and applicable permit conditions. Operators or supervisors of operations at publicly owned or publicly regulated wastewater treatment facilities shall be certified in accordance with 10 CSR 20-9.020(2) and any other applicable state law or regulation. Operators of other wastewater treatment facilities, water contaminant source or point sources, shall, upon request by the department, demonstrate that wastewater treatment equipment and facilities are effectively operated and maintained by competent personnel.

**4. Adverse Impact**

The permittee shall take all necessary steps to minimize any adverse impact to waters of the state resulting from non-compliance with any effluent limitations specified in this permit or set forth in the Missouri Clean Water Law and Regulations (hereinafter the Law and Regulations), including such accelerated or additional monitoring as necessary to determine the nature and impact of the non-complying discharge.

5. **Bypassing**

A. Any bypass or shut down of a wastewater treatment facility and tributary sewer system or any part of such a facility and sewer system that results in a violation of permit limits or conditions is prohibited except:

- (i) Where unavoidable to prevent loss of life, personal injury, or severe property damages; and
- (ii) Where unavoidable excessive storm drainage or runoff would catastrophically damage any facilities or processes necessary for compliance with the effluent limitations and conditions of this permit;
- (iii) Where maintenance is necessary to ensure efficient operation and alternative measures have been taken to maintain effluent quality during the period of maintenance.

B. The permittee shall notify the department in writing of all bypasses or shut down that result in a violation of permit limits or conditions. This section does not excuse any person from any liability, unless such relief is otherwise provided by the statute.

6. **Removed Substances**

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutants from entering waters of the state unless permitted by the Law, and a permanent record of the date and time, volume and methods of removal and disposal of such substances shall be maintained by the permittee.

7. **Power Failures**

In order to maintain compliance with the effluent limitations and other provisions of this permit, the permittee shall either:

- A. in accordance with the "Schedule of Compliance", provide an alternative power source sufficient to operate the wastewater control facilities; or,
- B. if such alternative power source is not in existence, and no date for its implementation appears in the Compliance Schedule, halt or otherwise control production and all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

8. **Right of Entry**

For the purpose of inspecting, monitoring, or sampling the point source, water contaminant source, or wastewater treatment facility for compliance with the Clean Water Law and these regulations, authorized representatives of the department shall be allowed by the permittee, upon presentation of credentials and at reasonable times:

- A. to enter upon permittee's premises in which a point source, water contaminant source, or wastewater treatment facility is located or in which any records are required to be kept under terms and conditions of the permit;
- B. to have access to, or copy, any records required to be kept under terms and conditions of the permit;
- C. to inspect any monitoring equipment or method required in the permit;
- D. to inspect any collection, treatment, or discharge facility covered under the permit; and
- E. to sample any wastewater at any point in the collection system or treatment process.

9. **Permits Transferable**

- A. Subject to section (3) of 10 CSR 20-6.010 an operating permit may be transferred upon submission to the department of an application to transfer signed by a new owner. Until such time as the permit is officially transferred, the original permittee remains responsible for complying with the terms and conditions of the existing permit.
- B. The department, within thirty (30) days of receipt of the application shall notify the new permittee of its intent to revoke and reissue or transfer the permit.

10. **Availability of Reports**

Except for data determined to be confidential under Section 308 of the Act, and the Law and Missouri Clean Water Commission Regulation for Public Participation, Hearings and Notice to Governmental Agencies 10 CSR 20-6.020, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. As required by statute, effluent data shall not be considered confidential. Knowingly making any false

statement on any such report shall be subject to the imposition of criminal penalties as provided for in Section 204.076 of the Law.

11. **Permit Modification**

A. Subject to compliance with statutory requirements of the Law and Regulations and applicable Court Order, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including but not limited to, the following:

- (i) violation of any terms or conditions of this permit or the Law;
- (ii) having obtained this permit by misrepresentation or failure to disclose fully all relevant facts;
- (iii) a change in any circumstances or conditions that requires either a temporary or permanent reduction or elimination of the authorized discharge, or
- (iv) any reason set forth in the Law and Regulations.

B. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

12. **Permit Modification-Less Stringent Requirements**

If any permit provisions are based on legal requirements which are lessened or removed, and should no other basis exist for such permit provisions, the permit shall be modified after notice and opportunity for a hearing.

13. **Civil and Criminal Liability**

Except as authorized by statute and provided in permit conditions on "Bypassing" (Standard Condition B-5) and "Power Failures" (Standard Condition B-7) nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

14. **Oil and Hazardous Substance Liability**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act, and the Law and Regulations. Oil and hazardous materials discharges must be reported in compliance with the requirements of the Federal Clean Water Act.

15. **State Laws**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state statute or regulations.

16. **Property Rights**

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of or violation of federal, state or local laws or regulations.

17. **Duty to reapply**

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for a new permit 180 days prior to expiration of this permit.

18. **Toxic Pollutants**

If a toxic effluent standard, prohibition, or schedule of compliance is established under section 307(a) of the Federal Clean Water Act for a toxic pollutant in the discharge of permittee's facility and such standard is more stringent than the limitations in the permit, then the more stringent standard, prohibition, or schedule shall be incorporated into the permit as one of its conditions, upon notice to the permittee.

19. **Signatory requirement**

All reports, or information submitted to the Director shall be signed (See 40 CFR-122.6)

20. **Rights Not Affected**

Nothing in this permit shall affect the permittee's right to appeal or seek a variance from applicable laws or regulations as allowed by law.

21. **Severability**

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

**STANDARD CONDITIONS FOR NPDES PERMITS**  
**ISSUED BY**  
**THE MISSOURI DEPARTMENT OF NATURAL RESOURCES**  
**MISSOURI CLEAN WATER COMMISSION**  
**Revised**  
**October 1, 1980**

**PART II — SPECIAL CONDITIONS**  
**— PUBLICLY OWNED TREATMENT WORKS**  
**SECTION A — MAJOR CONTRIBUTING INDUSTRY**

**1. Definitions**

Definitions as set forth in the Missouri Clean Water Law and Missouri Clean Water Commission Definition Regulation 10 CSR 20-2.010 shall apply to terms used herein, in addition to the following:

- A. A "major contributing industry" to a publicly owned treatment facility is a wastewater source that meets any one of the following criteria:
  - (1) has a flow of 50,000 gallons or more per average workday;
  - (2) has an average daily flow greater than five percent (5%) of the flow carried by the system receiving the waste;
  - (3) has in its waste a toxic pollutant in toxic amounts as defined in standards issued under Section 307(a) of the Federal Water Pollution Control Act (hereinafter the Act); or
  - (4) has significant impact, either singly or in combination with other contributing industries, on the treatment works or in the quality of its effluent.
- B. "Compatible pollutants" are biochemical oxygen demand, suspended solids, pH, and fecal coliform bacteria, plus additional pollutants, e.g., nitrogen or phosphorus, identified in the NPDES permit. If the publicly owned treatment facility was designed to treat such pollutants, approved by the Department and in fact does remove such pollutants to design specifications.
- C. An "incompatible pollutant" is any pollutant which is not a compatible pollutant as defined above.

