# SECTION IV

# *REGIONAL DESCRIPTION AND FACTORS INFLUENCING DEVELOPMENT*

## 4.1. INTRODUCTION

### General

This section provides an overview of the demographic, economic, recreational and environmental resources of the project area. The topics covered are population characteristics, distribution and trends, economic conditions, educational opportunities, transportation systems, climatic conditions, hydrological conditions, land-use, ecological resources, aesthetic qualities, geology and soil characteristics, archaeological and historical resources and recreation characteristics.

### Zone of Influence

A 150-mile radius zone of influence (reference *Plate Z-1*) centered at Alton has been adopted for purposes of this Master Plan. This zone includes the large metropolitan complex of Greater St. Louis and most of southern and west central Illinois and east central and southeastern Missouri. With the population within the 150-mile zone estimated at 3.5 million, the area is generally typical and characteristic of the Midwest adjacent to the Mississippi Valley. The St. Louis Metropolitan Statistical Area (MSA) on both sides of the Mississippi River represents the significant concentration of both population and industry and is within the 50-mile primary zone of influence. The remainder of the 150-mile zone is primarily agricultural in nature with numerous small cities, towns and villages offering commodities and services. The area is well served by freight rail, road systems, truck lines and inland navigable rivers.

## 4.2. DEMOGRAPHICS-URBAN AND RURAL:

### Summary of entire region

The Rivers Project Service area extends from Hannibal, Missouri, to Cairo, Illinois, on the Mississippi River; from La Grange, Illinois, to Grafton, Illinois, on the Illinois River; from Fayetteville, Illinois, to the Modoc, Illinois, area on the Kaskaskia River and from Augusta, Missouri, through North St. Louis County on the Missouri River. A total of 27 counties in Missouri and Illinois are within the Rivers Project service area corridors. The St. Louis Metropolitan Area, with twelve counties, is the population and economic hub of the region and has, by far, the most influence on the Rivers Project operations. The St. Louis area accounts for approximately 89 percent of the Rivers Project area population. The rural counties both upstream (six counties) and downstream (nine counties) of the St. Louis Metropolitan Area account for only 11 percent of the regions' population and are primarily agricultural areas that are either losing population or growing slowly at best. The Cape Girardeau, Missouri, area is the only significant and growing population center on the River Corridor outside of the St. Louis area.

*Table 4-1*

*St. Louis MSA Facts-(1996 Data)*

| | |
|---|---|
| **Population** | 2,562,500 |
| **Media market population** | 2,978, 000 |
| **U.S. population within 500 miles** | 33% |
| **Number of households** | 960,000 |
| **Area (square miles)** | 6,397 |
| **Labor Force** | 1,362,800 |
| **Unemployment rate** | 4.5 |
| **High-tech work force** | 151,000 |
| **Total income** | $66 billion |
| **Retail Sales** | $24 billion |
| **Colleges and Universities** | 12 |
| **Cost of living index (U.S.=100)** | 98.7 |

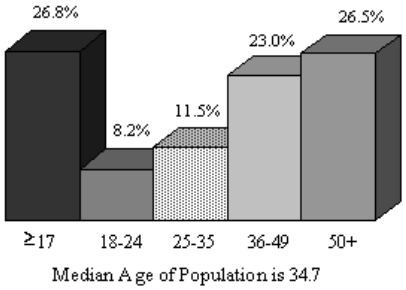
## St. Louis Metropolitan Statistical Area (MSA) Populations

### *History and Trends.*

The St. Louis MSA is a bi-state region comprising 12 counties, five in Illinois and seven in Missouri. It is the 18th most populous metropolitan area in the U.S. The St. Louis MSA has a stable, slow-growing population of approximately 2,562,500 as of 1996, an increase of almost 3 percent since the 1990 census.

Since 1930, the St. Louis MSA has gained more than a million people. The City of St. Louis' share of that total has decreased from 55 percent to about 14 percent. Typical of old cities, the city has experienced steady population losses during the 1980s and 1990s in virtually all major categories of population, housing, and economic activity. The average number of persons per household in the city fell from 2.5 to 2.35 during the 1980s, while one-person households increased from 36 percent in 1980 to 39.5 percent in 1990. The city slowed its loss to 6.7 percent for the first half of the 1980s, which may indicate a leveling off of population loss at 14 percent per decade. However, St. Louis is still among those cities losing proportionally the most population in the 1990s. Demographers for the State of Missouri currently estimate that the city's population in 2020 could be between approximately 223,000 and 277,000, depending on which trend variables are considered.

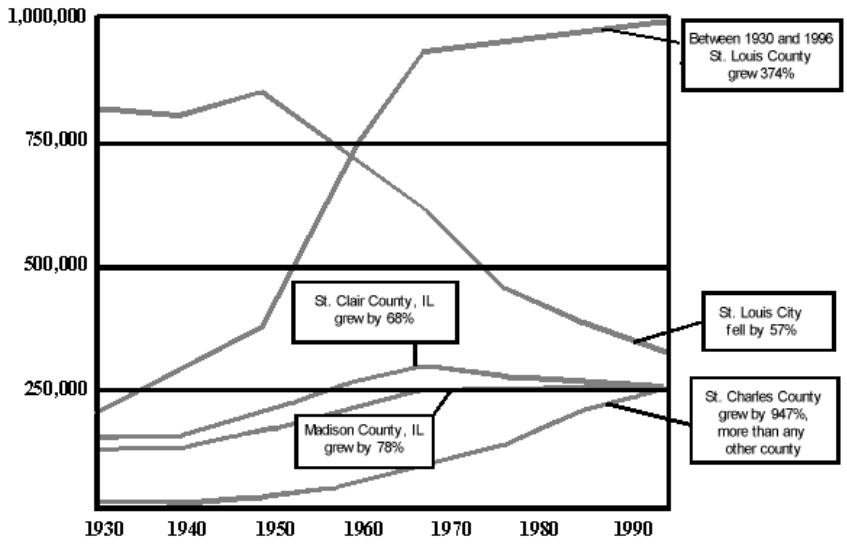
*Table 4-2*
*Age Distribution-(1996 Data)*




The outlying MSA counties in Missouri show significant, and at times spectacular, growth patterns which began in approximately 1970, with St. Charles County being one of the fastest growing counties in the United States with a growth rate of over 229 percent since 1970. Since 1990 alone, St. Charles County has grown an additional 30 percent. Warren and Lincoln Counties have also become increasingly urbanized, growing in population by 24.5 percent and 23 percent respectively.

The Illinois portion of the St. Louis MSA has approximately 600,000 inhabitants, or 24 percent of the total MSA. The five Illinois counties included in the St. Louis MSA are estimated to have gained 13,000 residents between 1990 and 1997, an increase of approximately 2.2 percent. Monroe County, with an estimated increase of 10.6 percent, is the fastest growing part of the MSA in Illinois.

*Table 4-3*
*Comparative Population Growth, St. Louis MSA 1930-1996*




## Rivers Corridor Populations

*Table 4 – 2* through *Table 4 - 10* provides population data for the Rivers Project Service Area. Existing populations, growth trends and population summaries for the 27 counties and more than 60 cities, towns and villages along the Rivers are documented.

*Table 4–4*
*Population Change 1980-2000, St.. Louis Metropolitan Statistical Area (Population exceeding 2 Million)*

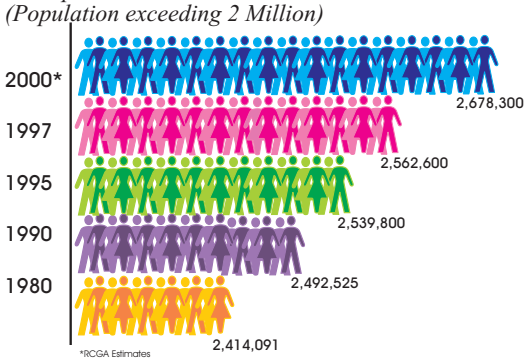



*Table 4-5*
*St. Louis Population by County, 1997 Estimates*

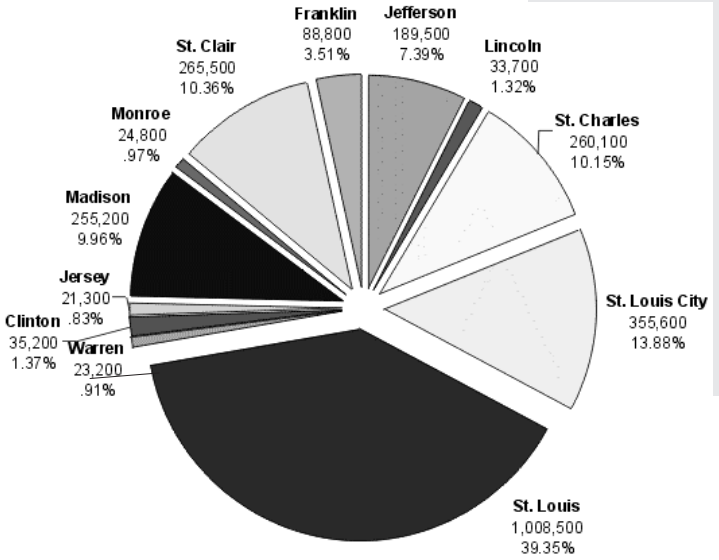



*Table 4-6*
*1980 - 2000 River Corridor Population by County*

| RIVER(S) CORRIDOR COUNTY AND STATE | POOL(S) NO. OR OPEN RIVER(OR) | 1980 CENSUS (000) | 1990 CENSUS (000) | % OF TOTAL REGION POPULATION | % CHANGE 1980-1990 | 1995 CENSUS (000) (96,97,98) | % CHANGE 1990-1995 | % TOTAL OF RIVER CORRIDOR POP. | 2000 PROJECTED POP. |
|---|---|---|---|---|---|---|---|---|---|
| Ralls, MO | 24 | 8.98 | 8.47 | 0.29 | -5.7 | 8.9 | 5.1 | 0.31 | 6 |
| Pike, MO | 24,25 | 17.57 | 15.97 | 0.56 | -9.1 | 16.17 | 1.3 | 0.56 | — |
| Pike, IL | 24 IL River (26) | 18.87 | 17.59 | 0.62 | -0.7 | 17.3 | -0.2 | 0.60 | 17.22 |
| Calhoun, IL | 25 IL River (26) | 5.89 | 5.32 | 0.18 | -1.0 | 4.97 | 0.6 | 0.17 | 5.57 |
| Scott, IL | IL River (26) | 6.09 | 5.65 | 0.19 | -0.8 | 5.64 | -0.1 | 0.19 | 5.5 |
| Greene, IL | IL River (26) | 16.68 | 15.33 | 0.54 | -0.8 | 15.65 | -0.1 | 0.54 | 15.24 |
| Jersey,IL (MSA) | 26 | 20.6 | 20.54 | 0.73 | -0.3 | 21.3 | 3.5 | 0.74 | 21.13 |
| Lincoln, MO (MSA) | 25,26 | 22.2 | 28.89 | 1.02 | 30.0 | 34.12 | 18.1 | 1.18 | — |
| St.Charles, MO (MSA) | 26, MO River | 144.1 | 212.75 | 7.5 | 47.7 | 255.06 | 19.9 | 8.83 | — |
| Madison, IL (MSA) | 26,27 | 247.65 | 249.58 | 8.82 | 0.77 | 255.2 | 2.2 | 8.83 | 259.17 |
| St.Louis, MO (MSA) | 27, OR, MO River | 974.17 | 993.51 | 35.15 | 2.0 | 1003.81 | 1.0 | 34.76 | — |
| St.Louis City (MSA) | 27, OR | 452.8 | 396.80 | 14.04 | -12.4 | 351.6 | -11.4 | 12.17 | — |
| Warren, MO (MSA) | MO River | 14.9 | 19.53 | 0.69 | 31.1 | 22.87 | 17.1 | 0.79 | — |
| Franklin, MO (MSA) | MO River | 71.23 | 80.60 | 2.85 | 13.2 | 89.48 | 11.0 | 3.1 | — |
| St.Clair, IL (MSA) | OR, Kaskaskia | 267.74 | 263.30 | 9.3 | -1.6 | 265.5 | 1.0 | 9.2 | 264.5 |
| Clinton, IL (MSA) | Kaskaskia | 32.79 | 34.00 | 1.12 | 3.5 | 35.2 | 0.4 | 1.2 | 36.43 |
| Monroe, IL (MSA) | OR, Kaskaskia | 20.2 | 22.40 | 0.79 | 9.8 | 24.8 | 10.6 | 0.86 | 27.8 |
| Jefferson, MO (MSA) | OR | 146.18 | 171.38 | 6.06 | 17.2 | 188.86 | 10.2 | 6.5 | — |
| St.Genevieve, MO | OR | 15.18 | 16.04 | 0.56 | 5.6 | 16.85 | 5.1 | 0.58 | — |
| Randolph, IL | OR | 35.55 | 34.61 | 1.22 | -2.5 | 34.29 | 0.3 | 1.2 | 35.32 |
| Perry, MO | OR | 16.78 | 16.65 | 0.58 | -0.8 | 17.43 | 4.7 | 0.60 | — |
| Jackson, IL | OR | 61.72 | 61.19 | 2.16 | -0.1 | 61.19 | -0.2 | 2.12 | 59.74 |
| Cape Girardeau, MO | OR | 58.84 | 61.63 | 2.18 | 4.8 | 65.72 | 6.6 | 2.27 | — |
| Union, IL | OR | 17.78 | 17.63 | 0.63 | -0.1 | 17.99 | -0.3 | 0.62 | 17.21 |
| Scott, MO | OR | 39.65 | 39.37 | 1.39 | -0.7 | 40.24 | 2.2 | 1.39 | — |
| Alexander, IL | OR | 12.28 | 10.64 | 0.37 | -1.4 | 10.36 | -0.8 | 0.36 | 9.83 |
| Pulaski, IL | Cache & Ohio Rivers | 8.79 | 7.53 | 0.26 | -1.5 | 7.40 | -0.8 | 0.25 | 6.94 |
| Total | | 2755.21 | 2826.90 | ~100% | +2.5 | 2879.00 | +2.14 | ~100% | — |

– Unavailable

*Table4-7*
*Population and Percent Total Population by State*

| | MISSOURI | ILLINOIS |
|---|---|---|
| Upstream Rural | 25,074 (.86%) | 43,550 (1.5%) |
| St. Louis SMA | 1,945,800 (67.37%) | 602,000 (20.84%) |
| Downstream Rural | 140,246 (4.8%) | 131,233 (4.54%) |
| TOTAL | 2,111,120 (73%) | 776,783 (26.9%) |
| **Total Both States** | (2,887,903) | |

*Figure 4-8*
*Rivers Corridor Population Summary(1995 Data)*

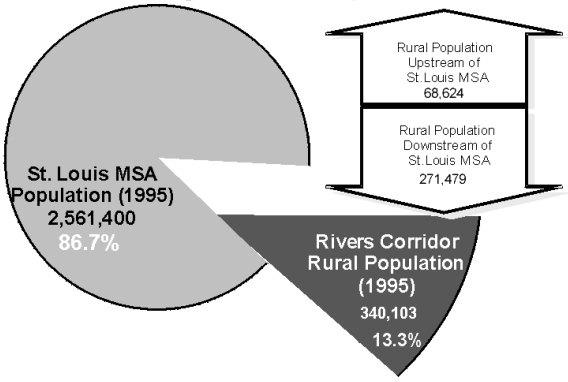



*Figure 4–9*
*Rural Statistical Population by Counties*

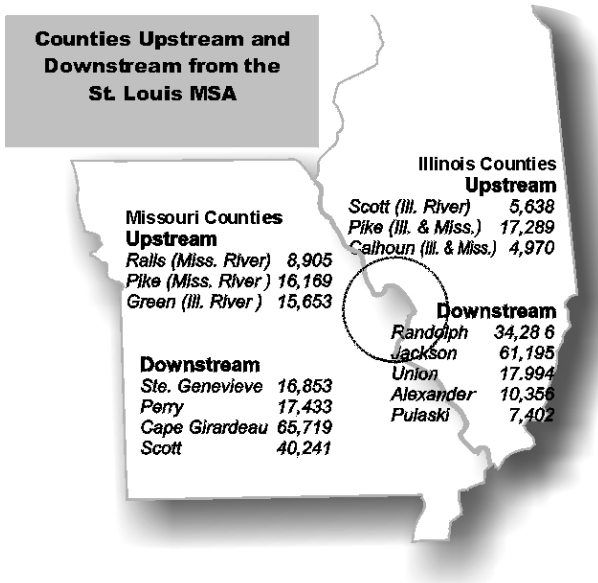



*Table 4-10*
*Populations of Municipalities on the River Corridors*

| | 1990 | 1996 | % CHANGE |
|---|---|---|---|
| **POOL 24** | | | |
| **Louisiana, MO** | 3,967 | 3,851 | - 3.0 |
| **Clarksville, MO** | 480 | 493 | + 2.6 |
| **Pleasant Hill, IL** | 1,030 | 1,024 | - 0.5 |
| **POOL 25** | | | |
| **Annada, MO** | 70 | 69 | - 1.4 |
| **Elsberry, MO** | 1,898 | 2,159 | +12.1 |
| **Foley, MO** | 209 | 202 | + 5.8 |
| **Winfield, MO** | 672 | 785 | +14.4 |
| **Belleview, IL** | – | – | – |
| **Mozier, IL** | – | – | – |
| **Hamburg, IL** | 150 | 140 | - 7.1 |
| **Batchtown, IL** | 225 | 212 | - 6.1 |
| **POOL 26 Mississippi River** | | | |
| **Peruque, MO** | – | – | – |
| **Portage Des Sioux, MO** | 503 | 495 | - 1.6 |
| **West Alton, MO** | – | – | – |
| **Chatauqua, IL** | – | – | – |
| **Elsah, IL** | 851 | 820 | - 3.7 |
| **Alton, IL** | 33,064 | 31,562 | - 4.75 |
| **East Alton, IL** | 7,063 | 6,779 | - 4.2 |
| **POOL 26 Illinois River** | | | |
| **Meredosia, IL** | 1,134 | 1,086 | - 4.4 |
| **Naples, IL** | 130 | 115 | - 13.0 |
| **Valley City, IL** | 23 | 22 | - 4.5 |
| **Florence, IL** | 45 | 46 | + 2.1 |
| **Montezuma, IL** | – | – | – |
| **Bedford, IL** | – | – | – |
| **Pearl, IL** | 177 | 174 | - 1.7 |
| **Hillview, IL** | 271 | 278 | + 2.5 |
| **Kampsville, IL** | 399 | 380 | - 5.0 |
| **Hardin, IL** | 1,071 | 1,021 | - 4.9 |
| **Brussels, IL** | 125 | 115 | - 8.7 |
| **Grafton, IL** | 918 | 890 | - 3.15 |
| **POOL 27** | | | |
| **Wood River, IL** | 11,490 | 11,097 | - 3.5 |
| **Hartford, IL** | 1,676 | 1,604 | - 4.48 |
| **Granite City, IL** | 32,766 | 31,449 | - 4.18 |
| **OPEN RIVER** | | | |
| **St. Louis, MO** | 396,685 | 351,565 | - 12.8 |
| **East St. Louis, IL** | 40,944 | 38,595 | - 6.1 |
| **Cahokia, IL** | 17,550 | 16,803 | -4.4 |
| **Dupo, IL** | 3,164 | 3,088 | -2.46 |
| **Valmeyer, IL** | 897 | 986 | +9.0 |
| **Kimmswick, MO** | 135 | 136 | +.7 |
| **Barnhart, MO** | – | – | – |
| **Pevely, MO** | 2,831 | 2,914 | +2.8 |
| **Herculaneum, MO** | 2,263 | 2,368 | + 4.4 |
| **Festus, MO** | 8,105 | 8,353 | +2.9 |
| **Crystal City, MO** | 4,088 | 3,973 | -2.9 |

*Populations of Municipalities on the River Corridors (Cont.)*

| | | | |
|---|---|---|---|
| **Ste. Genevieve, MO** | 4,411 | 4,666 | +5.46 |
| **St. Marys, MO** | 461 | 517 | + 10.8 |
| **Kaskaskia, IL** | 32 | 32 | 0 |
| **Prairie du Rocher, IL** | 602 | 574 | -4.8 |
| **Chester, IL** | 8,204 | 7,970 | -2.9 |
| **Perryville, MO** | 6,933 | 7,439 | +6.8 |
| **Cape Giradeau, MO** | 34,475 | 35,438 | +2.7 |
| **Scott City, MO** | 4,292 | 4,413 | +2.7 |
| **Rockwood, IL** | 45 | 45 | 0 |
| **Gorham, IL** | 290 | 291 | 0 |
| **Grand Tower, IL** | 775 | 765 | -1.2 |
| **E. Cape Giradeau, IL** | 451 | 425 | -5.7 |
| **Thebes, IL** | 461 | 426 | -7.5 |
| **Cairo, IL** | 4,846 | 4,496 | -7.2 |
| **Kaskaskia River** | | | |
| **Evansville, IL** | 844 | 803 | -4.8 |
| **New Athens, IL** | 2,010 | 1,974 | +1.7 |
| **Fayetteville, IL** | 371 | 373 | +1.0 |

– Unavailable

## 4.3. EDUCATIONAL INSTITUTIONS STATISTICS AND TRENDS

### Introduction

Interpretive services, educational outreach and school partnerships with educational institutions are important missions for the Rivers Project Office.