**2. Industrial Effluent Monitoring**

The permittee shall establish and implement a procedure to periodically or regularly obtain monitoring data on the quality and quantity of all effluents introduced by each major contributing industry. Frequency of monitoring shall be subject to approval by the Department.

**3. Industrial Users Report**

Each permittee which has a major contributing industry shall also submit to the permit-issuing authority semi-annual reports summarizing all major contributing industries subject to the pretreatment requirements of the Missouri Clean Water Law and Regulations (hereinafter the Law and Regulations), or Section 307 of the Act. These reports must be filed with the Department of Natural Resources, 2010 Missouri Boulevard, Jefferson City,

Missouri 65101 by January 1 and July 1 of each year. Such a report shall include at least the following information:

- A. name and number of major contributing industries using the treatment works and the waste type, raw materials usage (lbs/day or kg/day), and average daily flow for each industry;
- B. summary of monitoring data obtained in accordance with Standard Conditions Part II, Section A 2. above, detailing the quality and quantity of all effluents introduced by each major contributing industry, and the frequency of monitoring performed;
- C. number of major contributing industries in full compliance with the requirements of the Law and Regulations and Section 307 of the Act or not subject to these requirements (e.g., discharge only compatible pollutants); and
- D. a list identifying by name those major contributing industries presently in violation of the requirements of the Law and Regulations and Section 307 of the Act (e.g., discharges pollutant which interferes with, passes through or is incompatible with the municipal treatment works).

**4. Report on Pollutant Introduction**

The permittee shall give notice to the department of any new introduction of pollutants or any substantial change in the character or volume of pollutants already being introduced. Such notice shall include:

- A. the origin, quality, and quantity of pollutants to be introduced into the publicly owned treatment works, and
- B. any anticipated impact on the quality and quantity of the effluent to be discharged by such treatment works.
- C. any anticipated impact on the quality of the sludge produced by such treatment works causing the sludge to be hazardous under Federal and State Law.

**5. Industrial Users Compliance Schedules**

The permittee shall identify any introduction of pollutants into the facility subject to pretreatment standards under section 307(b) of the Federal Clean Water Act. In addition, the permittee shall require any industrial user of such treatment works to comply with the requirements of sections 204(b), 307, and 308 of the Federal Clean Water Act. As a means of insuring such compliance, the permittee shall require notices of compliance from each industrial user, subject to the requirements of section 307 of the Federal Clean Water Act and shall forward to the department a copy of periodic notice, over intervals not to exceed nine (9) months, of progress towards full compliance with section 307 requirements.

STANDARD CONDITIONS FOR NPDES PERMITS  
ISSUED BY  
THE MISSOURI DEPARTMENT OF NATURAL RESOURCES  
MISSOURI CLEAN WATER COMMISSION  
AUGUST 15, 1994

**PART III - SLUDGE & BIOSOLIDS FROM DOMESTIC WASTEWATER TREATMENT FACILITIES**

**SECTION A - GENERAL REQUIREMENTS**

1. This permit pertains to sludge requirements under the Missouri Clean Water Law and regulations and incorporates applicable federal sludge disposal requirements under 40 CFR 503. The Environmental Protection Agency (EPA) has principal authority for permitting and enforcement of the federal sludge regulations under 40 CFR 503 until such time as Missouri is delegated the new EPA sludge program. EPA has reviewed and accepted these standard sludge conditions. EPA may choose to issue a separate sludge addendum to this permit or a separate federal sludge permit at their discretion to further address federal requirements.
2. These PART III Standard Conditions apply only to sludge and biosolids generated at domestic wastewater treatment facilities, including public owned treatment works (POTW) and privately owned facilities.
3. Sludge and Biosolids Use and Disposal Practices.
  - a. Permittee is authorized to operate the sludge and biosolids treatment, storage, use, and disposal facilities listed in the facility description of this permit.
  - b. Permittee shall not exceed the design sludge volume listed in the facility description and shall not use sludge disposal methods that are not listed in the facility description, without prior approval of the permitting authority.
  - c. Permittee is authorized to operate the storage, treatment or generating sites listed in the Facility Description section of this permit.
  - d. A separate operating permit is required for each operating location where sludge or biosolids are generated, stored, treated, or disposed, unless specifically exempted in this permit or in 10 CSR 20, Chapter 6 regulations. For land application, see section H, subsection 3 of these standard conditions.
4. Sludge Received From Other Facilities
  - a. Permittees may accept domestic wastewater sludge from other facilities including septic tank pumpings from residential sources as long as the design sludge volume is not exceeded and the treatment facility performance is not impaired.
  - b. The permittee shall obtain a signed statement from the sludge generator or hauler that certifies the type and source of the sludge.
  - c. Sludge received from out-of-state generators shall receive prior approval of the permitting authority and shall be listed in the facility description or special conditions section of the permit.
5. These permit requirements do not supersede nor remove liability for compliance with county and other local ordinances.
6. These permit requirements do not supersede nor remove liability for compliance with other environmental regulations such as odor emissions under the Missouri Air Pollution Control Law and regulations.
7. This permit may (after due process) be modified, or alternatively revoked and reissued, to comply with any applicable sludge disposal standard or limitation issued or approved under Section 405(d) of the Clean Water Act or under Chapter 644 RSMo.
8. In addition to these STANDARD CONDITIONS, the department may include sludge limitations in the special conditions portion or other sections of this permit.
9. Alternate Limits in Site Specific Permit.

Where deemed appropriate, the department may require an individual site specific permit in order to authorize alternate limitations:

  - a. An individual permit must be obtained for each operating location, including application sites.
  - b. To request a site specific permit, an individual permit application, permit fees, and supporting documents shall be submitted for each operating location. This shall include a detailed sludge/biosolids management plan or engineering report.
10. Exceptions to these Standard Conditions may be authorized on a case-by-case basis by the department, as follows:
  - a. The department will prepare a permit modification and follow permit public notice provisions as applicable under 10 CSR 20-6.020, 40 CFR 124.10, and 40 CFR 501.15 (a)(2)(b)(E). This includes notification of the owners of property located adjacent to each land application site, where appropriate.
  - b. Exceptions cannot be granted where prohibited by the federal sludge regulations under 40 CFR 503.
11. Compliance Period

Compliance shall be achieved as expeditiously as possible but no later than the compliance dates under 40 CFR 503.2

## SECTION B - DEFINITIONS

1. **Biosolids** means an organic fertilizer or soil amendment produced by the treatment of domestic wastewater sludge. Untreated sludge or sludge that does not conform to the pollutants and pathogen treatment requirements in this permit is not considered biosolids.
2. **Biosolids land application facility** is a facility where biosolids are spread onto the land at agronomic rates for production of food or fiber. The facility includes any structures necessary to store the biosolids until soil, weather, and crop conditions are favorable for land application.
3. **Class A biosolids** means a material that has met the Class A pathogen reduction requirements or equivalent treatment by a Process to Further Reduce Pathogens (PFRP) in accordance with 40 CFR 503.
4. **Class B biosolids** means a material that has met the Class B pathogen reduction requirements or equivalent treatment by a Process to Significantly Reduce Pathogens (PSRP) in accordance with 40 CFR 503.
5. **Domestic wastewater** means wastewater originating from the sanitary conveniences of residences, commercial buildings, factories and institutions; or co-mingled sanitary and industrial wastewater processed by a public owned treatment works (POTW) or privately owned facility.
6. **Mechanical treatment plants** are wastewater treatment facilities that use mechanical devices to treat wastewater, including septic tanks, extended aeration, activated sludge, contact stabilization, trickling filters, rotating biological discs, and other similar facilities. It does not include un aerated wastewater treatment lagoons and constructed wetlands for wastewater treatment.
7. **Operating location** as defined in 10 CSR 20-2.010 is all contiguous lands owned, operated or controlled by one (1) person or by two (2) or more persons jointly or as tenants in common.
8. **Plant Available Nitrogen (PAN)** is the nitrogen that will be available to plants during the next growing season after biosolids application.
9. **Sinkhole** is a depression in the land surface into which surface water flows to join an underground drainage system.
10. **Site Specific Permit** is a permit that has alternate limits developed to address specific site conditions for each land application site or storage site.
11. **Sludge** is the solid, semisolid, or liquid residue removed during the treatment of wastewater. Sludge includes septage removed from septic tanks.
12. **Sludge lagoon** is an earthen basin that receives sludge that has been removed from a wastewater treatment facility. It does not include a wastewater treatment lagoon or sludge treatment units that are not a part of a mechanical wastewater treatment facility.
13. **Wetlands** are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include constructed wetlands used for wastewater treatment.

## SECTION C - MECHANICAL WASTEWATER TREATMENT FACILITIES

1. Sludge shall be routinely removed from the wastewater treatment facilities and handled according to the permit facility description and sludge conditions in this permit.
2. The permittee shall operate the facility so that there is no sludge loss into the discharged effluent in excess of permit limits, no sludge bypassing, and no discharge of sludge to waters of the state.
3. Mechanical treatment plants shall have separate sludge storage compartments in accordance with 10 CSR 20, Chapter 6. Failure to remove sludge from these storage compartments on the required design schedule is a violation of this permit.

## SECTION D - SLUDGE DISPOSED AT OTHER TREATMENT FACILITY OR CONTRACT HAULER

1. This section applies to permittees that haul sludge to another treatment facility for disposal or use contract haulers to remove and dispose of sludge.
2. Permittees that use contract haulers are responsible for compliance with all the terms of this permit including final disposal, unless the contract hauler has a separate permit for sludge or biosolids disposal issued by the department, or the hauler transports the sludge to another permitted treatment facility.
3. The permittee shall require documentation from the contractor of the disposal methods used and permits obtained by the contractor.
4. Testing of sludge, other than total solids content, is not required if sludge is hauled to a municipal wastewater treatment facility or other permitted wastewater treatment facility.



## SECTION E - WASTEWATER TREATMENT LAGOONS AND STORMWATER RETENTION BASINS

1. Sludge that is retained within a wastewater treatment lagoon is subject to sludge disposal requirements when the sludge is removed from the lagoon or when the lagoon ceases to receive and treat wastewater.
2. If sludge is removed during the year, an annual sludge report must be submitted.
3. Storm water retention basins or other earthen basins, which have been used as sludge storage for a mechanical treatment system is considered a sludge lagoon and must comply with Section G of this permit.

## SECTION F - INCINERATION OF SLUDGE

1. Sludge incineration facilities shall comply with the requirements in 40 CFR 503 Subpart E; air pollution control regulations under 10 CSR 10; and solid waste management regulations under 10 CSR 80.
2. Permittee may be authorized under the facility description of this permit to store incineration ash in lagoons or ash ponds. This permit does not authorize the disposal of incineration ash. Incineration ash shall be disposed in accordance with 10 CSR 80; or if the ash is determined to be hazardous waste, shall be disposed in accordance with 10 CSR 25.
3. In addition to normal sludge monitoring, incineration facilities shall report the following as part of the annual report: quantity of sludge incinerated, quantity of ash generated, quantity of ash stored; and ash use or disposal method, quantity, and location. Permittee shall also provide the name of the disposal facility and the applicable permit number.
4. Additional limitations, monitoring, and reporting requirements may be addressed in the Special Conditions sections of this permit.