The following summary of schools and universities throughout the Rivers Project Service Area is provided to assist in identifying the regional scope of opportunities for program development and execution.

### St. Louis Metropolitan Area Educational Resources

#### *Elementary and Secondary Schools*

The Greater St. Louis region offers education to more than 480,000 elementary and secondary students. More than 25,000 high school students graduate each year in the St. Louis area, ready to enter college or become members of the area's work force.

One hundred fifteen public school districts from urban magnet schools to suburban systems educate more than 400,000 students

Over 300 private and parochial schools educate more than 80,000 students.

The St. Louis area's average ACT score of 22.9 is significantly higher than the national average of 20.8.

*Figure 4–11*
*Educational Attainment of Persons Age 25 and Older*

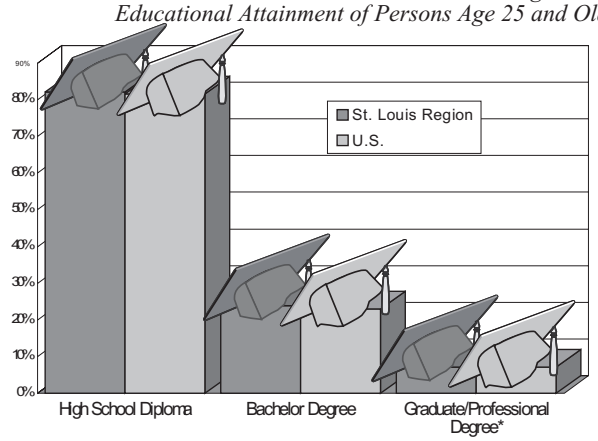
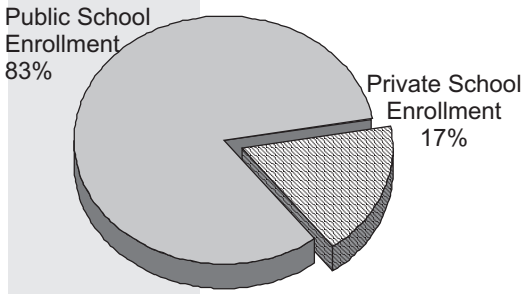


*Figure 4–12*
*Comparison between Public and Private School*

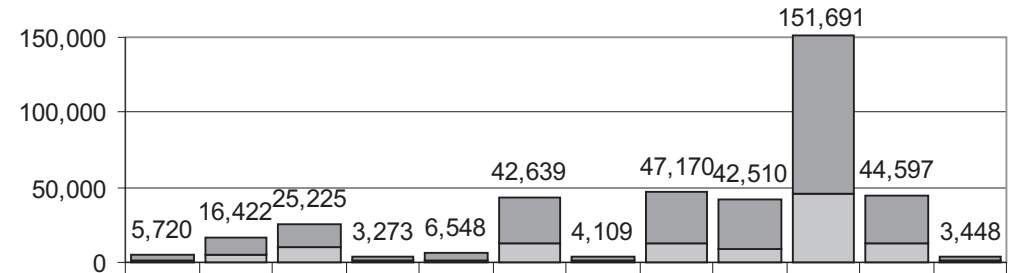



### *Higher Education*

Approximately 120,000 students are enrolled in higher education through the twelve colleges and universities, eight community colleges and more than 50 vocational-technical schools in the Greater St. Louis area. More than 8,000 bachelors degrees and 5,000 associates degrees are earned each year.

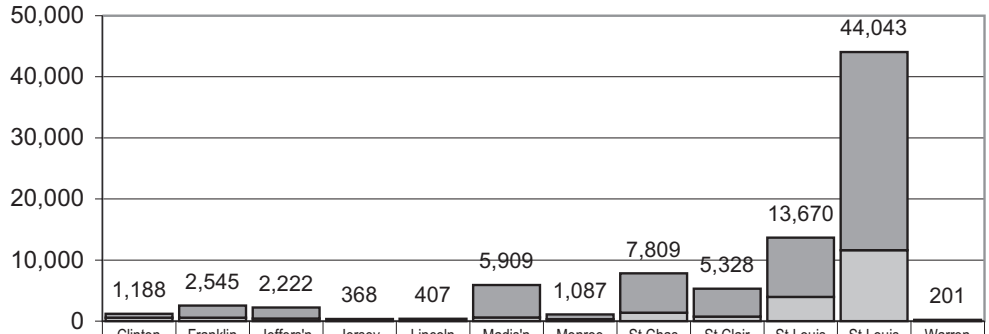
Washington University in St. Louis is among the top ranking major national universities. Saint Louis University and Webster University are among the area's other major private institutions of higher learning. The University of Missouri-St. Louis and Southern Illinois University at Edwardsville are the region's largest public universities.

*Figure 4-13*
*Elementary and Secondary Public School Enrollment by County-St. Louis MSA*




| | Clinton County | Franklin County | Jeffers'n County | Jersey County | Lincoln County | Madis'n County | Monroe County | St.Clair County | St.Louis City | St.Louis County | St.Chas County | Warren County |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total | 5,720 | 16,422 | 25,225 | 3,273 | 6,548 | 42,639 | 4,109 | 47,170 | 42,510 | 151,691 | 44,597 | 3,448 |
| Elementary | 4,313 | 11,520 | 15,226 | 2,205 | 4,685 | 29,498 | 2,791 | 33,867 | 33,176 | 106,517 | 31,918 | 2,481 |
| Secondary | 1,407 | 4,902 | 9,999 | 1,068 | 1,863 | 13,141 | 1,318 | 13,303 | 9,334 | 45,174 | 12,679 | 967 |

*Figure 4-14*
*Elementary and Secondary Private School Enrollment by County - St. Louis MSA*




| | Clinton County | Franklin County | Jeffers'n County | Jersey County | Lincoln County | Madis'n County | Monroe County | St.Chas County | St.Clair County | St.Louis City | St.Louis County | Warren County |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total | 1,188 | 2,545 | 2,222 | 368 | 407 | 5,909 | 1,087 | 7,809 | 5,328 | 13,670 | 44,043 | 201 |
| Elementary | 633 | 1,983 | 1,796 | 368 | 407 | 5,320 | 786 | 6,427 | 4,582 | 9,696 | 32,414 | 201 |
| Secondary | 555 | 562 | 426 | 0 | 0 | 589 | 301 | 1,382 | 746 | 3,974 | 11,629 | 0 |

*Table 4-15*
*University and College Enrollment and Conferred Degrees*

| | Full Time | Part Time | Total | Bachelor Degrees |
|---|---|---|---|---|
| **Missouri** | | | | |
| **Fontbonne College** | 997 | 297 | 1,294 | 249 |
| **Harris-Stowe State College** | 759 | 964 | 1,723 | 137 |
| **Lindenwood University** | 2,664 | 227 | 2,891 | 442 |
| **Maryville University of St. Louis** | 1,242 | 1,464 | 2,706 | 611 |
| **Missouri Baptist College** | 751 | 1,672 | 2,423 | 127 |
| **University of Missouri-St. Louis** | 5,082 | 8,148 | 13,230 | 1,680 |
| **Saint Louis University** | 4,822 | 4,034 | 8,956 | 1,142 |
| **Washington University** | 5,059 | 985 | 6,044 | 1,370 |
| **Webster University** | 1,681 | 1,567 | 3,248 | 821 |
| **Illinois** | | | | |
| **McKendree College** | 887 | 731 | 1,618 | 390 |
| **Principia College** | 546 | 19 | 565 | 113 |
| **Southern Illinois University-Edwardsville** | 8,769 | 4,278 | 13,047 | 1,369 |

Sources: State of Illinois Board of Higher Education; Board of Education's Fall Enrollment Survey, 11396.
State of Illinois Board of Higher Education; Higher Education Data Book, 1996.
Missouri Coordinating Board for Higher Education.

*Table 4-16*
*Community and Two-Year College Enrollment and Conferred Degree*

| | Full Time | Part Time | Total | Associate Degrees |
|---|---|---|---|---|
| **Missouri** | | | | |
| **East Central College** | 1,153 | 1,896 | 3,049 | 233 |
| **Jefferson College** | 1,846 | 2,088 | 3,934 | 425 |
| **St. Charles County Community College** | 1,407 | 3,250 | 4,657 | 279 |
| **St. Louis Community College (3 branches)** | 8,443 | 18,014 | 26,457 | 1,935 |
| **Forest Park SLACC** | 1,611 | 4,664 | 6,275 | 471 |
| **Meramec SLACC** | 4,590 | 8,208 | 12,798 | 848 |
| **Florissant Valley SLACC** | 2,242 | 5,142 | 7,384 | 616 |
| **Illinois** | | | | |
| **Southwestern Illinois College** | 3,923 | 10,000 | 13,923 | 1,243 |
| **Kaskaskia College** | 1,393 | 1,523 | 2,916 | 447 |
| **Lewis and Clark Community College** | 1,744 | 3,559 | 5,303 | 439 |
| **Metropolitan Community College** | 362 | 524 | 886 | 113 |

Sources: State of Illinois Board of Higher Education; Board of Education's Fall Enrollment Survey, 11396.
State of Illinois Board of Higher Education; Higher Education Data Book, 1996.
Missouri Coordinating Board for Higher Education.

*Table 4–17*
*Total College Enrollment and Conferred Degrees*

| | Total Enrollment | Part-Time Enrollment | Bachelors Degree | Associates Degree |
|---|---|---|---|---|
| **Universities and Colleges:** | 57,645 | 24,386 | 8,451 | — |
| **Two-Year/Community Colleges:** | 61,125 | 40,854 | — | 5,114 |

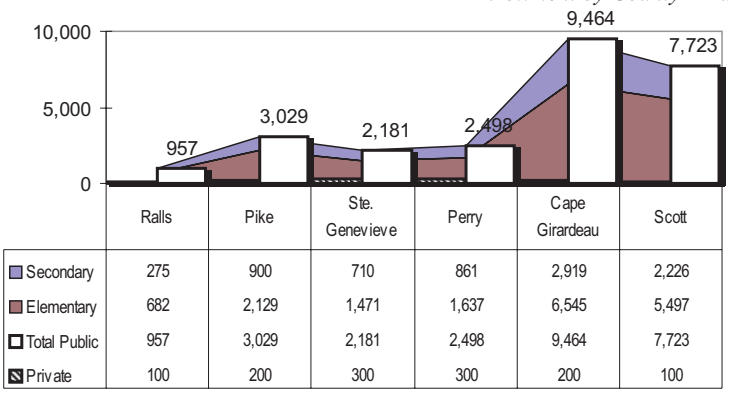
*Table 4–18*
*Graduate and Professional School*

| GRADUATE SCHOOLS | PROFESSIONAL SCHOOLS |
|---|---|
| **Missouri** | **Missouri** |
| Fontbonne College | Logan College of Chiropractic |
| Lindenwood University | Saint Louis University School of Law |
| Maryville University | Saint Louis University School of Medicine |
| Saint Louis University | St. Louis College of Pharmacy |
| University of Missouri-St. Louis | University of Missouri-St. Louis School of Optometry |
| Washington University | Washington University School of Law |
| Webster University | Washington University School of Medicine |
| **Illinois** | **Illinois** |
| Southern Illinois University - Edwardsville | Southern Illinois University - Edwardsville School of Dental Medicine |

## Rural County School Statistics

The Missouri rural rivers corridor counties average 2,200 elementary and secondary students per county except for Cape Girardeau and Scott counties which average 8,600 elementary and secondary school students. Southeast Missouri State University is the only educational institution in the rural Missouri counties in the project area.

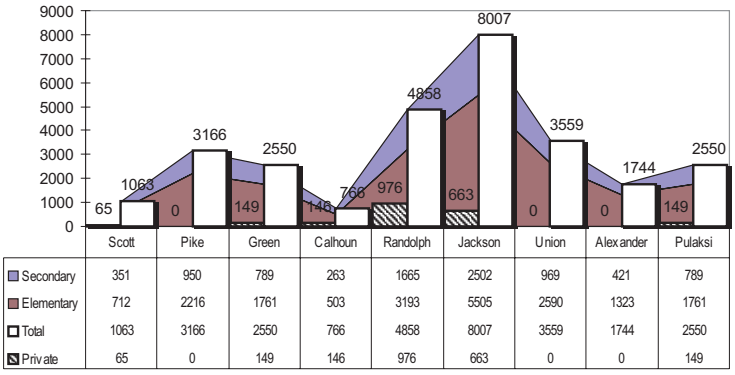
*Figure 4-19*
*Enrollment by County - Missouri*




| | Ralls | Pike | Ste. Genevieve | Perry | Cape Girardeau | Scott |
|---|---|---|---|---|---|---|
| Secondary | 275 | 900 | 710 | 861 | 2,919 | 2,226 |
| Elementary | 682 | 2,129 | 1,471 | 1,637 | 6,545 | 5,497 |
| Total Public | 957 | 3,029 | 2,181 | 2,498 | 9,464 | 7,723 |
| Private | 100 | 200 | 300 | 300 | 200 | 100 |

The Illinois Rivers Corridor counties average 2,400 elementary schools and secondary students per county except for Jackson and Randolph Counties which average 7,200 elementary and secondary students. Jackson County is the only rural county with Significant Higher Education Institutions having both Southern Illinois University at Carbondale and John A. Logan Community College.

*Figure 4-20*
*Enrollment by County - Illinois*




| | Scott | Pike | Green | Calhoun | Randolph | Jackson | Union | Alexander | Pulaksi |
|---|---|---|---|---|---|---|---|---|---|
| Secondary | 351 | 950 | 789 | 263 | 1665 | 2502 | 969 | 421 | 789 |
| Elementary | 712 | 2216 | 1761 | 503 | 3193 | 5505 | 2590 | 1323 | 1761 |
| Total | 1063 | 3166 | 2550 | 766 | 4858 | 8007 | 3559 | 1744 | 2550 |
| Private | 65 | 0 | 149 | 146 | 976 | 663 | 0 | 0 | 149 |

*Table 4-21*
*Rural County Higher Education Institutions*

| | Full time | Part-time | Total | Under-graduate | Graduate |
|---|---|---|---|---|---|
| ***Illinois*** | | | | | |
| **Southern Illinois University - Carbondale, Jackson County, IL** | 18,1666 | 4,085 | 22,251 | 17,939 | 4,312 |
| **John A. Logan Community College Carterville, Jackson County, IL** | 2,576 | 3,587 | 6,163 | | |
| **Shawnee Community College Ullin, Pulaski County, IL** | 695 | 1,005 | 1,700 | | |
| ***Missouri*** | | | | | |
| **Southeast Missouri State University Cape Girardeau County, MO** | 5,620 | 2,880 | 8,500 | 7,023 | 703 |

Source: Illinois Board of Higher Education, 1998. Missouri Coordinating Board fir Higher Education, 1998

## 4.4. REGIONAL TRANSPORTATION

## St. Louis Transportation Resources

St. Louis MSA occupies a central location on the interstate highway system, the national rail system and the inland waterway system, making the region an important national freight and transportation hub.

### *Road Transportation*

**Highways Serving The Greater St. Louis Region:**

Highway access in the region includes four interstate highways, I-44, I-55, I-64 and I-70, and four interstate linkages, I-255, I-170, I-270 and I-370, covering 325 miles of the MSA. There are also four federal highways and 34 state highways.

Some major transportation highway improvements recently built in the St. Louis area include the Highway 370 project in St. Charles County to relieve congestion at the Boone Bridge between St. Charles and St. Louis counties, and the Clark Bridge over the Mississippi River improving the connection between Alton, Illinois, and St. Louis and St. Charles Counties in Missouri. A new Mississippi River Bridge is now being designed to dramatically improve traffic flow between downtown St. Louis and Illinois and to facilitate future growth.

**Public Transportation**

***MetroLink Light Rail System***

Opened in 1994 to reduce commuter traffic congestion, MetroLink provides daily service to 37,000 riders, connecting Lambert Airport, to downtown St. Louis and East St. Louis Illinois. It is now expanding service to Mid-America Airport in Illinois. MetroLink served 12.9 million riders in 1996. More branch routes are being planned throughout the Metropolitan area.

***Bus Service***

Approximately six hundred active Bi-State and Madison County Transit buses driving 120 fixed routes serve much of the St. Louis area, providing 37.4 million rides a year, with an average daily passenger volume of 126,000.

### Motor Freight Service

The St. Louis region has a large trucking industry. More than 8,000 trailers with 16,000 tons of capacity are based in the area. Approximately 200 active trucking firms operate regularly, with local, statewide, and national firms represented.

### *Railroads Serving St. Louis*

St. Louis ranks second in the nation for railroad-related jobs and third in rail lines. Eleven major railroad companies and eight intermodal rail transfer terminals are located in the area. The major commodities passing through the region move primarily east to west. Rail freight in the region consists mainly of coal, farm products, food and transportation equipment.

### *Air Transportation*

Nine dedicated freight airlines and twenty-five passenger airlines at Lambert-St. Louis International Airport in St. Louis County provide overnight/same day delivery of critical freight, such as seafood, postal mail, deliverable packages, and machinery parts. Over 63,000 tons of cargo annually pass through Lambert. The Lambert International Airport currently meets the commercial air transportation needs of the majority of the area. However, Mid-America Airport, a recently built commercial airport adjacent to Scott Air Force Base in Illinois, is a joint military-private commercial use airport which is only 20 miles from the river and downtown St. Louis. Its growth and impact on the region is expected to be significant in the future.

*Table 4-22*
*St. Louis Port Summary Facts*

| | |
|---|---|
| **Barge lines** | Served by all major barge lines |
| **Facilities** | More than 100 docks and terminal facilities |
| **Channel** | 9' guaranteed (2.7 meters), 12-15' operational |
| **Channel width** | 300' (91.4 meters) |
| **Season** | Year-round |

*Table 4-23*
*Goods Passing Through the Port of Metropolitan St. Louis, 1995*

| Commodity | Thousands of Tons |
|---|---|
| **Coal** | 10,727 |
| **Petroleum and Petroleum Products** | 4,703 |
| **Chemicals and Related Products** | 1,486 |
| **Crude Materials** | 2,511 |
| **Primary Manufactured Goods** | 2,729 |
| **Total Food and Farm Products** | 7,951 |
| **Manufactures Equipment, Machinery and Products** | 31 |
| **Total** | 30,138 |

Source: Waterborne Commerce of the United States, Calendar Year 1995; Part 2-Waterways and Harbors-Gulf Coast, Mississippi River System and Antilles; U.S. Army Corps of Engineers Water Resources Support Center.

### *Water Transportation*

Historically, water transportation has been a key factor in the development of the economic strengths of the area.