## SECTION G - SURFACE DISPOSAL SITES AND SLUDGE LAGOONS

1. Surface disposal sites shall comply with the requirements in 40 CFR 503 Subpart C, and solid waste disposal regulations under 10 CSR 80.
2. Additional limitations, monitoring, and reporting requirements may be addressed in the Special Conditions section of this permit.
3. Effective February 19, 1995, a sludge lagoon that has been in use for more than two years without removal of accumulated sludge, or that has not been properly closed shall comply with one of the following options:
  - a. Permittee shall obtain a site specific permit to address surface disposal requirements under 40 CFR 503, ground water quality regulations under 10 CSR 20, Chapter 7 and 8, and solid waste management regulations under 10 CSR 80;
  - b. Permittee shall clean out the sludge lagoon to remove any sludge over two years old and shall continue to remove accumulated sludge at least every two years or an alternate schedule approved under 40 CFR 503.20(b). In order to avoid damage to the lagoon seal during cleaning, the permittee may leave a layer of sludge on the bottom of the lagoon, upon prior approval of the department; or
  - c. Permittee shall close the lagoon in accordance with Section I.

## SECTION H - LAND APPLICATION

1. The permittee shall not land apply sludge or biosolids unless land application is authorized in the Facility Description or special conditions section of the permit.
2. This permit replaces and terminates all previous sludge management plan approvals by the department for land application of sludge or biosolids.
3. Land application sites within a 20 mile radius of the wastewater treatment facility are authorized under this permit when biosolids are applied for beneficial use in accordance with these standard conditions unless a site specific permit is required under section A, subsection 9.
4. Biosolids shall not be land applied unless authorized in this permit or exempted under 10 CSR 20, Chapter 6.
  - a. This permit does not authorize the land application of sludge except when sludge meets the definition of biosolids.
  - b. This permit authorizes "Class A or B" biosolids derived from domestic wastewater sludges to be land applied onto grass land, crop land, timber land or other similar agricultural or silviculture lands at rates suitable for beneficial use as organic fertilizer and soil conditioner.
5. Public Contact Sites.

Permittees who wish to apply Class A biosolids to public contact sites must obtain approval from the department. Applications for approval shall be in the form of an engineering report and shall address priority pollutants and dioxin concentrations. Authorization for land applications must be provided in the special conditions section of this permit or in a separate site-specific permit.

6. Agricultural and Silvicultural Sites

In addition to specified conditions herein, this permit is subject to the attached Water Quality Guides numbers WQ 422 through 426 published by the University of Missouri, and hereby incorporated as though fully set forth herein. The guide topics are as follows:

WQ 422	Land Application of Septage
WQ 423	Monitoring Requirements for Biosolids Land Application
WQ 424	Biosolids Standards for Pathogens and Vectors
WQ 425	Biosolids Standards for Metals and Other Trace Substances
WQ 426	Best Management Practices for Biosolids Land Application

SECTION I - CLOSURE REQUIREMENTS

1. This section applies to all wastewater treatment facilities (mechanical and lagoons) and sludge or biosolids storage and treatment facilities and incineration ash ponds. It does not apply to land application sites.
2. Permittees who plan to cease operation must obtain department approval of a closure plan which addresses proper removal and disposal of all residues, including sludge, biosolids, and ash. Permittees must maintain this permit until the facility is properly closed per 10 CSR 20-6.010(12) and 10 CSR 20-6.015(12).
3. Residuals that are left in place during closure of a lagoon or earthen structure shall not exceed the agricultural loading rates as follows:
  - a. Residuals shall meet the monitoring and land application limits for agricultural rates as referenced in Section H of these standard conditions.
  - b. If a wastewater treatment lagoon has been in operation for 15 years or more, the sludge in the lagoon qualifies for Class B with respect to pathogens (See WQ 424, Table 3), and testing for fecal coliform is not required. For other lagoons, testing for fecal coliform is required to show compliance with Class B limitations. See WQ 423 and 424.
  - c. The allowable nitrogen loading that may be left in the lagoon shall be based on the plant available nitrogen (PAN) loading. See WQ 426 for calculation procedures. For a grass cover crop, the allowable PAN is 300 pounds/acre.
4. When closing a wastewater treatment lagoon with a design treatment capacity equal or less than 150 persons, the residuals are considered "septage" under the "similar treatment works" definition. See WQ 422. Under the septage category, residuals may be left in place as follows:
  - a. Testing for metals or fecal coliform is not required.
  - b. If the wastewater treatment lagoon has been in use for less than 15 years, mix lime with the sludge at the rate of 50 pounds of hydrated lime per 1000 gallons (134 cubic feet) of sludge.
  - c. The amount of sludge that may be left in the lagoon shall be based on the plant available nitrogen (PAN) loading. 100 dry tons/acre of sludge may be left in the basin without testing for nitrogen. If more than 100 dry tons/acre will be left in the lagoon, test for nitrogen and determine the PAN in accordance with WQ 426. Allowable PAN loading is 300 pounds/acre.
5. Residuals left within the lagoon shall be mixed with soil on at least a 1 to 1 ratio, the lagoon berms shall be demolished, and the site shall be graded and vegetated so as to avoid ponding of storm water and provide adequate surface water drainage without creating erosion.
6. Lagoon closure activities shall obtain a storm water permit for land disturbance activities that equal or exceed five acres in accordance with 10 CSR 20-6.200.
7. If sludge exceeds agricultural loading rates under Section H or I, a landfill permit or solid waste disposal permit shall be obtained to authorize on-site sludge disposal under the Missouri Solid Waste Management Law and regulations per 10 CSR 80, and the permittee must comply with the surface disposal requirements under 40 CFR 503, Subpart C.

SECTION J - MONITORING FREQUENCY

1. At a minimum, sludge or biosolids shall be tested for volume and percent total solids on a frequency that will accurately represent sludge quantities produced and disposed.
2. Testing for land application is listed under section H, subsection 6 of these standard conditions (see WQ 423). Once per year is the minimum test frequency. Additional testing shall be performed for each 100 dry tons of sludge generated or stored during the year.
3. Additional testing may be required in the special conditions or other sections of this permit. Permittees receiving industrial wastewater may be required to conduct additional testing upon request from the department.
4. Monitoring requirements shall be performed in accordance with, "POTW Sludge Sampling and Analysis Guidance Document", United States Environmental Protection Agency, August 1989, and subsequent revisions.