The volume of commodities carried on the River has grown from about two million tons in 1940 to approximately 80 plus million tons in the 1990s, a 4000 percent increase. (See *Table 4-23 St. Louis District Locks and Dams Tonnage Statistics, Figure 4-24* and *Table 4-25*.) The Nine-Foot Navigation Channel Project, the development of large diesel tow-boats and the large capacity of barges has made this growth possible. Fleeting areas and terminals have been developed adjacent to the navigation channel to accommodate barges and facilitate the transfer of cargoes to other modes of transportation.

The navigation channel is used largely for conducting commerce by moving material and commodities to and from locations remote to this region of the Mississippi River. Petroleum products are shipped upstream from the Gulf Coast, primarily Texas and Louisiana. Coal is shipped in large quantities from Central and Southern Illinois and Western Kentucky. Grain is a principal downbound product earmarked largely for the export market. Scrap metal ranks second to grain in downbound tonnage.

Products delivered or picked up by barges in the region are building stone, lime, sand and gravel: grain and soybean products; steel products, pipe, wire and scrap metal; coal, fuel oil and asphalt; fertilizer products and vinyl acetate; and timber.

### *Inland Waterways and The St. Louis MSA*

The Port of Metropolitan St. Louis plays a key role in meeting the bulk transportation needs of Greater St. Louis and the Midwest with a competitive advantage over other regions because of its central location on the U.S. Inland Waterways System.

St. Louis is the second largest inland port in the U.S. and the twenty fifth largest by tonnage among all U.S. ports.

*Figure 4-24*
*St. Louis District Locks and Dams Tonnage Statistics*

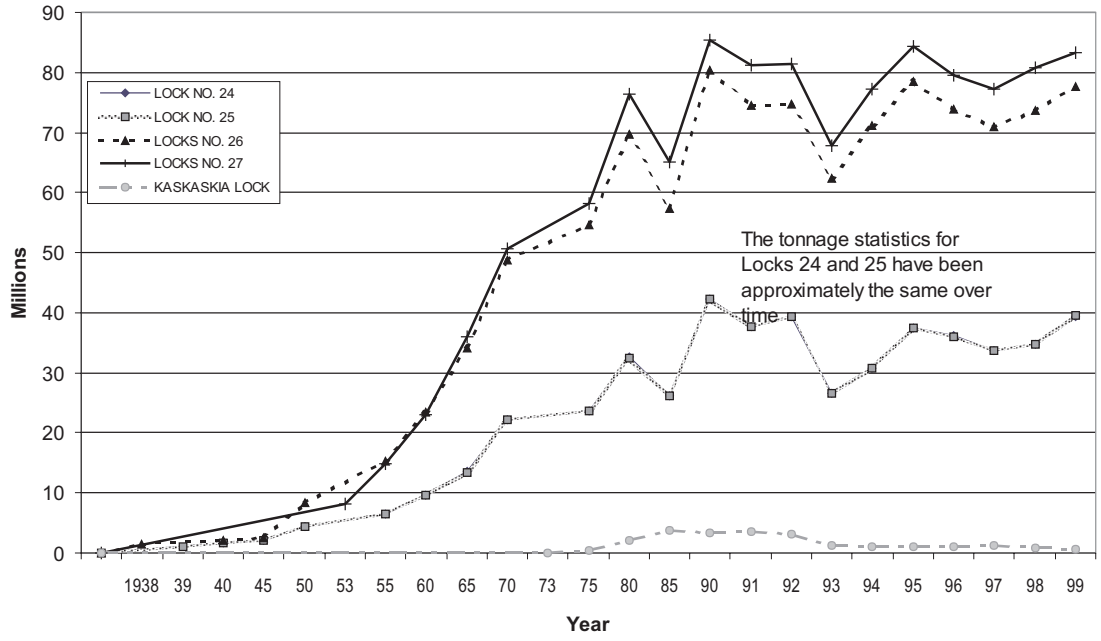



*Figure 4- 25*
*St. Louis District Locks and Dams Total Tonnage*

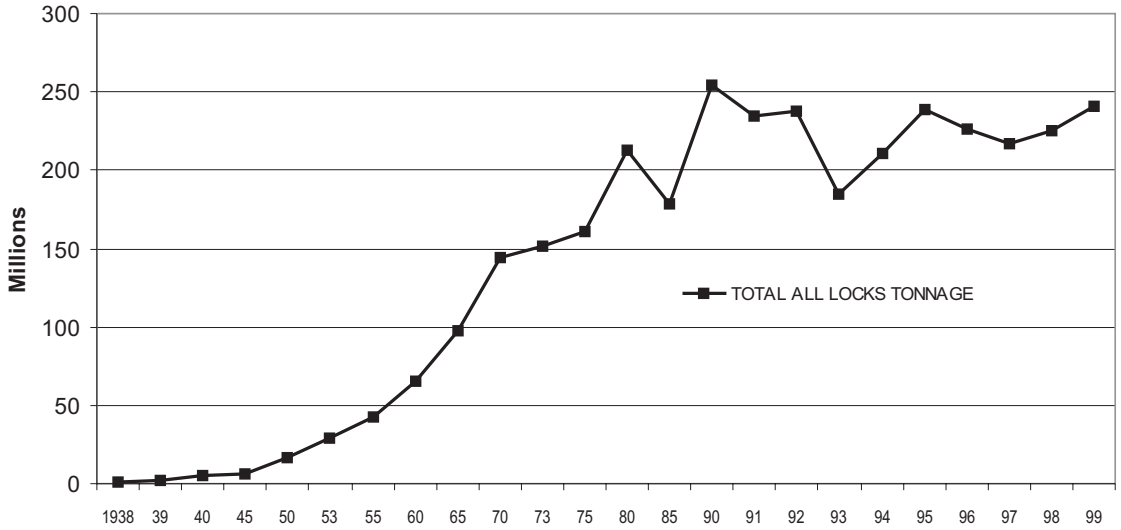


*Table 4 - 26*
*St. Louis District Locks and Dams Tonnage Statistics*

| YEAR | LOCK NO. 24 (OPEN 3/12/40) | | LOCK NO. 25 (OPEN 5/18/39) | | LOCKS NO. 26 MEL PRICE (OPEN 5/1/38) | | LOCKS NO. 27 (OPEN 2/7/53) | | KASKASKIA LOCK (OPEN 11/8/73) | | TOTAL ALL LOCKS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TONNAGE | LOCKAGES | TONNAGE | LOCKAGES | TONNAGE | LOCKAGES | TONNAGE | LOCKAGES | TONNAGE | LOCKAGES | TONNAGE | LOCKAGES |
| 1938 | | | | | 1,369,459 | 2,487 | | | | | 1,369,459 | 2,487 |
| 1939 | | | 1,122,824 | 1,645 | | | | | | | 2,534,032 | 4,476 |
| 1940 | 1,578,624 | 1,719 | 1,570,167 | 2,188 | 2,125,264 | 3,626 | | | | | 5,274,055 | 7,533 |
| 1945 | 2,029,925 | 1,214 | 2,033,557 | 1,695 | 2,587,408 | 3,337 | | | | | 6,650,890 | 6,246 |
| 1950 | 4,305,665 | 2,260 | 4,323,837 | 2,571 | 8,275,790 | 4,792 | | | | | 16,905,292 | 9,623 |
| 1953 | | | | | | | 8,127,305 | 3,386 | | | 29,395,957 | 14,027 |
| 1955 | 6,505,230 | 3,001 | 6,530,038 | 2,974 | 15,193,756 | 6,396 | 14,783,744 | 5,452 | | | 43,012,768 | 17,823 |
| 1960 | 9,711,261 | 3,408 | 9,686,116 | 3,737 | 23,507,217 | 8,205 | 22,942,101 | 7,885 | | | 65,846,695 | 23,235 |
| 1965 | 13,521,270 | 3,585 | 13,425,723 | 4,287 | 34,211,388 | 10,439 | 35,926,212 | 8,884 | | | 97,084,593 | 27,195 |
| 1970 | 22,209,505 | 4,938 | 22,175,609 | 5,327 | 48,673,509 | 12,784 | 50,747,918 | 11,353 | | | 143,806,541 | 34,402 |
| 1973 | | | | | | | | | 47,550 | 141 | 151,447,434 | 32,156 |
| 1975 | 23,713,451 | 5,058 | 23,712,446 | 5,336 | 54,567,957 | 13,905 | 58,189,032 | 8.526 | 432,735 | 8.526 | 160,615,621 | 34,110 |
| 1980 | 32,731,049 | 6,601 | 32,519,470 | 6,770 | 69,614,362 | 16,130 | 76,394,103 | 12,608 | 2,030,840 | 12,608 | 213,289,824 | 44,087 |
| 1985 | 26,101,054 | 5,040 | 26,109,104 | 5,389 | 57,309,016 | 13,0500 | 65,137,963 | 9,368 | 3,776,482 | 9,368 | 178,433,619 | 36,040 |
| 1990 | 42,352,920 | 7,670 | 42,339,143 | 7,923 | 80,447,308 | 9,577 | 85,373,942 | 11,990 | 3,426,750 | 11,990 | 253,940,063 | 40,390 |
| 1991 | 37,595,771 | 6,897 | 37,758,657 | 7,394 | 74,515,995 | 9,054 | 81,233,688 | 10,954 | 3,654,175 | 10,954 | 234,758,286 | 38,019 |
| 1992 | 39,423,782 | 7,078 | 39,378,151 | 7,282 | 74,673,715 | 9,023 | 81,463,112 | 10,706 | 3,144,700 | 10,706 | 238,083,460 | 37,866 |
| 1993 | 26,581,272 | 4,657 | 26,560,658 | 4,687 | 62,343,108 | 7,101 | 67,796,856 | 7,953 | 1,164,300 | 7,953 | 184,446,194 | 25,694 |
| 1994 | 30,735,288 | 5,331 | 30,758,651 | 5,658 | 71,179,460 | 8,319 | 77,328,058 | 9,403 | 980,231 | 9,403 | 210,981,688 | 31,828 |
| 1995 | 37,540,528 | 6,537 | 37,432,909 | 6,654 | 78,420,608 | 10,488 | 84,423,520 | 9,387 | 1,134,804 | 9,387 | 238,952,369 | 35,634 |
| 1996 | 36,181,599 | 6,481 | 36,088,709 | 6,652 | 73,873,169 | 9,085 | 79,440,582 | 9,814 | 1,104,600 | 9,814 | 226,688,659 | 34,332 |
| 1997 | 33,614,330 | 5,835 | 33,638,634 | 6,132 | 70,871,839 | 8,140 | 77,168,006 | 8,860 | 1,171,000 | 8,860 | 216,463,809 | 31,748 |
| 1998 | 34,747,480 | 5,767 | 34,819,845 | 6,110 | 73,721,633 | 7,677 | 80,746,809 | 8,967 | 925,050 | 2,457 | 224,960,817 | 30,978 |
| 1999 | 39,296,994 | 6,503 | 39,536,830 | 6,777 | 77,580,836 | 8,740 | 83,378,714 | 9,215 | 583,183 | 8,860 | 240,376,557 | 33,294 |

The Port of Metropolitan St. Louis is the northernmost ice-free port on the Mississippi River remaining open throughout the year and provides a direct avenue to the Gulf of Mexico and other world markets. The Port of Metropolitan St. Louis is centrally located on the 25,000-mile U.S. Inland Waterway System connecting the markets and industrial centers located along the St. Lawrence Seaway, the Missouri, Ohio, Illinois and Tennessee rivers, the Gulf of Mexico and beyond to international markets. Intermodal transportation facilities provide industrial and agricultural users within Greater St. Louis cost effective competitively priced transportation access to and from the U.S. Inland Waterway System to world markets. Because of its location within the agricultural and industrial Midwest, the Port of St. Louis is the major shipper of grain, coal, petroleum products and chemicals. It provides dependable, efficient, environmentally sound, low-cost transportation particularly for the shippers of bulk commodities where rates and freight cost considerations are the critical ingredient in the competitiveness of their operations.

The Port of St. Louis spans 70 miles and includes six public Port Authorities and dozens of private independent company docks and wharves. Of the six Port Authorities within the Port of St. Louis, only three have active harbor operations. Tri-City Port District, the City of St. Louis Port Authority and the Kaskaskia Port District are the three operating ports. Jefferson County Port Authority, St. Louis County Port Authority and Southwest Regional Port Authority are primarily involved in economic development activities and do not have waterside operations.

The Port of Metropolitan St. Louis loads and unloads approximately 30 million tons of goods annually. Tri-City Port on the Chain of Rocks Canal typically moves the most tonnage from a single port location. The City of St. Louis Port Authority leases city-owned land to private companies along the port's 19-mile stretch of the Mississippi River. The Kaskaskia is the largest port in terms of geographic territory, which extends into three counties within Greater St. Louis, but does the least amount of business.

## 4.5. ROADWAY ACCESS TO PROJECT LANDS/WATERS

Rivers Project areas are accessible primarily by state and local roads. Traffic crossing the river in the upper pools of 24 and 25 is limited to the Highway 54 bridge in Louisiana, Missouri, and the Winfield Ferry located three miles east of Winfield, Missouri, off Highway N. Traffic crossing the river in Pool 26 is limited to the Golden Eagle Ferry in Calhoun County, Illinois, and the U.S. Highway 67 bridge in Alton, Illinois. Illinois River crossings on Pool 26 are provided by the Brussels Ferry near Grafton, the ferry at Kampsville, and the bridge at Hardin, Illinois. Traffic crossing the river in Pool 27 area is limited to U.S. Interstate 270 and the St. Louis traffic bridges, which include the McKinley, Eads, Martin Luther King and Popular Street bridges. On the Open River, bridge crossings occur on I-255 in South St. Louis County (Jefferson Barracks Bridge), Chester, Illinois and Cape Girardeau, Missouri.

*Table 4-27*
*Highway Access by Pool*

| | In Illinois | In Missouri |
|---|---|---|
| **Pool 27** | State Highway 3 | No Access |
| **Pool 26** | Highway 100 (National Scenic Byway) | U.S. Highway 67, and State Highway 94 and 79 |
| **Pool 25** | State Highway 100 | State Highway 79 |
| **Pool 24** | State Highway 96 and U.S. Highway 54 | State Highway 79 and U.S. Highway 54 |
| **Open River** | State Highway 3 | U.S. Highway 61 and Interstate 55 |
| **Kaskaskia River** | State Highway 3, 13, 154 and 15 | N/A |

## 4.6. CLIMATE AND WEATHER

### Overview

The project area is located at approximately Latitude 34E north and longitude 90E west. The topographic relief within the region has limited influence on climatic conditions.

Continental climatic conditions prevail in the project area because of its latitudinal and interior location. The area is temperate and in a transitional zone between the Humid Subtropical and the Humid Continental climate with a long summer. The growing season occurs from early April to late October and averages 215 days annually. The region has four distinct seasons without prolonged periods of extreme heat, or high humidity. From May to November, southerly warm moist air from the Gulf of Mexico predominates, while from December to April northwesterly cold air masses from Canada influence regional weather conditions. The area experiences wide day-to-day and seasonal fluctuations in temperature and precipitation averages. Years of significant drought in the region include the 1930s, 1954, 1964, 1976, and 1988.

*Table 4 – 28*
*Climate Averages*

| | |
|---|---|
| Average Number of Days with the High above 90° | **42** |
| Average Number of Days with the Low below 0° | **4** |
| Average Number of Clear days | **140** |
| Average Annual Temperature | **55 °F** |
| Average Humidity Range -Summer | **50-60%** |
| Average Humidity Range -Winter | **60-75%** |

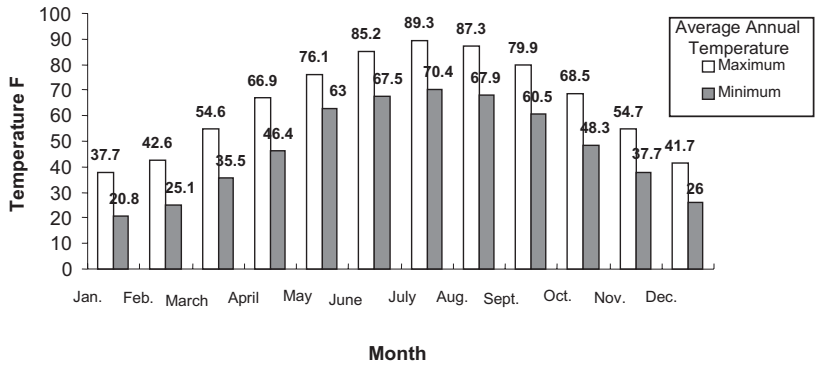
### Weather Summary

The region experiences the changes of a four-season climate without the undue hardships of prolonged periods of extreme high or low temperatures. Winters are seldom severe.

*Table 4–29*
*Temperature and Precipitation*

| Record Temperatures | | |
|---|---|---|
| **Low** | -23° | Jan 1864 |
| **High** | 115° | July 1954 |
| **Average Monthly Precipitation Extremes** | | |
| **Low** | 2" | Feb |
| **High** | 4" | June |
| **Normal Precipitation** | | |
| **Rainfall per year:** | | 37.51 inches |
| **Snowfall per year:** | | 18 inches |

*Figure 4-30*
*Average Temperatures*




## 4.7. GEOLOGIC RESOURCES

### General Description

The Mississippi River flows through three major landform regions. North of Crystal City, Missouri, is the Central Lowland Province. South of this city, the river enters the Ozark Plateau Province. Between Cape Girardeau, Missouri and Thebes, Illinois, the river flows into the Coastal Plain Province.

The drainage area of the Mississippi increases between Saverton, Missouri, and Cairo, Illinois, from 137,500 square miles to 921,000 square miles. This increase is due to the addition of seven major rivers and a narrow corridor of minor tributaries.

Rolling narrow ridgetops, moderate to steep valley slopes, and bluffs characterize the area. The floodplain of the Mississippi averages about

five miles in width from bluff to bluff. This alluvial valley is quite wide in three locations, at the confluence of the Missouri and Illinois Rivers with the Mississippi River, the American Bottoms in Madison and St. Clair Counties, Illinois, and at the reach near Cairo, Illinois which is in the Coastal Plain Province. The major tributaries have nearly level, broad floodplains, with extensive bottomlands.

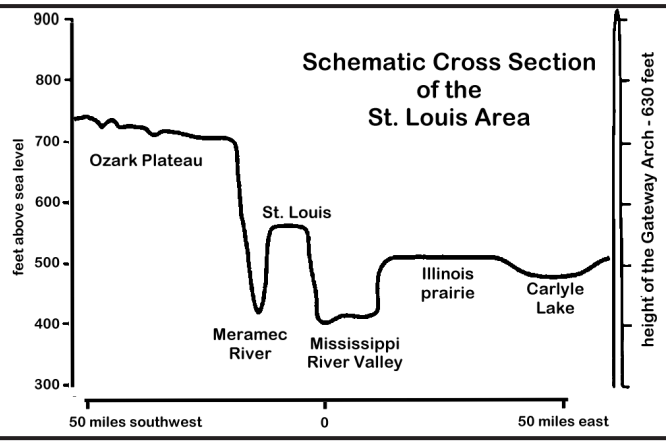
Major coal deposits are found in the region. In addition, lead, zinc, stone, sand, clay and crude oil are mined or quarried.

## Physiography

The landform of the study area may be classified as to the regional variations of topography and geology. In the National Atlas (1970, Hammond, "Classes of Land-Surface Form"), the region is classified as an area of "Irregular Plains" with a typical relief of 300 to 600 feet and 50 to 80 percent of the surface gently sloping with 50 to 75 percent of the gentle slope on the divide between the stream valleys.

In the St. Louis region, east of the Mississippi River, lie the relatively flat and productive farmlands of Illinois that were once prairie. Crossing the Mississippi from Illinois to Missouri, the landscape changes abruptly. West of the Mississippi River and north of the Missouri River is a region dominated by rolling hills with mixed forest and farmland. Southwest of St. Louis is the rugged Ozark plateau that achieves elevations as high as 1,100 feet msl. The Missouri and Mississippi Rivers are at the northern and eastern extremes of this ancient mountain range. *Figure 4 – 31* illustrates the topographic diversity of this region.