Water quality data for Bear Creek on Boone County Fairgrounds Property

Site Name	Date	Time	DO mg/L	Air Temp °C	Sample Temp °C	Conductivity uS/cm	pH	Alkalinity	Hardness	NH4	Turbidity NTU
Above upper lagoon	3/12/00	1:00 PM	13.3	18.8	8.3						
At break in dam of upper lagoon	3/12/00	1:10 PM	3.9	20.8	15.6						
At discharge of upper lagoon	3/12/00	1:20 PM	8.5	13.2	12.5						
Below all three lagoons	3/12/00	1:20 PM	8.5	13.2	12.4						
Below western service bridge	3/12/00	4:30 PM	12.6	20.8	12.6						
Above upper lagoon	3/13/00	4:00 PM			23.2	693	7.98	196	262	0.0607	1.8
At break in dam of upper lagoon	3/13/00	4:00 PM			23.2	670	7.48	214	452	5.98	17
At break in dam of upper lagoon	3/13/00	4:00 PM							325*		
At discharge of upper lagoon	3/13/00	4:00 PM			22.9	654	8.01	194	262	0.045	2
Below all three lagoons	3/13/00	4:00 PM			22.9	648	8.04	198	254	0.0238	11
Below all three lagoons	3/13/00	4:00 PM								0.0856*	
Below western service bridge	3/13/00	4:00 PM			22.6	1249	7.77	144	370	0.0783	16

\* Second run. Accept second run, disregard first reading due to technical error.

All samples were <0.25 NO<sub>3</sub>-N. The 11 mg/L Standard read 11mg/L.

# Boone County Fall-Ground-Sports Complex

## Dimensions:

Soccer Field 225ft\* 360ft  
81,000 sq.ft.









Softball Field 275ft\* 275ft  
75,625 sq.ft

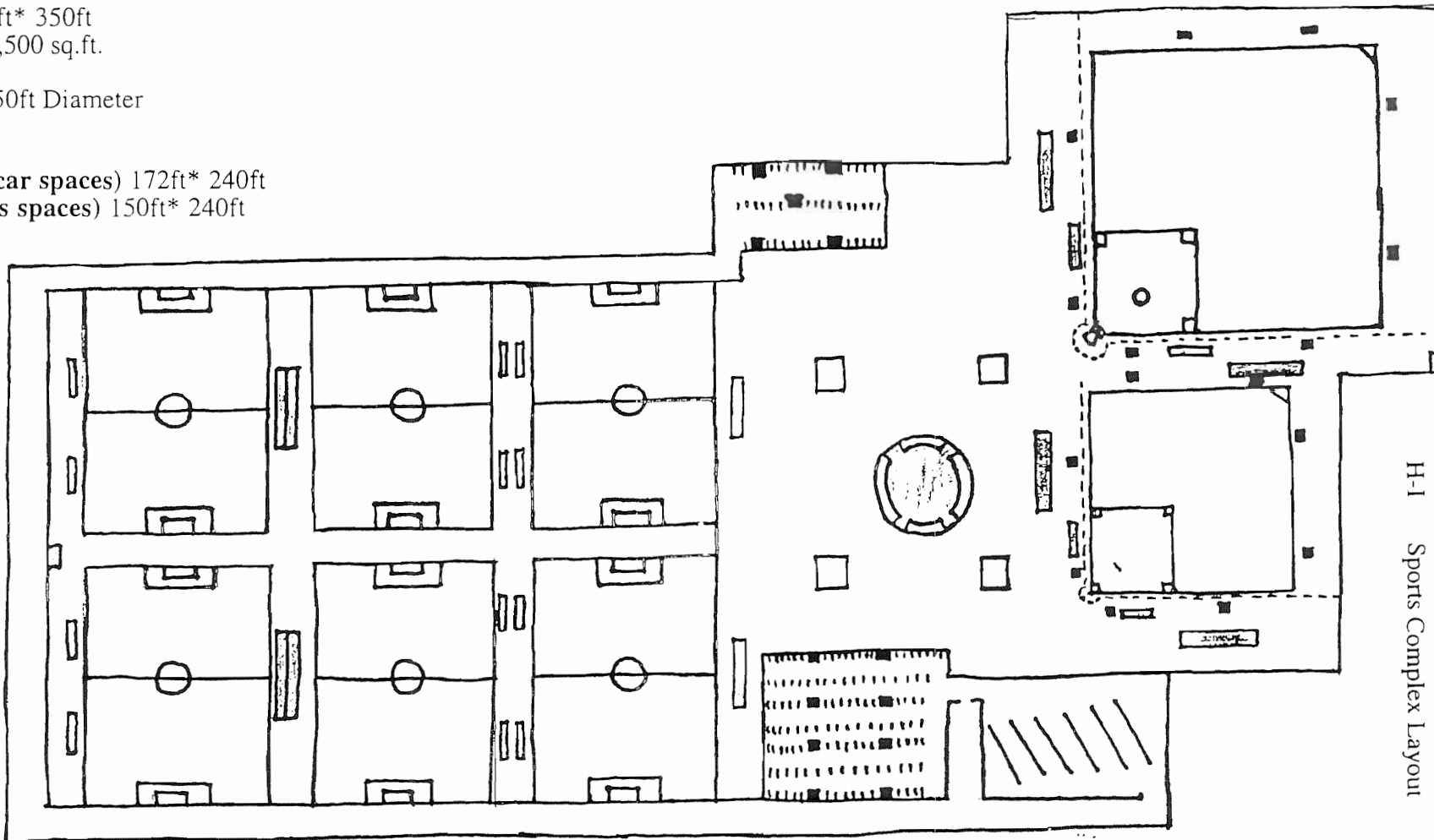
Baseball Field 350ft\* 350ft  
122,500 sq.ft.

Concession Stand 50ft Diameter

Parking Lots  
South (140 car spaces) 172ft\* 240ft  
South (6 bus spaces) 150ft\* 240ft

### Key

-  Picnic Areas
-  Team Benches
-  Bleachers
-  Lights
-  Road/Parking Area
-  Concession Stand
-  Maintenance Shed
-  Score Board