*Figure 4 – 31*
*Schematic Cross Section of the St. Louis Area*




The bluffs along the floodplains are highly variable in local relief and slope. This variability is in direct relationship to the hardness of the bedrock in which the streams have incised their channels. The gentle slope of the upland surface is due to the mantle of unconsolidated glacial materials, drift and loess, which tends to subdue the profiles. The large alluvial valleys of the Mississippi River, in contrast, are relatively level with only minor differences in local relief.

Landforms in the U.S. have also been classified into physiographic regions which have a certain amount of homogeneity in terms of topography, rock units, and structure. The Fenneman (1938) Classification places most of the study area in the Central Lowland Province, a region which covers much of the Midwest. This province is subdivided into smaller units called sections. The United States Geological Survey's *Physical Divisions Map of the U.S.* (1946) places the unit of the study region east of the Mississippi River in the Till Plains Section consisting of young till plains with a few moraines and no lakes. The unit west of the

Mississippi is the Dissected Till Plains Section which is composed of submaturely to maturely dissected till plains.

Most of the area between the Mississippi and Illinois Rivers in Calhoun and Pike Counties, Illinois, and Lincoln, St. Charles, and Pike Counties, Missouri, are within the Lincoln Hills Section of the Ozark Plateaus Province.

The Lincoln Hills Section is an upland which is developed along the Lincoln fold, a secondary structure of the larger Ozark dome to the south. The Mississippi River cuts through this structure. Most of the section has not been glaciated, in contrast to areas to the east and west. The southern boundary in Calhoun County is along the Cap au Gris faulted flexure.

## Structural Geology

The broad tectonic framework of the study area includes the Illinois Basin east of the study area and the Ozark dome to the south of the area. Important minor structures within the Rivers Project area are the Lincoln Fold and the Cap au Gris faulted flexure.

The Lincoln Fold forms part of a divide which separates the Illinois Basin to the east from the Forest City Basin to the west. The length of the fold in Missouri is approximately 165 miles and the width varies, but may measure as much as 15 miles. The Lincoln Fold is more than a simple anticline. The structure is a regional uplift with anticlines, domes, inclines, and faults superimposed on it. Detailed geologic history of the Lincoln Fold is not complete because a detailed geological survey has not been made. Available information indicates that possibly during the late Silurian or the early part of the Devonian period the Lincoln Fold began to develop. Continued development occurred as repeated stages of erosion and deposition took place during the Devonian and Mississippian time. At the end of the Mississippian period, rocks were stripped from the fold. The fold was then buried under Pennsylvanian deposits. The remainder of the fold's geologic history has been obscured by the removal of most of the Pennsylvanian rocks. Geologists assume that the area was not inundated by a marine environment again and that the fold has remained essentially unchanged since that time. The fold can be followed southward from the Iowa state line to its point of termination against the Cap au Gris Fault in Lincoln County, Missouri.

The Cap au Gris faulted flexture, which derives its name from Cap au Gris Landing just east of Winfield, Missouri, on the Mississippi River is located in west central Illinois and east central Missouri. The fault zone crosses the Mississippi River about one mile south of Cap au Gris, Missouri, and the Illinois River near Meppen, Illinois. The generally east-west trending fault is described as a narrow band of steeply dipping rocks and discontinuous faults. The throw along the fault is approximately 1,000 to 1,100 feet. On the north, the upthrown side of the fault beds gently dip downward into the fault. South of the fault zone, rocks of Upper Middle Paleozoic Age are steeply upturned. The Cap au Gris fault is probably a left lateral fault that has moved approximately 30 miles. Geologists believe that recent movement has not occurred along the fault zone because Pleistocene terraces crossing the fault have not been warped or displaced.

## Historical Geology

There were four main events in the geologic history of the study area, which account for the bedrock distribution, structural features, and the surficial materials of the uplands and alluvial valleys.

Sedimentary rock units, some 4,000 to 5,000 feet thick, were deposited over Precambrian extrusive and intrusive igneous rocks by alternate

inundation and regression of semitropical or tropical seas. The marine phases were the most persistent.

During the Paleozoic Era, the area to the east of the Mississippi River began to subside. A spoon-shaped depression was formed which became the Illinois Basin. Thus, the rock which comes to the surface at Alton is several thousand feet under the surface in Central Illinois. Also, during the Paleozoic Era, the Ozark dome began to rise and the Lincoln Fold was formed.

Beginning during the Pleistocene Epoch or Ice Age, about one million years ago, great continental ice sheets moved into the mid-latitudes of the United States, and the Midwest was overrun by a series of glacial phases known as the Nebraskan, Kansan, Illinoian, and Wisconsinan glaciers. The last glacial phase, the Wisconsinan, receded approximately 12,000 years ago. These glaciers deposited drift on the uplands and filled the alluvial valleys with outwash.

During and after the Wisconsinian period, dry winds dominantly from the west, blew across exposed glacial outwash in the Mississippi, Illinois and Kaskaskia valleys. This lighter weight material was carried eastward and deposited loess on the upland part of the region. Loess is the parent material for most of the present soils on the upland part of the region.

During the Holocene Stage (recent), the upland surface has been eroded and modern soils created. The age of the surficial bedrock is Ordovician to Cretaceous and is overlain with a mantle of younger Pleistocene and Holocene drift and soils. In the alluvial valleys, some of the valley fill has been scoured away and subsequent river changes and flooding have created the present day floodplain morphology and alluvial soils.

## Geomorphology

The present day geomorphology of the Upper Mississippi River valley is a result of water, wind and ice over time acting under gravitational forces to sculpt the river, floodplain and valley walls. During the last two hundred years human settlement and development in the river valley has further effected the morphology of the river and floodplain.

Four common morphological valley forms (or river categories) that have developed on the Upper Mississippi and present today are illustrated in *Figure 4 – 32.*

## Kaskaskia River Basin Geology

Geologically, the Kaskaskia River Basin lies in the Illinois basin, a broad depression that covers most of Illinois and extends into portions of Kentucky and Indiana. The geologic features present in the area are products of complex depositional and erosional processes spanning millions of years.

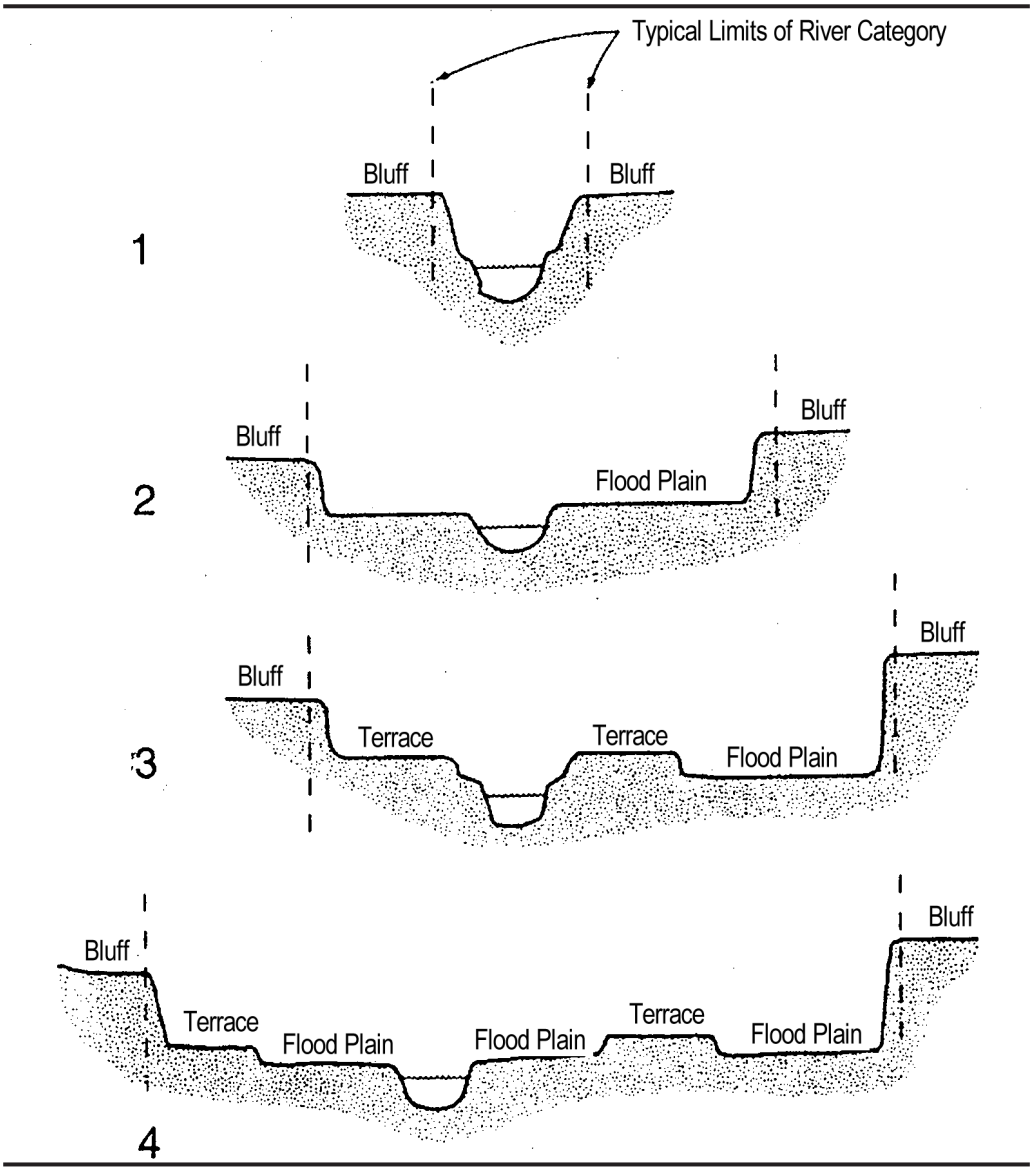
Much like the Mississippi valley, the underlying bedrock formations of the Kaskaskia River were deposited millions of years ago during the Paleozoic Era and were subjected to erosion and weathering during the late Mesozoic Era and the Tertiary Period. During the periods coinciding with the Ice Ages (Pleistocene Epoch), recurring continental glaciations deposited sediments which were altered by weathering and erosional processes. In recent times, the same processes shaped the features of the present topography and formed the modern soils.

As the Ice Age ended, molding of our present day landforms and soils began. The Kaskaskia River and tributaries began to downcut and created the modern floodplain, leaving elevated terraces of higher floodplains isolated from the river. Modern soils began to develop on the uplands, modified by differing vegetation and slopes and by weathering.

Flooding of the river and its tributaries covered the glacial fill with present day bottom land soils (Cahokia Alluvium).

## Mineral Resources

*Figure 4 – 32*
*Four Common River Categories in the Upper Mississippi River*




While coal is the most important mineral resource in the project area, other resources present include natural gas, oil, sand, gravel, clay and limestone. Pockets of sand and gravel are found in nearly every county of the drainage basin. These deposits are mainly a result of deposits that were formed from glacial outwash. From various sedimentary rock formations come cement-making materials, crushed stone, agricultural limestone, brick-making clays and sands for molding and glass. Most of the mineral resources are obtained by strip-mining.

### *Sand and Gravel*

Sand and gravel deposits occur in the floodplains of the Kaskaskia River and Mississippi River. Along the Mississippi River, these deposits are

found under 10 to 40 feet of silt and clay overburden. Sand and gravel occurs in terraces along both sides of the Kaskaskia Valley.

The material is commonly extracted by pit mining as the deposits have a thin overburden, or by removal from a river or lake by dredging. In many areas, deposits are so compacted that crushing is necessary to prepare the material for use.

In many places, deposits have been or are being exploited for local purposes and are sufficient to be a valuable resource for local use.

### *Limestone*

Limestones are capable of producing numerous products including: portland cement, concrete aggregate, lime, rip-rap, building stone, filter beds and crushed stone. With demand for such products increasing steadily, limestone resources within the project area remain a viable industry (Yarbrough, et al., 1974). Most of the limestone in the project area is mined in open-pit quarries. However, underground mining is being used more frequently, where the mineable limestone is overlain by bedrock.

The counties of the project area use substantial amounts of agricultural limestone and limestone for construction. The limestone resources are particularly important in those counties bordering the Mississippi River where a large and well-distributed quarry industry exists. This area is capable of supplying the limestone needs of the region.

### *Clay and Shale*

Clay and shale resources are widespread throughout the project area. Deposits are associated with glacial drift or located along streams inter-bedded with limestone and sandstone. Industrial uses for clays and shales include the manufacture of structural clay products, lightweight aggregate and portland cement.

Miscellaneous clay and shale resources are quite widespread and supplies appear adequate. Shortages, if they do occur, are of a local nature for specific use, probably due to lack of long-range planning to locate and protect strategically located deposits of common clays suitable for various construction use from urban encroachment.

### *Natural Gas*

Since its discovery in Illinois during 1888, there has been little exploitation of natural gas. It has never been an important market commodity being mostly solution gas produced with oil. The main activity for natural gas in Illinois is storage for winter withdrawals.

Deposits of natural gas are usually found in the Cypress Sandstone. Depth for drilling has been from 300 feet to 4,500 feet, averaging around 2,500 feet. Currently there are several producing gas fields in St. Clair County.

### *Oil*

The most common method in Illinois for recovering oil is waterflooding, where water is pumped into the well to force out the oil. Oil has been in production within the drainage system since the 1880s. Oil production reached its maximum during the early 1940s and has been continually declining except for a brief recovery period in the early 1960s.

Oil production is not significant in the project area.

### *Coal*

Since the 1820s, coal has been mined in the region. St. Clair and Randolph counties have been major sources of coal for Illinois, both in

the past and today. These two counties are among the top coal producers in the State of Illinois.

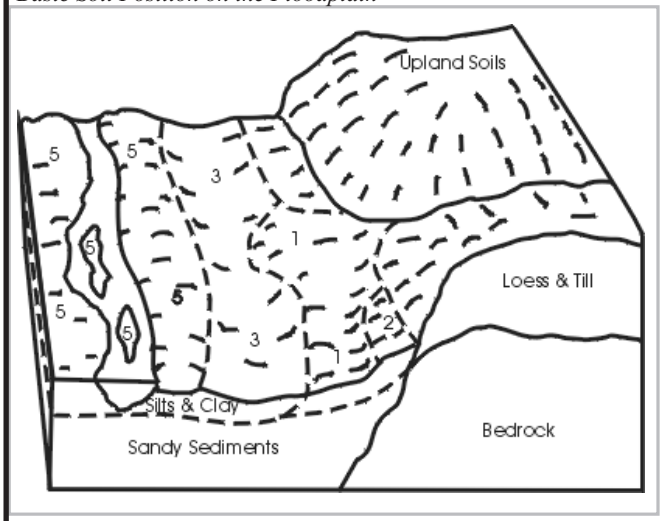
## 4.8. RIVER AREA SOILS

### General Description

This section briefly describes some of the physical properties and land-use capabilities of the soils in the study area. *Table 4 – 33* shows the physiographic location of eight soil units occurring in the alluvial valleys of the study area.

1.Materials found at the foot of the bluffs consist of reworked loess, fragments of bedrock, and eroded glacial till from the uplands. Alluvial and colluvial materials may be deposited either as fans where tributary streams enter the main valley or as loose and incoherent deposits at the foot of the bluffs. The soil which develops on these deposits is usually coarse in texture, has good drainage, and is moist but not wet.

*Table 4–33*
*Basic Soil Position on the Floodplain*




2.Terraces, which are remnants of older, higher floodplains, are also found adjacent to the bluffs or may occur as isolated highs in the floodplain. These “high bottoms,” or “second bottoms” as they are sometimes referred to, may be remnants of Pleistocene sands and gravels which were deposited as glacial streams aggraded. Some terraces may be of more recent deposition. These usually consist of finer sediments that are not as well drained as the sandy Ice Age terraces.

3.Low areas, such as depressions, old water courses, and sloughs are also found on the floodplain. “Gumbo” is the common name for the soil found in these areas which is usually high in clay content and very wet.

4.Higher areas, such as natural levees, sand bars, and old islands may also be found in the alluvial valleys of the study area. The soils in these areas are composed mainly of sands and silts and are usually moist but not wet.

5.Islands and lowlands adjacent to the river are areas of recent deposition. The materials found in these locations are generally wet, but otherwise highly variable and may change their geographical extent and depth with each flood.

Some of the five basic floodplain positions have more than one soil unit representing a topographical unit. These additions reflect differences in soil texture and native vegetation. Soil units are derived by combining several soil series with similar characteristics. *Table 4 - 34* contains some of the properties and land-use capabilities of these soil units.

The fertile soils derived from the alluvial deposits are primarily composed of fine textured clays intermingled with fine sandy loams. Major difficulties with these soils are weed control, maintaining fertility, and drainage. Relatively fertile, dark, grayish-brown soils with silt loam surfaces have developed from loess overlying glacial tills on the gently sloping to rolling areas of the Illinois plains. Light-colored soils with silt loam surfaces have developed on the loessial deposits and the moderately to steeply sloping areas on the Missouri side. These soils are less fertile than those found in the floodplains and the Illinois plains.

Bottomland soils suitable for recreational development are limited due to flooding, poor drainage, and seasonal water tables. Recreational sites and improvements must be planned and designed with a firm understanding of the flood hazards and precautions to minimize damage and maintenance costs.

## Erosion and Sediment

In the uplands adjacent to the river corridor, an estimated sixty-seven million tons of soil are dislodged annually. Agricultural sheet and rill erosion accounts for 85 percent of this dislodged soil. Twenty-nine percent of this dislodged soil is delivered to the Mississippi River and accounts for 17 percent of the average annual sediment yield at Alton, Illinois and 6 percent of the average annual sediment yield at Thebes, Illinois. Due to improved conservation practices in the basin over the past 25 years, some reduction in sediment discharge has occurred but the reduction has not yet reached acceptable levels.

*Table 4 – 34*
*Summary of Project Area Soils Characteristics*

| Soil Unit | Landscape Position | Surface Texture | Rate of Surface Runoff | Depth to Water Table | Internal Drainage | Flood Hazard | Openland | Woodland | Suitability for Wildlife | Suitability for Recreation Uses[1)2)] | Slope Range (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **I (Hapludalfa)** | Uplands and terraces | Silt loam and fine, sandy loam | Slow to medium | As shallow as 3-4' in spring | Well-drained to moderately well-drained | No | Yes | Yes | Wetland | ◆ | 0-18 |
| **II (Ochraqualfa)** | Uplands, terraces, and outwash plains | Silt loam and loam spring | Slow to medium poorly drained | As shallow as 1-3' in spring | Somewhat poorly to poorly drained | No | Yes | Yes | No | Moderate to severe | <3 |
| **III (Albaqualfs)** | Uplands and terraces | Silt loam ponded | Slow to 2' in spring | Less than poorly drained | Poorly to very poorly drained | No | Yes | Yes | Yes | Severe | <2 |
| **IV (Udifluvents)** | Bottom lands | Silt loam | Slow | 1-3' in spring | Well-drained and somewhat poorly drained | Yes | Yes | Yes | Yes | Moderate to severe | 0-2 |
| **V (Fluvaquents)** | Bottom lands | Silt loam | Slow | 0-3' in spring | Poorly to somewhat poorly drained | Yes | Yes | Yes | ○ | Moderate to severe | <2 |
| **VI (Hapludolls)** | Bottom lands | Silt loam | Slow | Fluctuates with adjacent streams | Moderately well-drained | Yes | Yes | Yes | Yes | Moderate to severe | <2 |
| **VII (Haplaquolls)** | Bottom lands | Silty clay | Slow to ponded | 0-2' in spring | Poorly to very poorly drained | Yes | Yes | Yes | No | Severe | 0-2 |
| **VIII(Argiudolls)** | Uplands and terraces | Silt loam and Silty clay loam | Slow to ponded | Less than 3' in spring | Poorly and somewhat poorly drained | No | Yes | Yes | Yes | Moderate to severe | 0-3 |

1) Roads and picnicking.
2) Slight - minor limitations or limitations are easily overcome.
Moderate - limitations need to be recognized; but can be overcome with proper planning
Severe limitations are difficult to overcome and require careful planning
◆ Slight on gentle slopes to severe on steep slopes
○ Depends on drainage

Navigation-related control activities have retarded the natural migration of the river. The pools in the Upper River have inundated many of the previous river courses. In the open river, shifting of the channel has been minimized by regulating works (dikes and rip-rap) which have significantly reduced the caving of banks and levees. The alluvial riverbed, however, continues to erode and fill. Some tributaries to areas controlled by pools are aggrading in lower reaches. Estimated daily suspended sediment transport at St. Louis, Missouri, ranges from 28,000 tons to 7 million tons and averages 370,000 tons. Average annual sediment yields at selected gauging stations are presented in the following table.