1 in = 200 ft.    ↑N

H-1 Sports Complex Layout

ATHLETIC FIELD  
SOCCER/FOOTBALL  
MODE I

Athletic Field Mode I	Frequencies	Description of task	Dollar value per unit per field	Total dollar per occurrence/field
Mowing	48	72-inch mower 60 minutes/field	*\$15.96 per field	\$766.08
Fertilizer	4	Quarterly Contract basis	\$25 per field	\$100
Disease/Pest	2	Semi-annual or as needed Contract basis	\$50 per field	\$100
Aeration	4	Quarterly 6-ft fairway core aerator	6 hrs per field \$95.76 per field	\$383.04
Restoration Seeding	2	Seeding 4 lbs seed/1000 sq ft	30 min/field \$15.96 per field \$696 for seed/field	\$31.92 \$1,392.00
Restoration Sod	2	Sod 120 sq yards/field	3 hrs/120 sq yds/field \$47.88/sq yds \$180 for 120 sq yds	\$95.76 \$360.00
Irrigation	36	1 hour/week of use 30 minutes per field	\$7.98 per field	\$287.28
Field Layout	2	Initial field layout. install goals 2 seasons	4 hrs per field \$63.84 per field	\$127.68
Field Preparation	8	Bi-weekly with paint Riding field liner	30 min per field = \$7.98 \$30 for paint	\$63.84 \$240.00
Inspections	300	7 days per week during season. less often non-season	15 min/per field \$3.99 per field	\$1,197
Administration	52	5 minutes/field	\$12.50/field	\$650.00
Total			\$1,252.85/field	\$5,794.60

\*\$12.00 per hour + 33% benefits = \$15.96

**ATHLETIC FIELD  
SOCCER/FOOTBALL  
MODE II**

<b>Athletic Field Mode II</b>	Frequencies	Description of task	Dollar value per unit per field	Total dollar per occurrence/field
Mowing	38	72-inch mower 60 minutes/field	*\$15.96 per field	\$606.48
Fertilizer	4	Quarterly Contract basis	\$25 per field	\$100
Disease/Pest	2	Semi-annual or as needed Contract basis	\$50 per field	\$100
Aeration	2	Semi-annual 6-ft fairway core aerator	6 hrs per field \$95.76 per field	\$191.52
Restoration Seeding	2	Seeding 4 lbs seed/1000 sq ft	30 min/field \$15.96 per field \$696 for seed/field	\$31.92 \$1,392.00
Restoration Sod	1	Sod 120 sq yards/field	3 hrs/120 sq yds/field \$47.88/sq yds \$180 for 120 sq yds	\$47.88 \$180.00
Irrigation	36	1 hour/week of use 30 minutes per field	\$7.98 per field	\$287.28
Field Layout	2	Initial field layout, install goals 2 seasons	4 hrs per field \$63.84 per field	\$127.68
Field Preparation	8	Bi-weekly with paint Riding field liner	30 min per field = \$7.98 \$30 for paint	\$63.84 \$240.00
Inspections	150	5 days per week during season, less often non-season	15 min/per field \$3.99 per field	\$598.50
Administration	36	5 minutes/field	\$12.50/field	\$450.00
<b>Total</b>			<b>\$1,252.85/field</b>	<b>\$4,417.10</b>

\*\$12.00 per hour + 33% benefits = \$15.96

**ATHLETIC FIELD  
SOCCER/FOOTBALL  
MODE III**

Athletic Field Mode III	Frequencies	Description of task	Dollar value per unit per field	Total dollar per occurrence/field
Mowing	23	72-inch mower 60 minutes/field	*\$15.96 per field	\$367.08
Fertilizer	1	Annual Contract basis	\$25 per field	\$25.00
Disease/Pest	1	Annual or as needed Contract basis	\$50 per field	\$50.00
Aeration	1	Annual 6-ft fairway core aerator	6 hrs per field \$95.76 per field	\$95.76
Restoration Seeding	1	Seeding 4 lbs seed/1000 sq ft	30 min/field \$15.96 per field \$696 for seed/field	\$15.96 \$696.00
Restoration Sod	No Sod			
Irrigation	No Irrigation			
Field Layout	2	Initial field layout. install goals 2 seasons	4 hrs per field \$63.84 per field	\$127.68
Field Preparation	8	Bi-weekly with paint Riding field liner	30 min per field = \$7.98 \$30 for paint	\$63.84 \$240.00
Inspections	52	Once @ 3 days, less often non-season	15 min/per field \$3.99 per field	\$207.48
Administration	18	5 minutes/field	\$12.50/field	\$225.00
Total			\$1,252.85/field	\$2,088.80

\*\$12.00 per hour + 33% benefits = \$15.96

**ATHLETIC FIELD  
SOCCER/FOOTBALL  
MODE IV**

<b>Athletic Field Mode III</b>	Frequencies	Description of task	Dollar value per unit per field	Total dollar per occurrence/field
Mowing	16	72-inch mower 60 minutes/field	*\$15.96 per field	\$255.36
Fertilizer	No Fertilizer			
Disease/Pest	1	Semi-annual or as needed Contract basis	\$50 per field	\$50.00
Aeration	No Aeration			
Restoration Seeding	1	Seeding 4 lbs seed/1000 sq ft	30 min/field \$15.96 per field \$696 for seed/field	\$15.96 \$696.00
Restoration Sod	No Sod			
Irrigation	No Irrigation			
Field Layout	1	Initial field layout. install goals	4 hrs per field \$63.84 per field	\$63.84
Field Preparation	No Field Preparation			
Inspections	26	Once @ 2 weeks	15 min/per field \$3.99 per field	\$103.74
Administration	12	5 minutes/field	\$12.50/field	\$150.00
Total			\$1,252.85/field	\$1,334.90

\*\$12.00 per hour + 33% benefits = \$15.96



13  
ATHLETIC FIELD  
BASEBALL/SOFTBALL  
MODE I

Athletic Field Mode I	Frequency per Year	Description of task	Unit Cost per Field	Total Cost per Field
Mowing	48	72-inch mower 30 minutes/field	*\$7.98 per field	\$383.04
Fertilizer	4	Quarterly Contract basis	\$25 per field	\$100.00
Disease/Pest	2	Semi-annual or as needed Contract basis	\$50 per field	\$100.00
Aeration	4	Quarterly 6-ft fairway core aerator	4 hrs per field \$63.84 per field	\$255.36
Restoration Seeding	2	Seeding 4 lbs seed/1000 sq ft	15 min/field \$3.99 per field \$348 for seed/field	\$7.98 \$696.00
Restoration Sod	2	Sod 60 sq yards	120 min/60 sq yds/field \$31.92 /sq yds \$100 for 60 sq yds	\$63.84 \$200.00
Irrigation	36	1 hour/week of use 30 minutes per field	\$7.98 per field	\$287.28
Off-season Infield Preparation	4	Add calcine clay or infield mix as needed. Till infield, level.	8 hrs per field=\$127.68 \$120 per half-ton calcine clay	\$510.72 \$480.00
Infield Preparation	189 (27 week season, 7 days/week)	Drag infield, clean dugouts, litter control, set bases, chalk/mark field	45 minutes per field \$11.97 per field labor \$2.00 per field materials	\$2,262.33 \$378.00
Inspections	300	7 days per week during season, less often non-season	15 min/per field \$3.99 per field	\$1,197.00
Administration	52	5 minutes/field	\$12.50/field	\$650.00
Total			\$916.85/field	\$7,571.55