### *Kaskaskia River Area Soils*

Topographically, the study area consists of five surface forms, elongate ridges and hills of Illinois Age glacial drift, level uplands of till plain, erosional slopes, level terraces which are a lacustrine zone of

*Table 4–35*
*Average Annual Sediment Yield at Gagging Stations*

| Station | Drainage Area (sq. mi.) | Sediment Yield (tons per sq. mi. per year) | Total Tons |
|---|---|---|---|
| Mississippi River at Keokuk, Iowa | 119,000 | 79 | 9,401,000 |
| North Fabius River at Monticello, MO | 452 | 973 | 439,790 |
| Mississippi River at Hannibal, MO | 137,300 | 181 | 19,400,000 |
| Salt River near Monroe City, MO | 2,230 | 454 | 3,300,000 |
| Missouri River at Hermann, MO | 528,200 | 295 | 70,700,000 |

undetermined glacial age, and the present day floodplains of the Kaskaskia River and its major tributaries. Elevations in the region average between 350 to 500 feet above msl, with a majority of the area gently sloping. Most of the gentle slope is on the upland surfaces. With only isolated areas of hills and steep slopes, most of the land is or can be under cultivation.

There are nine types of soil associations predominant in the area along the Kaskaskia River Canal. Five of the associations form the majority of soil types occurring within project lands. The predominant soil association within the Kaskaskia River Navigation Project land belongs in the Darwin-Lawson-Wakeland-Belknap-Bonnie Association. This association is found in an almost continuous stretch along either side of the waterway from the mouth of the Kaskaskia River upstream to below Fayetteville. In general, the associations have moderate to severe limitations for most non-farm uses due to slow to moderated permeability and relatively poor drainage.

Many of the soils near the navigable channel have been modified by the construction of the navigation project and by the placement of excavated dredge material on the adjoining banks during channel maintenance activities.

## 4.9. RIVER HYDROLOGICAL CHARACTERISTICS

### General Description

The St. Louis District is located on an important stretch of the Mississippi River where the river changes dramatically in size and character due to the confluences of the three major tributaries: The Illinois, the Missouri and the Ohio Rivers. These river confluences greatly enlarge and influence the nature of the Mississippi River.

The nature and path of the Mississippi River has changed over time. Before the Ice Age, the Mississippi River flowed into the Gulf of Mexico over a different path with a much smaller amount of water. Sediment deposited by melt water from the glaciers forced the river from a previous westerly direction towards its current path.

Much of the present-day Missouri and Ohio Rivers flowed eastward and northward into the Hudson Bay and the Gulf of St. Lawrence respectively. The descent of the Kansan ice sheets altered the drainage patterns of the Midwest. The Missouri and Ohio Rivers became ice-marginal streams which flowed along the leading edge of the glacier. This edge formed the lines of the two riverbeds as they are now situated which caused the rivers to flow into the Mississippi. During the period of glacial retreat the Mississippi discharged a much greater volume of water than in post glacial times. A glacier lake, which formed in southern Canada and Northern Minnesota, flowed southward for a time into the Mississippi. The Great Lakes also drained into the Mississippi through the Illinois River. The result of this massive runoff was to carve a wide

floodplain in the Mississippi Valley creating the third largest river basin in the world.

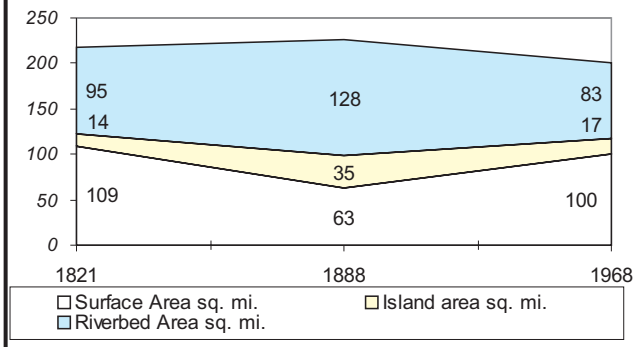
Currently, the Mississippi River basin is exceeded in size only by the Amazon and the Congo. It contains fourteen times the area of the Rhine basin. The river itself is almost 2,300 miles long and its more than fifty navigable tributaries furnish about 15,000 miles of navigable streams (and thousands of miles of un-navigable ones), traversing or bordering thirty-one states. The Mississippi River basin system watersheds drain approximately 1,858,000 square miles. All water between the Appalachian Mountains in the East and the Rocky Mountains in the West eventually flows into it. Over one-half of the population and 65 percent of the improved land in the United States are contained in the basin of the Mississippi.

The natural state of the Mississippi River is narrow and deep. In the early 1800s, forests of trees spread out across the rich alluvial bottomlands and lined the river's banks. The river was so narrow that settlers could stand on the bank at Cahokia and shout across to the settlement at St. Louis for a boat to come and ferry them across.

The Louisiana Purchase in 1803 marked the opening of the West. Settlements along the Mississippi like St. Louis began growing. In 1817, the first steamboat arrived in St. Louis, the Zebulon M. Pike. The population of St. Louis soared, and steamboat arrivals followed suit. From three arrivals in 1817 to more than 3,600 arrivals in 1858, steamboats had turned the Mississippi into a nationally significant transportation corridor.

The rich timber resources which lined the Mississippi's banks were used to build rapidly expanding settlements, cleared for agricultural purposes and used as fuel for the steamers boilers. As steamboats and settlements grew, great forests of timber were cleared.

*Table 4–36*
*Open River: Geomorphic Changes*




Source: Simons, et al. Geomorphology of the Middle Mississippi River. 1974.

As the timber vanished, the riverbanks became less stable and rapidly deteriorated. The river widened and the less stable banks crumbled and fell. Trees were thrust into the river impeding navigation. The tree snags, the shallowness of the channel and the congestion of river traffic combined to make navigation difficult and steamboat travel dangerous. Many lives and vessels were lost.

To correct the situation, Congress, in 1878, directed the Corps to create and maintain a safe and dependable navigation channel and return the river to its previous condition.

This effort was begun by stabilizing the river banks and designing navigation structures that worked in harmony with the natural laws of the river.

A variety of methods and navigational structures were employed. Riverbanks were stabilized, dredges removed sediment from the channel. Snag boats were used to clear downed trees, wrecked steamboats and other debris.

Today, the river closely resembles the dimensions it held in the early 1800s. Achieving this goal required the use of a variety of river structures which worked to guide the current, stabilize banks and encourage a narrowing of the river's width through a natural buildup of siltation. The process took many years.

Since the 1970s, the Corps and its partner agencies (USFWS, IDNR, MDC) have been evaluating the biological impact of the navigational structures on the river's ecosystem and making modifications to improve the biological productivity of the river.

### *Channel Diversions*

The Mississippi River tends to meander as it flows downstream. This meandering creates havoc with the navigation channel which must be maintained at a nine-foot depth. This happens most often where side channels are already in existence. The river, having traveled for years on one side of a grove of trees or small sandbar begins to flow heavier on the other side of the land area. If allowed to continue, the current will eventually be diverted from the main channel which will fill with sediment. Ultimately a new channel is formed.

The river also tends to cut new channels in areas where it makes sharp turns. In places where the current hits a protruding river bank, it begins to wear down the exposed bank eventually forming a side channel and much later a main channel.

### *Erosion and Sedimentation*

Banklines on both sides of the river are exposed to erosion. The bankline along the fast moving side of the river is exposed to the river's current, scouring and eroding the bank. The river bank running along the slow side of the river can also be exposed to a more gradual form of erosion. Wind, rain, the impact of humans and the river itself all contribute to the loss of bankline stability.

Each year the Mississippi carries an estimated 130 million tons of sediment to the Gulf of Mexico. That which doesn't reach the Gulf adds approximately 300 yards to the State of Louisiana each year. The rest is deposited in the river channel. How much and where sedimentation is deposited depends on the speed of the river and the size and placement of any objects impeding its flow.

Historically, the use of dikes to maintain a navigational channel and the resulting sediment build up assisted in narrowing the channel. Today, river engineering techniques are employed to allow river engineers to achieve navigation objectives without the build up of sediment through modification of the navigation structures. However, even without the use of dikes, sedimentation is a naturally occurring phenomenon and is primarily managed through the use of dredging.

### *The Annual River Hydrograph*

The long term average annual hydrologic pattern on the UMRS is one of high river flows in the spring followed by a low summer flow followed by an increased flow in fall and a low flow in the winter. The Mississippi River at St. Louis which drains 97 percent on the UMRS watershed shows the highest mean discharges in April and May and the lowest discharge in December and January.

For the Mississippi River in the St. Louis District, historic average annual stage hydrographs are illustrated in *Figures 4–37, 4–38,* and *4–39*. Pool 25 Tailwater St. Louis and Cape Girardeau river gauge locations were selected to provide a geographic sampling of upper, middle and lower river hydrographic conditions in the district.

## Open River

The open Middle Mississippi River is defined as the reach of river between the Missouri River and Ohio River confluences. Below St. Louis, the river shows a marked tendency to meander in the alluvial valley and is seldom found in the middle of the floodplain. From St. Louis, the river continues along the Missouri Bluff to St. Genevieve, then crosses the valley to Fort Gage, Illinois, flows adjacent to the Illinois bluffs for about 14 miles, and returns to the Missouri bluffs at Red Rock. It follows this bluff line to Cape Girardeau. Continuing past the natural flood outlet into the St. Francis Basin, the river flows through the 7-mile rocky gorge, Grays Point, to Commerce, Missouri. It then sweeps on through the lower wide alluvial valley (coastal plain), which is characteristic of the Lower Mississippi River.

Between St. Louis and Cairo, Illinois, bank full widths vary from 2,500 to 4,800 feet and low-water widths from 1,500 to 1,900 feet. The floodplain of the Middle Mississippi River is widest just north of St. Louis, where the distance is approximately 12 miles, and from St. Louis to Grays Point, approximately 135 river miles downstream, the alluvial plain has an average width of 4 to 5 miles. The 7-mile long Grays Point-Commerce Gorge is narrow with a minimum width of about one-half mile. Just below Commerce, Missouri, the bluffs diverge sharply and mark the beginning of the very wide delta region of the alluvial valley of the Lower Mississippi River. The Middle Mississippi River drops in elevation at an average of 0.57 foot-per-mile. The maximum observed slope, a fall of 2.0 foot-per-mile, during low water, occurs just below Chain of Rocks opposite north St. Louis. In the gorge between Grays Point and Commerce, the flood of 1844 had a mean fall of 1.7 foot-per-mile and at the low stage of 24 December 1904, a mean fall of 0.18 foot-per-mile. Even flatter low water slopes have been observed in the St. Louis Harbor.

Historical accounts indicate that, at about 1820, the Middle Mississippi River passed from its natural state into a state where human activity had a significant effect on the morphological processes.

European settlement, the advent of steam powered boats and the river current itself all contributed to excessive timber removal from the banklines creating deteriorating

*Figure 4 – 37*
*Comparative Stage Hydrograph – Mississippi River at Cape Girardeau*

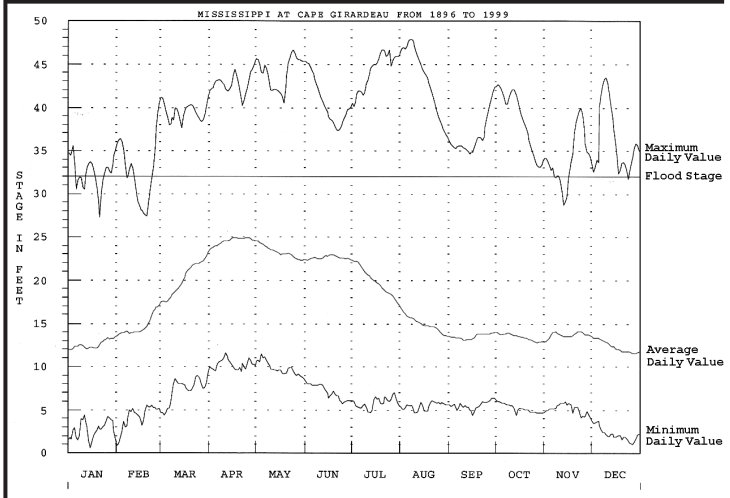



*Figure 4 – 38*
*Comparative Stage Hydrograph – Mississippi River at St. Louis*

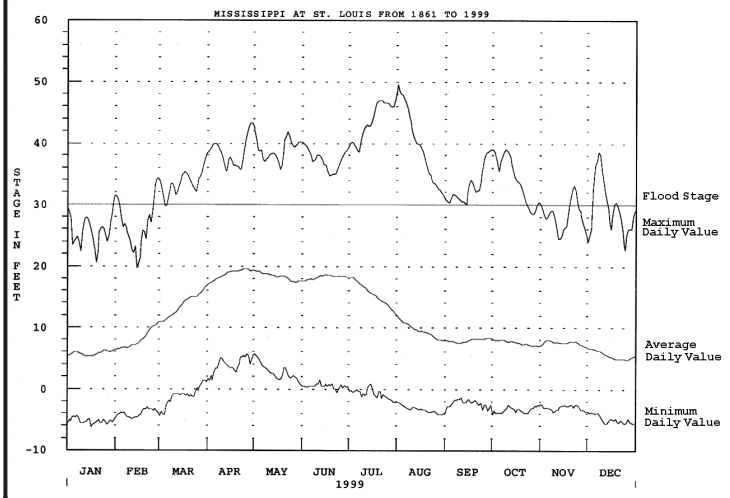
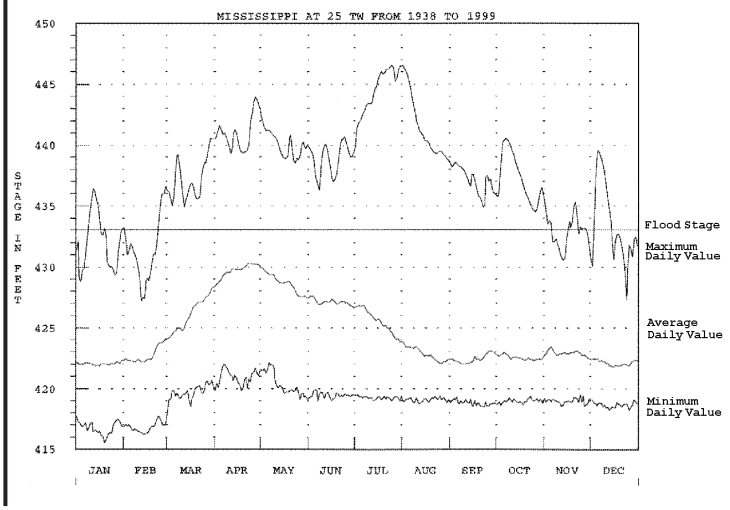



*Figure 4 – 39*
*Comparative Stage Hydrograph – Mississippi River at Pool 25 Tailwater*



and unstable riverbanks. As a result, the river width increased from an average of 3,600 feet in 1821 to an average 5,300 feet in 1888. In the 1880s, the Federal Government began the task of obtaining and maintaining a navigation channel. The average width of the Middle Mississippi River was changed from about 5,300 feet in the 1880s to an average width of 3,200 feet today, as compared to the 3,600 feet in the 1820s. River length has varied from a minimum of about 186 miles to a maximum of about 195 miles. The navigation project has greatly influenced these geomorphic changes.

## Pooled River

Early in the twentieth century, it became apparent that the residents of the Upper Mississippi Valley could benefit from long haul, low-cost water transportation. However, nature did not provide the proper conditions for people to fully utilize the Upper Mississippi River. In the 1930s, Congress turned to the Corps to design and construct a series of Locks and Dams to provide a safe and dependable navigation channel.

Before the Corps built the lock and dam system on the Mississippi, navigation on the river was intermittent at best. During low-flow periods, the river had many shallow reaches which limited or curtailed water transportation on the Upper Mississippi River. The low river depths not only limited river navigation, but also limited recreational development.

Extensive work by the Corps since the 1930s has allowed for the integrated system which utilizes the resources of the Mississippi, the Illinois, and the Ohio Rivers for transportation. For over 60 years, this river transportation system has had the desired result of providing a safe and dependable navigation system and has also provided various other benefits as well.

The Corps has examined opportunities, within its current authority, to respond to recreational and environmental concerns. The Corps works closely with the USFWS and with state departments of conservation on habitat improvement projects within the river pools. The Corps also works closely with recreational interest groups to accommodate boating, fishing, hunting, nature study, sightseeing, etc.

The locks and dam system has been operated successfully for over 50 years. From St. Anthony Falls, Minnesota, to St. Louis, the Mississippi resembles a downward staircase with each of the steps represented by a navigation pool. The locks which accompany the dams allow river traffic to “step” from pool to pool. Regulation of the pool levels is a major responsibility of the Corps.

### *Navigation Pool Regulation*

A dam, to the average person, is a huge solid structure used to block the flow in a river and form a lake. This conception is not true of navigation dams, such as those on the Upper Mississippi. These dams are not solid but are a series of concrete piers across the river with movable gates between the piers. A dam is formed when the gates are lowered, causing the water level upstream of the dam to rise and to form a slack-water pool which provides adequate navigation depth.

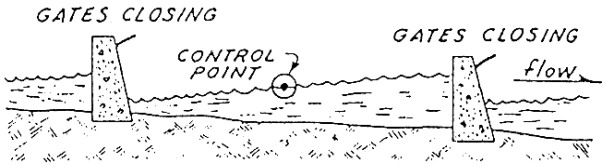
In order to operate the slack-water pool system, it was necessary for the federal government to acquire all real estate which would be inundated by the use of the dam gates. Much of this land is now serving the public for recreational and environmental purposes and is the focus of this Master Plan. Some land is owned outright and some is covered by “flowage easements” allowing artificial flooding of privately owned land (if necessary).

Operation of each dam makes control of the depth of water possible for commercial navigation purposes. Each dam is operated in response to the river flow conditions which exist. During normal operation, all gates are partially opened with water flowing beneath them. As the flow increases or decreases, the gate openings are increased or decreased accordingly.

Each pool within the St. Louis District has a control or “hinge point” located near the middle of each pool, with established maximum and minimum water levels. In Pool 26, this control point is located at Grafton, Illinois. In order to maintain a nine-foot depth throughout the pool, the water level must be maintained at or above the established minimum elevation at the control point.

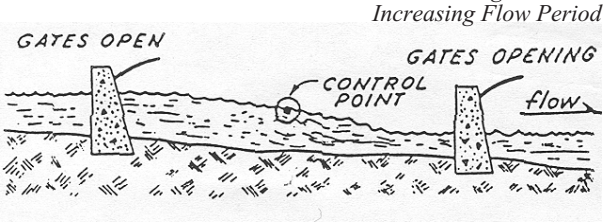
During full-pool periods, the water level behind the dam is nearly level and the dam is providing its maximum benefit. The dam is maintaining a higher pool level than would occur naturally. These increased levels make possible both commercial navigation and intensive recreation usage of the river.

*Figure 4 – 40*
*Low Flow Periods*



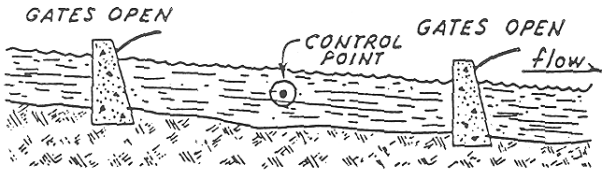

As the rate of flowing water increases, the water surface in the upper end of the pool rises. Therefore, the gates of the dam downstream are adjusted to pass the increased flow and to keep the elevation at the control point within its established limits. By this means, the river is held within prescribed boundaries along the entire length of the pool.

*Figure 4 – 41*
*Increasing Flow Period*




As the gates are opened, the water elevation at the dam falls and the water surface throughout the pool attains a slope. At that time, the water surface elevation upstream of the control point is higher than it is at full pool. The downstream reach is lower than it is at full pool, yet higher than it is in the natural condition. The level at the control point remains practically unchanged. This condition is known as pool drawdown.

*Figure 4 – 42*
*High Flow Period*




During drawdown, problems often occur for some river interest groups (particularly those located below the control point). Since flow rates within the river change, it is impossible to satisfy these interests at all times without causing flood damage to other areas of the river. Consistent with the basic purpose of the navigation projects, every effort is made to cooperate with all activities within the pools (including small boat harbors, recreation areas, agricultural interests, etc.)

After the high water passes and the flow decreases, it is necessary to reverse the procedure in order to keep the water surface at the control point at or above its established minimum level. The water surface in the upper part of the pool must not be permitted to drop to a point where the Nine-Foot Navigation Channel is threatened. Therefore, the gates of the downstream dam are lowered into the water and the gates are adjusted to maintain the established stage at the control point. In this way, the water level upstream of the dam is slowly raised until the pool reaches full pool levels throughout its length.

There are periods of the year, usually in the spring months, when the natural flow provides adequate depths for navigation without the use of the dam gates. During these high-flow periods, the dams have no control

over flooding. River levels throughout the length of the pool are near to, or are above, flood stage. At such times, the gates are lifted entirely out of the water (a situation known as “open-river conditions”), and the stages reached are the same as they would have been had the dams not been in existence.

In the early 1990s, the district began to use the seasonal drawdowns to stimulate wetland vegetation growth and improve river habitat conditions on the pools. Referred to as Environmental Pool Management (EPM), this practice was fully implemented in 1994 as a way to create thousands of acres of critical wetland vegetation for wildlife in the navigation pools, while still providing for the needs of navigation. Several factors contribute to a successful EPM year. First the pool must be drawn down 0.5-2.0 feet for approximately 30 days. This pool drawdown occurs during May 1 through July 30, with the May-June period being the most desirable for vegetative growth and seed production. Secondly, after the initial drawdown, the goal is to allow the pool to rise at a rate not greater than 0.2 foot per day.

EPM benefits the entire river ecosystem by simulating the pre-dam annual hydrograph (i.e. spring flood followed by summer low flow, followed by a small flood in late fall/early winter and winter low flow) which was mostly lost with dam operation. The growth of moist soil vegetation benefits fish and migratory waterfowl by providing attachment sites for food organisms (macroinvertebrates). It also benefits fishes by providing both protective cover for small fishes and ambush cover for predators.

EPM continues to be successful each year in providing a safe and dependable navigation channel and creation of thousands of acres of vegetation for wildlife and erosion control.

### *River Engineering Structures for Navigation*

The Corps designs its river regulating structures for navigation in a manner that also improves river habitat diversity. Four primary habitats important to the river ecosystem that are enhanced through innovative design modifications of navigation structures include:

- Fast water: Water moving quickly, usually the current in the main river channel.
- Slow Water/Quiet Water: Water outside of the main river channel moving slower than the primary river current.
- Wetted Edge: Land which is constantly getting wet and then dry again as the river rises and falls. This area is in a continual state of change. This habitat is very important, as there is a constant exchange of nutrients from the land to the aquatic environment.
- Terrestrial: Land separated from the shore is especially important because it is away from humans and other predators.

Primary structural designs that provide for navigation as well as habitat diversity include:

- Notched Dikes
- Stepped-up Dikes
- Bank and Off Bankline Revetments
- Chevron Dikes
- Side channel Improvements
- Bendway Weirs

## Notched Dikes

Rock dikes running perpendicular to the shore have long been used to guide the river and maintain the navigation channel. River engineers found that, simply by adding notches, the dikes continue to create navigation dimensions as well as support diverse habitats. The river is allowed to move in and out between the notches creating all four of the primary river habitats. Sediment buildup forms small sandbars between each of the dikes. A variety of notch locations, sizes and widths were studied to create the optimum design. The overall result, however, is the creation of diverse environments by making a small but significant design modification.

*Figure A*
*Notched Dike Environment*

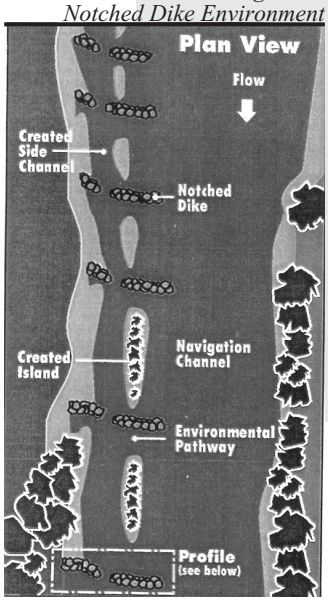
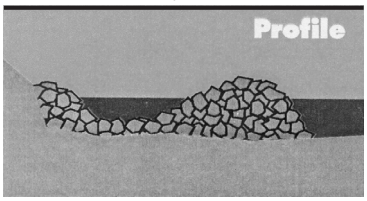



*Figure B*
*Notched Dike Profile*

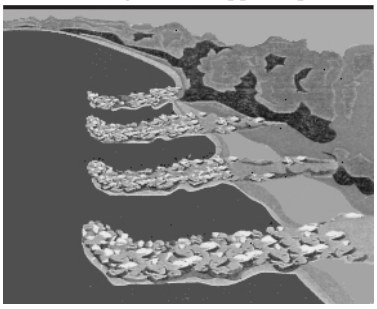



## Stepped Up Dikes

Stepped-Up dike fields of various elevations are developed to provide an additional element of diversity. They counteract sediment deposition, thereby preventing the conversion of aquatic habitat into terrestrial habitat. In the stepped-up dike configuration, each dike in sequence rises two feet higher than the previous one. This approach utilizes the river's energy to change the sediment deposits as the water level rises and falls.

When the river's current hits the first dike it is propelled towards the main channel. As the river level rises, it moves over the first dike and hits the second dike, once again moving back into the main channel this process repeats as the river rises and falls. The river's current, moving over each submerged dike, allows the sediment buildup to be redistributed back into the main channel and carried downstream.

*Figure C Stepped Up Dikes*



*Stepped Up Dikes*

*Figure D*

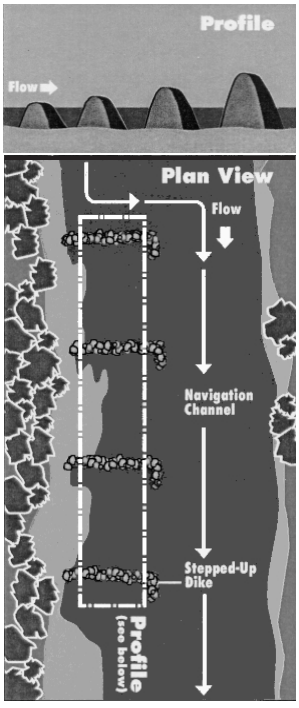



*Figure E*

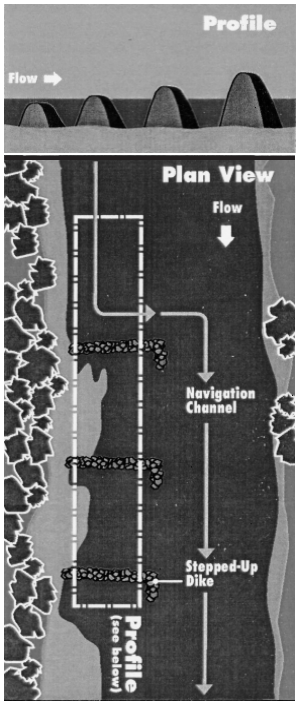



*Figure F*

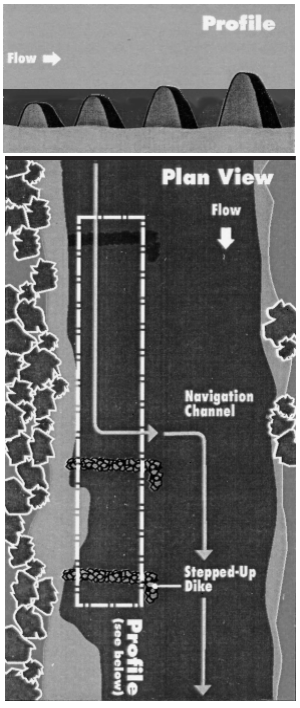



*Figure G*

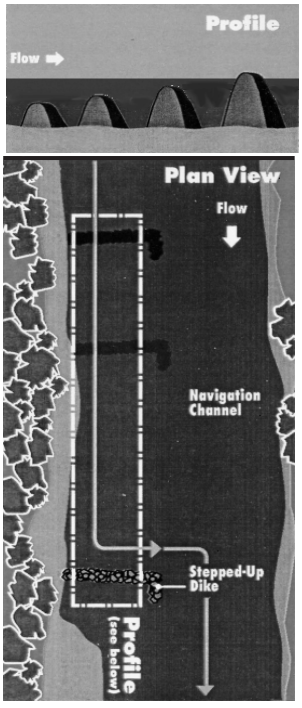
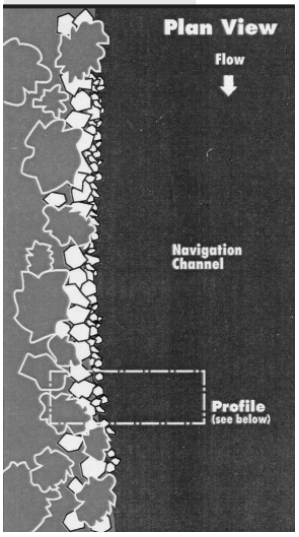
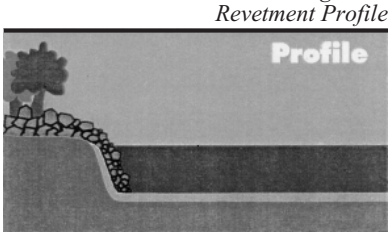


*Figure I*
*Revetments in a Side Channel*




## Revetments

*Figure H*
*Revetment Profile*




Traditional methods of stabilizing eroding riverbanks through bankline revetments involve the removal of existing vegetation followed by grading the bank to form a stable slope on which to lay rock. The rock placed is relatively uniform with a maximum size of 400 pounds. The resulting environment is homogeneous and therefore does not provide as much diversity as the natural river banks.

Current bankline revetment methods use a much more variable gradation of rock with a maximum size of 5,000 pounds. This change provides two important benefits. First, the larger maximum size rock provides greater bank stability. This removes the requirement to grade the bankline and remove all the vegetation. Now, trees and rock revetment can coexist. Second, the wider variation in rock size also creates greater habitat diversity and attracts more aquatic species than the natural caving bankline.

*Figure J*
*Off-Bank Revetment*

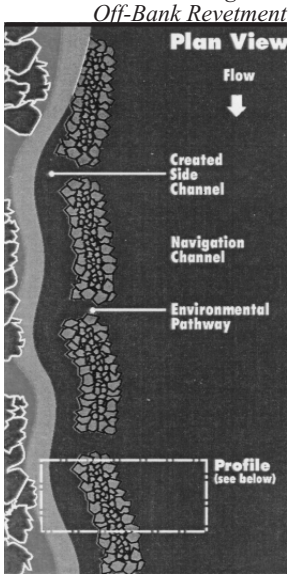
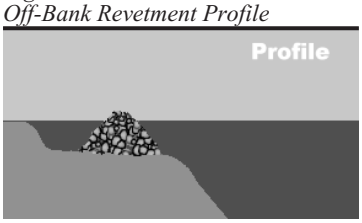



*Figure K*
*Off-Bank Revetment Profile*

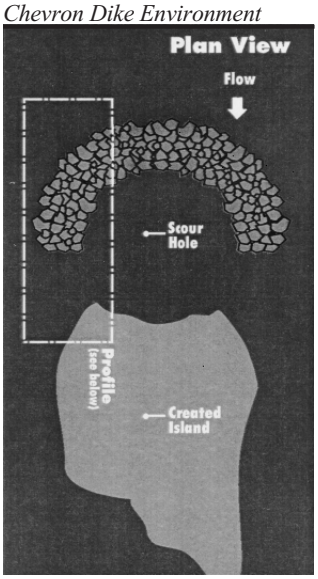



## Off Bank Revetments

In areas where the caving river bank is on the shallow side of the river, there is a greater flexibility to design alternative solutions.

By placing a parallel structure of stone off the bankline, erosion is reduced and diverse habitats are maintained. In some areas, the revetment is notched allowing fish to move between the fast water and the slow water easily. The areas between the revetments and the bank line are considered to be prime fishing locations by both commercial and recreational fisherman.

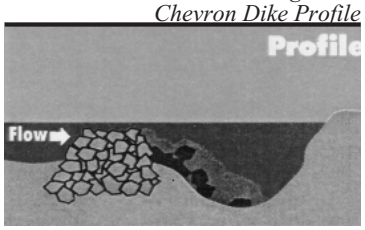
*Figure L*
*Chevron Dike Environment*




## Chevron Dikes

A navigation structure called a chevron dike is used to improve river habitat and to create beneficial uses of dredge material. These structures are placed in the shallow side of the river channel pointing upstream. Their effect is to improve the river channel.

*Figure M*
*Chevron Dike Profile*

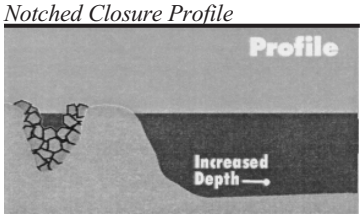



When dredging is needed to improve the main navigation channel, dredge sediment is deposited behind the chevron dike. These small islands encourage the development of all four primary river ecosystem habitats. In addition, various microorganisms cling to the underwater rock structures, providing a food source for fish.

## Notched Closure Structures

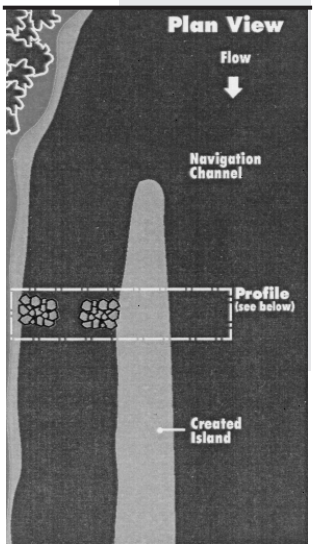
Side channels are not used for navigation, but are valuable environmental areas. Traditionally these side channels were closed with rock structures to divert the flow into the main channel. While improving navigation, this process tends to fill the side channels with sediment and convert aquatic habitat to terrestrial habitat.

*Figure N*
*Notched Closure Profile*




Notching a closure structure tends to keep the side channels from being filled with sedimentation. These structures form areas of deep water and shallow water creating a diversity of habitat, attracting different species of fish.

*Figure O*
*Notched Closure in a Side Channel*



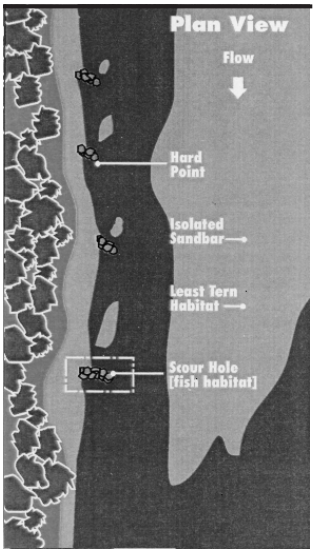

### Hard Points in Side Channels

Hard points are very short rock dikes that are used to stabilize side channel river banks. These navigation structures extend from the riverbank into the river and do not cause a significant buildup of sediment. Their contribution to habitat improvement is the creation of scour holes under the hard points. These deep plunge holes attract catfish that flourish in this environment.

### Bendway Weirs

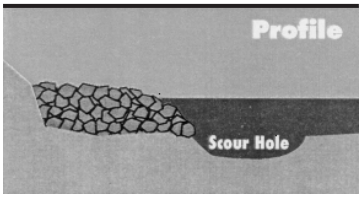
The Bendway weir is a low level, totally submerged rock structure that is positioned from the outside bankline of the riverbend, angled upstream towards the flow. These underwater structures extend directly into the navigation channel underneath passing tows. Their unique position and alignment alter the river's secondary currents in a manner which controls excessive channel deepening and reduces adjacent riverbank erosion on the outside bendway. Because excessive river depths are controlled, the opposite side of the riverbank is widened naturally. This results in a wider and safer navigation channel through the bend without the need for periodic maintenance dredging.

*Figure P*
*Hard points in a Side Channel*




Since 1994, studies have been conducted by the Corps, USFWS, IDNR and MDC to assess the impact of the bendway weirs on fish habitat. Data collected on fish populations and species composition on river bends with and without bendway weirs have generally shown increase in fish populations as much as five fold in the river bends containing bendway weirs.

*Figure Q*
*Hard point Profile*




### *Summary*

Biological Studies on the various river navigation structures described above have found an increase in diversity and numbers of micro-invertebrates. To a lesser degree, fish communities are also found to have greater diversity. In addition, the larger problem of aquatic environment becoming terrestrial is reduced, the river channel is maintained, structures are basically self-maintained and biological diversity is increased.

Isolated sandbars created by the various navigational structures provide suitable nesting sites for the endangered Least tern. These sandbars are usually away from human encroachment which helps aid their development. In addition, the easy access from slow water to fast water is important for fisheries habitat.

Each structure is a piece of a giant jigsaw puzzle, having to "fit" exactly to create a safe and dependable navigation channel and at the same time, stimulate the rivers biological diversity.

## Kaskaskia River Navigation Project

The Kaskaskia River originates in an area near Champaign, Illinois, and flows southwesterly for approximately 310 miles to its confluence with the Mississippi River, eight miles upstream from Chester, Illinois. It is the second longest river to be located entirely within the State of Illinois, the Illinois River being the largest drainage basin. The Kaskaskia River Basin is 175 miles in length and 33 miles in width, covering an area of approximately 5,840 square miles. The area included in this plan is limited to 3 of the 15 counties which are considered to be part of the drainage basin.

Official identification of the Kaskaskia River was made in 1768 when the river was surveyed and listed in the records of the Pennsylvania Historical Society (U.S. Corps of Engineers, St. Louis). Prior to this time, the river had been used by the resident Native American population and French traders and explorers. As development increased in the surrounding area during the late 1700s and early 1800s, efforts were made by the federal government and the State of Illinois to improve navigation on the Kaskaskia River by removing log jams and other navigation hazards. During this period, the river was used to ship wheat flour from Carlyle and New Athens to southern markets. In 1819, the State of Illinois declared the Kaskaskia River a navigable waterway. In the late 1800s, work was completed in creating a three-foot deep navigation channel.

During the late 1940s and early 1950s, planning studies were conducted by the Corps to determine the feasibility of providing a nine foot navigation channel on the lower Kaskaskia River in conjunction with the flood control reservoirs. In 1958, construction was begun on Carlyle Lake Reservoir and in 1966, one year prior to the completion of the reservoir, funds were appropriated for construction of navigation improvements on the Lower Kaskaskia River.

## Dredging and Dredged Material Uses

When maintenance dredging occurs, excavated material is placed along the shore or between the channel and the bank. This material is almost always put back into the Mississippi River. Approximately 150 sites in the Rivers Project Area have been dredged at one time or another. River stage; hydrologic, geomorphologic, and geometric properties of a particular reach of the river; volume of material to be dredged; capability of the equipment used; river structures in a reach such as dikes, revetments, and locks and dams; the volume of river traffic; and recommendations received from federal and state conservation and fish and wildlife agencies are considered before locating a disposal site. Between 30 to 50 river locations are dredged regularly in the St. Louis District. Some locations are dredged very infrequently, others annually, and some more than once each year. All dredging activities comply with applicable federal and state regulations.