\*\$12.00 per hour + 33% benefits = \$15.96 divided by 2 = \$7.98

**ATHLETIC FIELD  
BASEBALL/SOFTBALL  
MODE II**

Athletic Field Mode II	Frequency per Year	Description of task	Unit Cost per Field	Total Cost per Field
Mowing	38	72-inch mower 30 minutes/field	*\$7.98 per field	\$303.24
Fertilizer	4	Quarterly Contract basis	\$25 per field	\$100.00
Disease/Pest	2	Semi-annual or as needed Contract basis	\$50 per field	\$100.00
Aeration	2	Semi-annual 6-ft fairway core aerator	4 hrs per field \$63.84 per field	\$127.68
Restoration Seeding	2	Semi-annual Seeding 4 lbs seed/1000 sq ft	15 min/field \$3.99 per field \$348 for seed/field	\$7.98 \$696.00
Restoration Sod	1	Annual Sod 60 sq yards	120 min/60 sq yds/field \$31.92 /sq yds \$100 for 60 sq yds	\$31.92 \$100.00
Irrigation	36	1 hour/week of use 30 minutes per field	\$7.98 per field	\$287.28
Off-season Infield Preparation	2	Add calcine clay or infield mix as needed. Till infield, level.	8 hrs per field=\$127.68 \$120 per half-ton calcine clay	\$255.36 \$240.00
Infield Preparation	100 (20 week season, 5 days/week)	Drag infield, clean dugouts, litter control, set bases, chalk/mark field	45 minutes per field \$11.97 per field labor \$2.00 per field materials	\$1,197.00 \$200.00
Inspections	150	5 days per week during season, less often non-season	15 min/per field \$3.99 per field	\$598.50
Administration	36	5 minutes/field	\$12.50/field	\$450.00
Total			\$916.85/field	\$4,694.96

\*\$12.00 per hour + 33% benefits = \$15.96 divided by 2 = \$7.98

**ATHLETIC FIELD  
BASEBALL/SOFTBALL  
MODE III**

Athletic Field Mode III	Frequency per Year	Description of task	Unit Cost per Field	Total Cost per Field
Mowing	23	72-inch mower 30 minutes/field	*\$7.98 per field	\$183.54
Fertilizer	1	Annual Contract basis	\$25 per field	\$25.00
Disease/Pest	1	Annual or as needed Contract basis	\$50 per field	\$50.00
Aeration	1	Annual 6-ft fairway core aerator	4 hrs per field \$63.84 per field	\$63.84
Restoration Seeding	1	Seeding 4 lbs seed/1000 sq ft	15 min/field \$3.99 per field \$348 for seed/field	\$3.99 \$348.00
Restoration Sod	No Sod			
Irrigation	No Irrigation			
Off-season Infield Preparation	1	Add calcine clay or infield mix as needed. Till infield, level.	8 hrs per field=\$127.68 \$120 per half-ton calcine clay	\$127.68 \$120.00
Infield Preparation	80 (16 week season, 5 days per week)	Drag infield, clean dugouts, litter control, set bases, chalk/mark field	45 minutes per field \$11.97 per field labor \$2.00 per field materials	\$957.60 \$160.00
Inspections	52	Once @ 3 days, less often non-season	15 min/per field \$3.99 per field	\$207.48
Administration	18	5 minutes/field	\$12.50/field	\$225.00
Total			\$776.95/field	\$2,472.13

\*\$12.00 per hour + 33% benefits = \$15.96 divided by 2 = \$7.98

**ATHLETIC FIELD  
BASEBALL/SOFTBALL  
MODE IV  
Recreational or Practice Fields  
No regularly scheduled games**

<b>Athletic Field Mode IV</b>	<b>Frequency per Year</b>	<b>Description of task</b>	<b>Unit Cost per Field</b>	<b>Total Cost per Field</b>
Mowing	16	72-inch mower 30 minutes/field	*\$7.98 per field	\$127.68
Fertilizer	No Fertilizer			
Disease/Pest	1	Annual or as needed Contract basis	\$50 per field	\$50.00
Aeration	No Aeration			
Restoration Seeding	1	Seeding 2 lbs seed/1000 sq ft	15 min/field \$3.99 per field \$174 for seed/field	\$3.99 \$174.00
Restoration Sod	No Sod			
Irrigation	No Irrigation			
Off-season Infield Preparation	1	Add calcine clay or infield mix as needed. Till infield. level.	8 hrs per field=\$127.68 \$120 per half-ton calcine clay	\$127.68 \$120.00
Infield Preparation	No Infield Preparation. Practice or Pick-up Only			
Inspections	26	Once @ 2 weeks	15 min/per field \$3.99 per field	\$103.74
Administration	12	5 minutes/field	\$12.50/field	\$150.00
Total			\$500.14/field	\$857.09

\*\$12.00 per hour + 33% benefits = \$15.96 divided by 2 = \$7.98

Sports Complex Construction Costs**Baseball Field & Softball Field**

Electronic Score Board (2) (10ft*20ft): \$75/sq.ft.	Total= \$30,000
Bases (6): \$50	Total= \$300
Home plate (2): \$50	Total= \$100
Pitchers Plate (2): \$12.95	Total= \$25.90
Hooded Backstop (2): \$599	Total= \$1,198
Bleachers (4) (100 Seats): \$27.50/seat	Total= \$11,000
Team Bench (4) (20 Seats): \$37/seat	Total= \$2,960
Black Vinyl Backdrop (2): \$300	Total= \$600
Foul Poles (4) (25ft*1.75'top): \$349.95	Total= \$1,400

**Soccer Fields**

Goals (12): \$1,000	Total= \$12,000
Team Bench (12) (20 Seats): \$37/seat	Total= \$8,880
Bleachers (6) (50 Seats): \$30.50/seat	Total= \$9,150
Corner Flags (24): \$25	Total= \$600

**Maintenance Sheds**

Construction:	
Softball/Baseball : (20ft*20ft): \$82/sq.ft	Total= \$32,800
Electric (20ft*20ft): \$3.50/sq.ft	Total= \$1,400
Soccer (10ft*10ft): \$82/sq.ft.	Total= \$8,200
Lining Machine (2): \$300	Total= \$600
Rake Machine (1): \$500	Total= \$500

**Concession Stand/Picnic Area**

Construction:	
Building (50ft Diameter): \$97/sq. ft.	Total= \$190,459
Electric (50ft Diameter): \$3.50/sq.ft.	Total= \$6,872
Heating and Air Conditioning (50ft. D): \$3.50/sq.ft.	Total= \$6,872
Paint: \$0.60/sq.ft.	Total= \$1,178
Floor Covering (50ft. Diameter): \$15.00/sq.ft.	Total= \$29,452
Roof (50ft Diameter): \$9.00/sq.ft.	Total= \$17,671
Gutters and Drainage System: \$6.50/L.ft.	Total= \$1,021
Exterior Door (2): \$850	Total= \$1,700
Double Door (1): \$1,850	Total= \$1,850
Sewer Hookup: \$7.50/L.ft.	Total= \$1,177
Water Hookup: \$3.50/L.ft	Total= \$549

**Food Area**

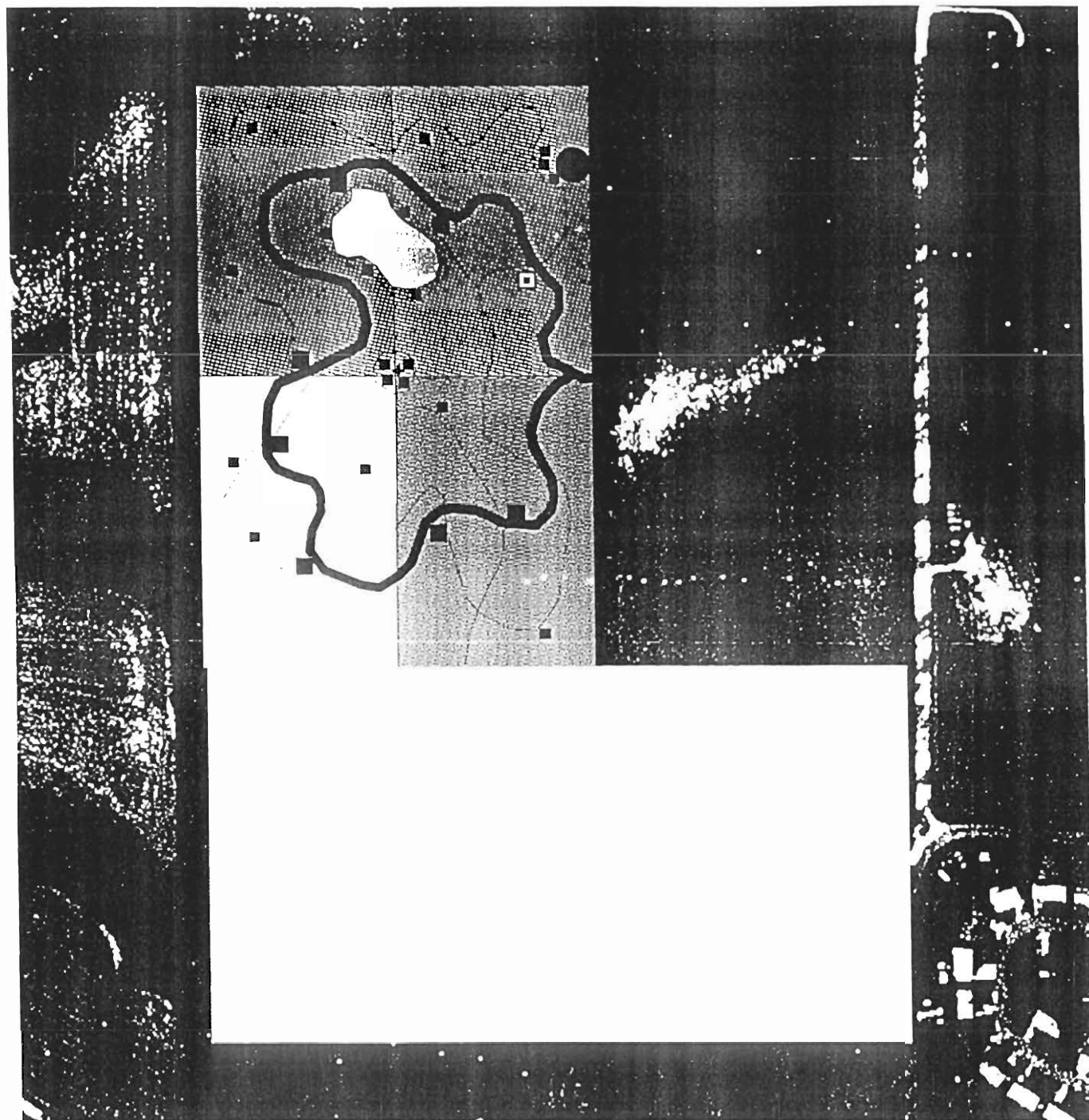
Indoor Grill (1): \$3,125	Total= \$3,125
Large Freezer (1): \$10,380	Total= \$10,380
Popcorn Machine (2): \$1,500	Total= \$3,000
Snow Cone Machine (1): \$1,075	Total= \$1,075
Ice Maker (2): \$3,450	Total= \$3,450

**Covered Picnic Shelters**

Pavilion (4) (30ft*30ft): \$8,000	Total= \$32,000
Handicap Accessible Picnic Tables (16): \$1,250	Total= \$20,000

<b><u>Roads and Parking Area</u></b> (195,680 sq.ft): \$3.80/sq.ft	Total= \$743,584
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# Nature Center, Arboretum, and Spontaneous Recreation Area



0.06 0 0.06 0.12 Miles

- bench
- + fountain
- gazebo
- picnic
- ▬ Pond
- ▬ Arboretum Trails
- ▬ Nature Center Roads
- Arboretum
  - ▬ fall
  - ▬ spring
  - ▬ summer
  - ▬ winter
- ▬ Nature Center and Parking
- ▬ Spontaneous Rec. Area