The St. Louis District coordinates with other pertinent agencies regarding locations which may require dredging and the proposed disposal sites. Yearly inspection trips are conducted with the Fish and Wildlife Work Group to discuss navigation and environmental issues on the river at which time dredge sites are evaluated and mutually agreed upon locations are identified. In addition, operations plans are developed for environmentally sensitive areas. Dredge and disposal locations identified after annual coordination meetings are coordinated prior to work using the internet, electronic mail, fax and telephone communications, with meetings conducted as needed.

The average annual amount of material dredged over the last 15 years is about seven million cubic yards. This material is temporarily resuspended during disposal. While sizeable, this amounts to only 7 percent of the suspended material passing St. Louis annually. Ninety-five percent of the material dredged in the St. Louis District is sand.

Whenever possible, material dredged to maintain the authorized navigation channel is used for beach nourishment and creation of sandbars and islands that are popular with recreational boaters. These newly created habitats may also become important fish and wildlife habitat.

## Floods and Flood Damage Reduction

### *General Discussion*

Since prehistoric times, the Mississippi, Missouri, Illinois and Kaskaskia Rivers have periodically topped their banks, flooding and shaping broad floodplains. Historic documentation of the effects of these floods abounds.

From Hannibal to Cairo, major floods have repeatedly washed over the floodplains within the St. Louis District. Perhaps the greatest flood in the nineteenth century came in 1844, before any levee system was in place. Flood water covered an area several miles wide from bluff to bluff and stood above the second story of houses in East St. Louis.

Floods in this century have caused extensive damage due to floodplain development.

Early flood control relied almost exclusively on levees, and throughout most of the 19th century, flood protection was a local option. A local organization, referred to as drainage or levee district, could tax local land owners to erect a barrier levee designed to keep high waters at bay.

The absence of a comprehensive levee system allowed the 1903 flood to disrupt commerce on the American Bottoms. Following this flood, the East Side Levee and Sanitary District, organized in 1908, began to encircle much of the urban and industrial district of the East Side of the metropolitan area with a levee system.

Between 1900 and 1930, Illinois River area residents built levees around over 140,000 acres of floodplain lands along the lower Illinois River. Along the Mississippi River, downstream from St. Louis, nearly 170,000 additional floodplain acres were lined with levees. These local efforts provided greater protection, and also encouraged more development of flood-prone lands.

One of the most devastating floods of all times occurred in 1927 and it motivated the federal government to undertake greater flood control programs. In all, the 1927 flood inundated over 16 million acres in seven states, causing more than $100 million in crop losses. More than 160,000 homes flooded, forcing over 350,000 people to seek refuge in Red Cross camps.

A primary charge of the Corps was improving navigation, but by the mid-nineteenth century pressure was building for the Corps to play a role in flood protection. Following recurring disastrous floods and pleas for help from residents in the affected areas, the federal government passed a series of Acts that made flood protection a responsibility of the federal government, and ultimately of the Corps.

Flood control became a major mission of the Corps in the mid-twentieth century. The Flood Control Act of 1936 called for a comprehensive system of levees, reservoirs to store excess precipitation, and channel improvements to speed water movement.

Major Mississippi River floods caused by excessive rainfall returned in 1944, 1945, 1947, 1951, 1973, 1993 and 1995. The 1993 flood was the historic flood of record and was notable for its duration. It exceeded the previous record (1973) by over six feet and remained over flood stage 148 days as compared to 77 days in 1973. The flood control system has provided the citizens of the valley a great deal of protection. To date flood damages prevented by the system of levees and reservoirs in the St. Louis District have exceeded $16 billion.

Today, the Corps oversees a vast engineering flood damage reduction system. The two main elements are levees and reservoirs. The St. Louis District flood control system includes approximately 100 levee systems protecting approximately 400,000 acres in the district, and five major reservoirs to reduce flood levels on the Rivers.

### Levees

Levees are built to protect people, crops and transportation/utility, residential, industrial and business infrastructure from flooding. In the St. Louis District portion of the Mississippi River valley approximately 50 percent of the pooled river floodplain is protected by levees and about 80 percent of the open river floodplain is protected by levees. On the Illinois River, from Kampsville to LaGrange, approximately 80 percent of the floodplain is protected by levees.

There are three kinds of levees. They are described in *Table 4 – 43.*

Levees in the St. Louis District are identified in *Figure 4 – 44* through *Figure 4 – 47*.

### Floodwalls

Floodwalls serve the same purpose as levees and are built when levees are not physically or economically feasible for a given area. They are high narrow concrete and steel structures, founded beneath the ground surface, with closures structures, or gates, that can be closed during floods. St. Louis, Missouri, and Cape Girardeau, Missouri, have riverfront floodwalls built by the St. Louis District.

*Table 4 – 43 Comparison of Levee Characteristics*

| Federal Levees |
|---|
| **Built by Corps of Engineers**<br>Made of a tightly compacted clay core with berms extending out at the base on both sides<br>May stand on a base over 200 feet wide, with a crest 20 feet wide<br>Size depends on the degree of protection required for adjacent property<br>Federal agricultural levees built to withstand normal seasonal flooding and constructed with a height about 10 feet above flood stage<br>Federal urban levees built to provide greater protection |
| Local or Non-federal Levees |
| **Constructed by local agencies**<br>Often made of more permeable material capped with compacted clay<br>Generally have steeper sides than federal levees |
| Private Levees |
| **Construction specifications left to the builder**<br>Made of a wide variety of materials<br>Generally the first to fail in a flood |

*Figure 4– 44*
*Mississippi River Levees – Alton to Clarksville Area*

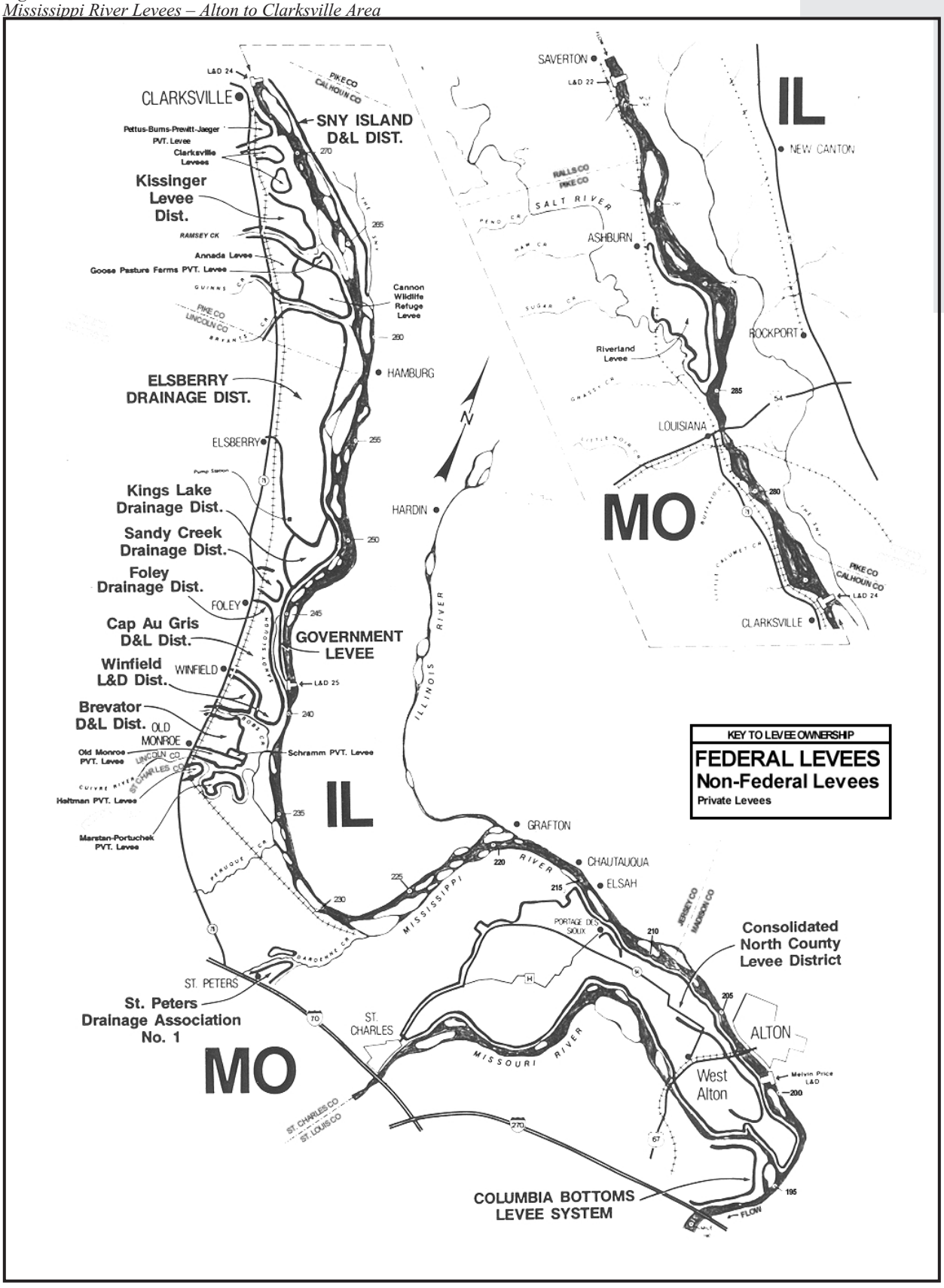


*Figure 4– 45*
*Illinois River Levees – LaGrange to Grafton*

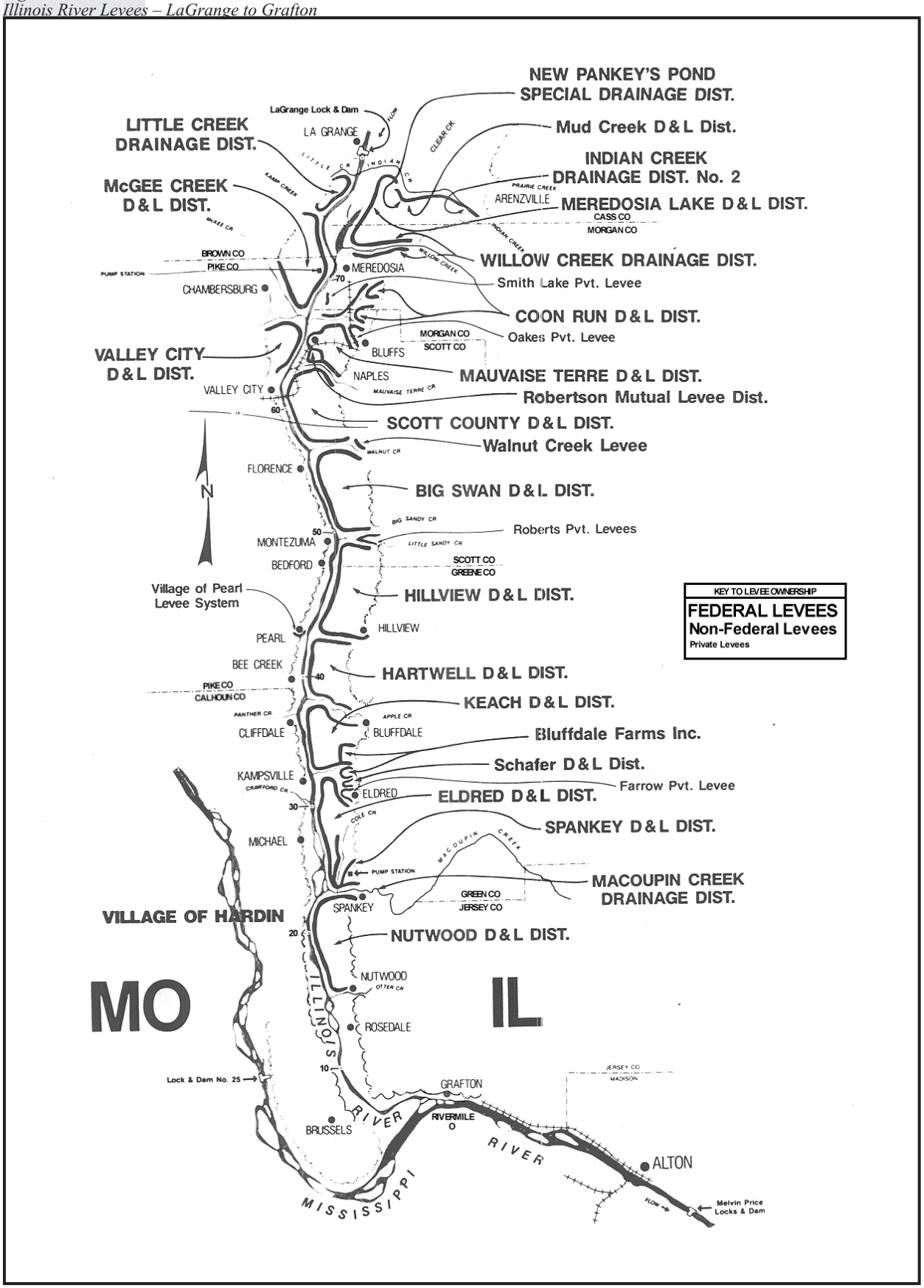


*Figure 4– 46*
*Mississippi River Levees – St. Louis Area to Prairie Du Rocher Area*

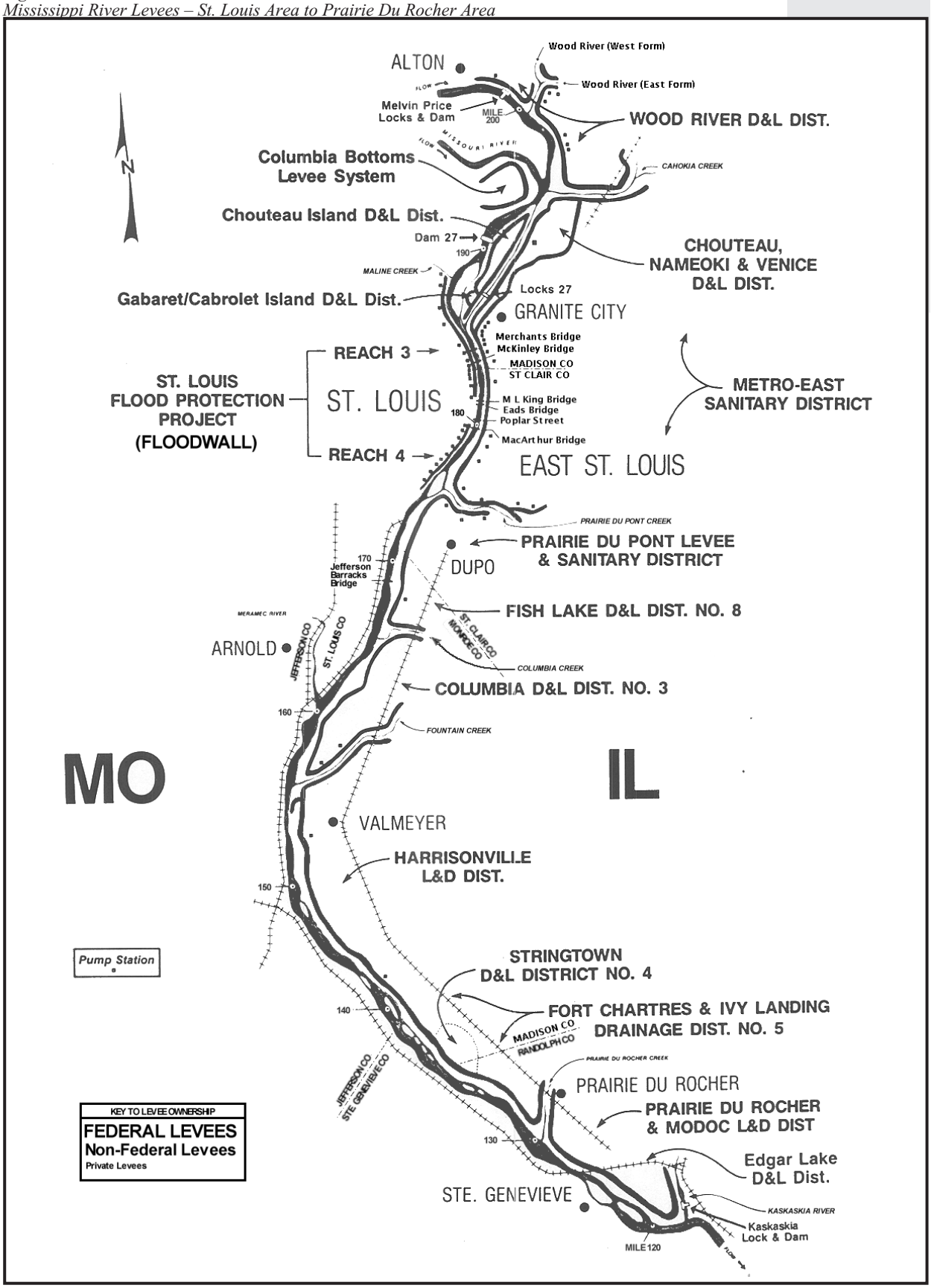
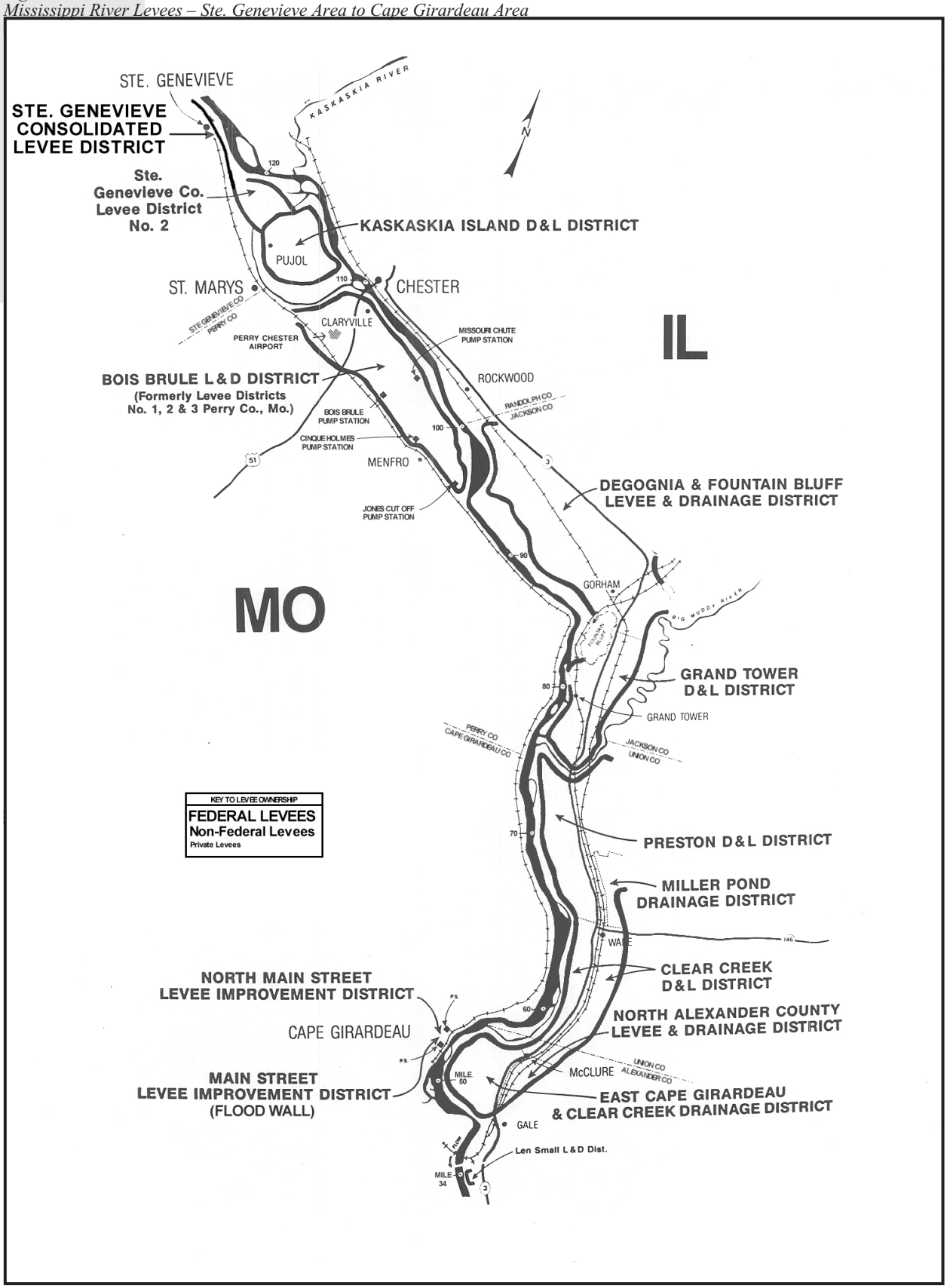


*Figure 4– 47*
*Mississippi River Levees – Ste. Genevieve Area to Cape Girardeau Area*



### Flood Level Frequency Estimates

Based on historic data, flood level frequency estimates have been developed to determine flood protection project levels.

- A “50-year flood” has a 2 percent chance of occurring in any given year. Most agricultural levees are designed to withstand a flood of this magnitude.
- A “100-year flood” has a 1 percent chance of occurring in any given year. The Federal Emergency Management Agency requires 100-year flood protection for building in the floodplain.
- A “500-year flood” has a 0.2 percent chance of occurring in any given year. Five hundred-year flood protection is provided to some urban areas, such as St. Louis, East St. Louis, Wood River, Prairie Du Pont and Cape Girardeau.

### Flood Control Reservoirs

The Corps has constructed a system of over 40 flood-control reservoirs in the entire Mississippi River Basin. The reservoirs store excess water during floods, and after the crest passes, the stored water can be released slowly.

Four major flood control reservoirs exist within the St. Louis District that affect the Rivers Project Service Area. They are:

- Mark Twain Lake on the Salt River, Missouri
- Lake Shelbyville on the Kaskaskia River, Illinois
- Carlyle Lake on the Kaskaskia River, Illinois
- Rend Lake on the Big Muddy River, Illinois

Initially authorized in 1936, this system of reservoirs became fully operational by the early 1980s. These giant holding basins can hold back vast quantities of water from the river systems and reduce flooding downstream.

In addition to flood control functions, other benefits provided by the reservoir system include:

- Hydro-electric power generation
- Drinking and irrigation water supply
- Water quality improvement
- Navigation control
- Recreation opportunities
- Fish and wildlife habitat improvement

### The Great Flood of 1993

In the summer of 1993, very heavy and extensive rains in mid-June fell on the upper Midwest, eventually pushing the Mississippi River to a crest of 43 feet at St. Louis on 12 July, equaling the previous 1973 flood record. By mid-to late July, heavy rains in Iowa, North Dakota, Nebraska, Kansas, and Missouri caused record flooding on the Missouri River, setting a new record in St. Charles and pushing the Mississippi River to a record 49.47 feet at St. Louis on 1 August.

The flood of 1993 was one of the most damaging natural disasters to occur in the United States. Damage throughout the Midwest totaled $15 billion, 50 people died, hundreds of levees failed, and thousands of people were evacuated. In the St. Louis District, 12 of 42 federal levees

and 39 of 47 non-federal levees either failed or were overtopped. Of the federal levees that were overtopped, the crest of the river exceeded their design heights. For example, the Columbia, Illinois, levee that was overtopped was built to withstand a flood of 45.0 feet (as referenced to the St. Louis gage) and was overtopped when the Mississippi River at St. Louis exceeded 49.5 feet.

Flood damage prevented in the St. Louis District by the reservoirs and levees exceeded $5 billion in 1993.

By July 1997, the area's recovery from the flood was nearly complete, but concern over the cause of the flood and the likelihood of another remains. A series of federal, non-federal, and private levees continue to protect much of the developed and agricultural land along the Mississippi, Illinois and Missouri Rivers. Property has been restored or homeowners have been bought out and moved to avoid future damage.

## 4.10.LAND AND WATER USE CHARACTERISTICS

### Introduction

#### *General Description of Navigation Pools*

The portion of the Mississippi River and floodplain in the St. Louis District is in a well-defined valley which was excavated by glacial activity. The present channel follows a winding course in a wide floodplain of alluvial terraces. The floodplain is bordered by high massive limestone bluffs of scenic beauty, rolling hills and hardwood forests. The distance between the valley walls varies. The landscape often shifts from the high limestone bluffs on one shoreline to broad floodplains on the other.

### Mississippi River Navigational Pools

#### *Pool 24 Land Use*

In Pool 24, the river width varies greatly to a maximum width of approximately one-half mile at Louisiana, Missouri. The alluvial floodplain measures a maximum width, approximately seven miles, at the Salt River tributary on the Missouri side of the river. The average width of the alluvial plain of this pool is about five miles. The pool flows toward the west bluff, leaving a large floodplain on the Illinois side where extensive agriculture and small towns are protected by the levees.

Approximately 70 percent of the alluvial plain of Pool 24 is used for agriculture. The majority of the agriculture is cropland, but some pasture or grasslands exist. Agricultural activities probably could not be practiced in its present magnitude without the flood protection afforded by the existing levee systems.

Forest conditions occupy most of the remaining portion of the floodplain. Bottomland forests are found along the riverbanks, on the islands, along streams, around lakes and sloughs, and in low-lying areas. In general, forests exist in areas too wet to farm. The largest wooded area, a high-quality pin oak stand, now under stress from repeated flooding, is found on the southern half of the oval-shaped bottoms at the mouth of the Salt River and in managed by the MDC as the Ted Shanks Conservation Area.

Some lakes and wetlands occur on the floodplain in Pool 24. Lakes include the permanent water bodies that collect drainage, have restricted exits, or are land locked. Lakes frequently occur along the base of the levees on the riverward side. Many of these lakes are formed from borrow pits resulting from levee construction. Others occupy abandoned river meanders and side channels.

Ownership and management of public lands is significant in Pool 24. The USFWS operates the Delair Division of the Mark Twain National Wildlife Refuge. The Ted Shanks Conservation Area and the Upper Mississippi Conservation Area, managed by MDC, encompasses approximately 7,000 acres of lands and waters managed for fish and wildlife purposes. The MDC manages most of the Corps River Project lands and waters in Missouri for fish and wildlife purposes as authorized by the General Plan. The Corps conducts stewardship management on most of the federal lands acquired for Pool 24 on the Illinois side. Public access areas along this pool are developed and operated by either the Corps or the State of Missouri.

Small farming communities along the floodplain include the communities of Louisiana, Clarksville and Ashburn, Missouri, and Pleasant Hill, Rockport, New Canton, and Kinderhook, Illinois. The Missouri towns are located on the banks of the river, while the Illinois towns are several miles from the river usually along the edge of the floodplain. Louisiana, which had a 1995 population of 3,900, is the largest community.

State Highway 79 in Missouri and State Highway 96 in Illinois extend the length of Pool 24 on both sides. A rail line runs the length of the pool on the Missouri side as well. US Highway 54 and a railroad bridge cross the river at Louisiana, Missouri.

Industries in the area are primarily agriculture, cement, industrial chemicals, nurseries and retail services. Industrial land-use consists of four major barge terminals for the shipment of cement, sand, grain, and chemicals.

### *Pool 25 Land Use*

The river in Pool 25 (reference *Plate L-25*) contains numerous islands and varies in width from 0.5 miles to 1.5 miles. Upstream from Lock and Dam 25, the floodplain, measured bluff to bluff, gradually widens from a width of 3.5 miles to 5.0 miles at Clarksville. The western (Missouri) portion of the floodplain is the widest side in the Pool 25 and is leveed almost the entire length. The eastern side of the alluvial plain is narrow and only the northern one-third is leveed.

Approximately 60 percent of the floodplain of Pool 25 is used for agriculture; most of the remaining 40 percent is in bottomland forest or other wetlands. The broad Missouri side of the floodplain comprises the bulk of the area's agriculture. A relatively small amount of agriculture is found on the narrow eastern floodplain in Illinois.

Forests occur along the riverbanks, on the numerous islands, along stream and riverside channels, and around lakes. Large areas of forest occur on the eastern floodplain, particularly in the areas from Batchtown to Hamburg, Illinois, in Calhoun County. Most of this land is in public ownership as a part of the navigation Pool 25 project and is jointly managed by the Corps, USFWS and IDNR. The riverbanks are forested nearly the entire length of Pool 25.

Public lands acquired for the navigation project are primarily confined to low-lying areas on the alluvial plain, adjacent to the river. Approximately 9,000 acres of Corps project lands and waters are managed by the USFWS in cooperation with the States of Illinois and Missouri. This includes the Batchtown Division of the Mark Twain National Wildlife Refuge. The areas managed by these agencies are for fish and wildlife purposes in accordance with the General Plan and Cooperative Agreement. In addition, some of the developed recreation accesses on project lands are leased to and operated by the States of Illinois and Missouri. The Corps also provides public access on Pool 25, primarily on the Missouri Side.

Urban development consists of the farming communities of Winfield, Foley, Elsberry, Annada, and Clarksville in Missouri, and Belleview, Pleasant Hill, Mosier, Hamburg and Batchtown in Illinois. Elsberry, which had a 1995 population of 2,200, is the largest community in the Pool 25 area.

A rail line parallels the river along the foot of the western bluff on the Missouri side of Pool 25. State Highway 79 borders the Pool on the Missouri side and Calhoun County roads and a portion of State Highway 96 borders the Pool on the Illinois side.

### *Pool 26 Land Use*

In Pool 26 (reference *Plate L-26*) the floodplain widens to approximately 5.5 miles near O'Fallon, Missouri. The river is widest near Alton, Illinois, where it is just over one mile wide between vegetated banks. The width is due to the addition of the Illinois River, which measures about one-half mile across at the confluence of the two rivers at Grafton. In comparison, the floodplain produced by the joining of the Mississippi, Illinois, and Missouri Rivers, measures over twelve miles across from bluff to bluff.

In Pool 26, the alluvial floodplain and bordering uplands feature extensive forest and wetland areas. Major land-uses include recreation, agriculture, residential, commercial/industrial, transportation, extractive, and combined urban.

Approximately 60 percent of the alluvial plain of Pool 26 is used for agriculture. The main stem Mississippi portion of Pool 26 is not leveed except for the very lower end of the pool. Woodriver Levee District near Alton, Illinois, provides urban flood protection. Consolidated North Levee District is a large agricultural levee that provides protection from the Missouri River confluence area to the West Alton, Missouri area.

Forest conditions occupy most of the remaining portion of the floodplain. Bottomland forests are found along the riverbanks, on the islands, along streams, around lakes, and in low-lying areas. In general, forest exists in areas too wet to farm.

Lakes and wetlands are present on the floodplain and the Pool islands; however, many have been ditched and drained over the years primarily for agricultural use.

Public lands acquired for the navigation project are primarily confined to low-lying areas on the alluvial plain adjacent to the river and some of the islands in the river. Most of these lands are managed for recreation and stewardship.

In Pool 26, including the lower 15 miles of the Illinois River, there are approximately 18,000 acres of project lands and waters managed for fish and wildlife purposes by USFWS in cooperation with the States of Illinois and Missouri. This includes the Calhoun Division of the Mark Twain National Wildlife Refuge. These project lands were established in accordance with the General Plan with the Corps as authorized by the Fish and Wildlife Coordination Act.

Urban development on the floodplain consists of the Missouri farming communities of West Alton, Portage des Sioux, Orchard Farm, Old Monroe, and Winfield. Metropolitan areas partially on or adjacent to the floodplain in St. Charles County, Missouri, include St. Charles, St. Peters and O'Fallon. Communities on the Illinois side include Alton, East Alton, Godfrey, Elsah, Chautauqua, and Grafton. Numerous cabins and private and commercial marinas are located along the Missouri shoreline between Melvin Price Locks and Dam and the upper reaches of the pool near St. Charles, Missouri. The Illinois side of the river has only two marinas. Route 100 along the river is designated a national scenic byway and features bike trails, scenic views, and quaint towns that are popular with tourists.

Two rail lines, Missouri Highways 79 and 94, and several county roads parallel the pool on the west. The AmerenUE generating plant, located about two miles east of Portage des Sioux, Missouri, is the only commercial/industrial development. State Highway 143 and State Highway 100 (National Scenic Byway) follow the river on the Illinois shore.

### *Lower Illinois River Area Land Use*

The Lower Illinois River portion of Pool 26 flows through an alluvial floodplain averaging 4 miles in width. The river width between vegetated banks is narrow, averaging about one-fourth mile across. This width is not constant where islands exist. The river widens to three-fourths mile across in several places.

Pool 26 influences the lower 80 miles of the Illinois River from Grafton, Illinois, to LaGrange, Illinois. Land use in the Illinois River floodplain, north of Nutwood, is approximately 80 percent agricultural, consisting primarily of cropland. The southern reach of the river from Kampsville downstream features a complex system of lakes, wetlands, and forest that are primarily navigation project acquired lands, and thus very little agriculture occurs on the floodplain.

Bottomland forests and lakes account for more than one-half of the floodplain area south of Nutwood. North of Nutwood, forest is found in narrow corridors along riverbanks, streams, and on the few islands. Large forested tracts occur around Meredosia Lake where the land is low-lying, tends to flood, and is risky to farm. Lakes and wetlands, like forests, are relatively scarce on the floodplain; relatively sizeable lakes and other wetlands occur only from Grafton to the Kampsville area and in the Meredosia area.

Pere Marquette State Park, the largest state park in Illinois, is located on the lower Illinois River, just upstream from Grafton. Numerous river and lake public access sites are located on project lands. Numerous cottage sites leased on project lands are also present.

Development along the Illinois River consists of regularly spaced and moderately sized farming communities and regional centers near the bluff and on the floodplain. Communities at the base of the bluffs include Grafton, Nutwood, Hardin, Spanky, Michael, Eldred, Kampsville, Bluffdale, Hillview, Pearl, Montezuma, Florence, Oxville, Valley City, Chambersburg, and LaGrange. Floodplain communities consist of Hardin, Naples, and Meredosia. Meredosia (pop. 1,100) and Hardin (pop. 1,000) are the largest communities on this reach of the Illinois River. Three rail lines serve the floodplain area. State Highway 100 follows the river from Grafton to Meredosia. River ferries exist near Grafton and Kampsville. River bridges are located in Hardin and near Florence, Valley City and Meredosia.

### *Pool 27 Land Use*

The Corps operates and maintains approximately 3,400 acres of land acquired for the Locks 27 and Chain of Rocks Canal Project (reference *Plate L-27*). The locks and canal project was authorized by Congress in 1945 and construction was completed in 1953. The project is located entirely on the Illinois side of the river across the river from the City of St. Louis and adjacent to Granite City, Illinois.

The canal extends adjacent to the Mississippi River from RM 184 to RM 194.5. The locks facility includes one 1,200-foot main lock chamber and one 600-foot auxiliary lock chamber.

This project is part of the Nine-Foot Channel Project and was designed to bypass a dangerous reach of the Mississippi River in which rock ledges, excessive velocities, and shallow navigation depths constituted

hazards to navigation. Levees are located on each side of the canal, the west canal levee affording protection to the Chouteau Island Drainage and Levee District and the east canal levee forming a component part of the riverfront levee system of the East Side Levee and Sanitary District which protects the valuable industrial/residential urban areas on the floodplain in the Illinois Metropolitan area.

The east side of the canal includes the Tri-City Regional Port District. Granite City, the Melvin Price Support Center Army base and other industrial sites are immediately adjacent to project lands.

The west side of the canal includes Chouteau and Gaberet Islands which are primarily agricultural areas that are protected by levees and a large sanitary landfill. The "green space" afforded by the project is a popular area with residents from the surrounding Metropolitan area. A Madison County sponsored bike trail is developed on the east canal levee area and extends to the project visitor's center at the locks site. The Corps provides public access sites on both sides of the canal and on the Mississippi shoreline for sightseeing and fishing. The State of Illinois operates a Lewis and Clark memorial on project lands on the upstream end of the project. A Lewis and Clark Museum and park is being developed on adjacent lands near the monument site.

Illinois State Highway 3 runs along the east side of the project area. The Interstate 270 Bridge crosses the Mississippi River and the canal over the project at RM 191.

## Open River Land Use

The open river portion of the Mississippi River in the St. Louis District (reference *Plates L-01* and *L-02*) starts below Locks 27 in the St. Louis Metropolitan area (RM 183.2) and is also referred to as the Middle Mississippi River.

The open river generally divides the States of Illinois and Missouri, with isolated pockets of Illinois located adjacent to and contiguous with the state of Missouri and with isolated pockets of Missouri located adjacent to and contiguous with the state of Illinois. This is a result of the rivers' propensity to meander and the choice of the 1839 thalweg (or river channel) to delineate the boundary between the states.

The development of the surrounding land can be generally characterized as rural and agrarian in nature with isolated areas of highly developed industrialized urban pockets. The largest of these is the St. Louis Metropolitan area and the second largest is the Cape Girardeau-Scott City area. The St. Louis area places a great deal of localized pressure on the Mississippi River due to intensive industrial and urban developments and subsequent pollution.

The deforestation and subsequent agricultural use of the surrounding lands has had and continues to have a dramatic impact on the river. Approximately 70 percent of the floodplain is in agricultural use. All of these areas are protected by a very extensive levee and drainage system. Erosion from the agricultural fields is the largest contributor to the silt and sediment carried by the river. Navigation, one of the first uses of the river by humans, continues to increase and to be of extreme importance. The increase in commercial navigation can be directly linked to industrial activities and agricultural development of the basin. After a well-organized commercial transportation system was in place, industrial development began to flourish and add to the increase in commercial navigation. The flood control levee and drainage system have had a dramatic effect by restricting annual flooding (frequency and severity) which, in turn, allows further development of the floodplain.

State Highway 3 in Illinois runs along the length of the Open River. U.S. Highway 61 and Interstate 55 run along the Missouri side. Bridge crossings occur between South County, Missouri and Columbia, Illinois (Jefferson Barracks) and at Chester, Illinois and Cape Girardeau, Missouri.

The Ohio, which doubles the volume of water in the Mississippi River, is the major tributary on the lower end of this stretch.

Other regionally important tributaries within the lower river of the St. Louis District include the Meramec River, Kaskaskia River, and the Big Muddy River with numerous smaller important rivers and creeks.

The major tributaries upstream of this stretch of the river include the Illinois and Missouri Rivers.

## Kaskaskia River Land Use

The geographic location of the Kaskaskia River Navigation Project (KRNP) is on the edge of the St. Louis MSA. The area is primarily rural rolling farmland with forested areas primarily confined to area rivers, streams and other wetlands or steep hilly areas.

There are 36 miles of navigable waterways located in the KRNP located from the confluence of the Mississippi and Kaskaskia rivers north along the Kaskaskia to Fayetteville. Although the navigable portion of the river is short, the potential significance of these miles is heightened because the river flows into the Mississippi, thus providing access to all ports on the U.S. Inland Waterway System and to international deep water ports at Chicago and New Orleans. Therefore, shipment of goods and materials is not limited to KRNP lands or local markets but has the potential for reaching the entPire United States and the world.

The Kaskaskia Regional Port District provides a shipping facility and port on the project and promotes navigation and economic development on the waterway. Location of the Kaskaskia River Navigation Project is south of the most southern lock and dam facility on the Mississippi River

The St. Louis District Corps maintains a 9-foot deep, 225-foot wide channel in the Kaskaskia River during the ice-free season. A lock and dam facility is located on the Kaskaskia north of the confluence of the rivers to maintain the required channel depth on the Lower Kaskaskia. The facility is 600 feet in length and permits a tow of 5 to 6 barges to lock through at one time.

One large consumer, the Baldwin Power Plant, operated by Illinois Power Company, has a water supply contract to remove 36 mgd of water from the Kaskaskia River below Carlyle Reservoir. With one such large water user on the waterway, there is a problem in any additional industry requiring water consumption trying to locate in the area, as 36 mgd is only 4 mgd above the projected 100 year drought event, and most of the 4 mgd is utilized by the municipal water districts already in the area.

The majority of the land within the three counties surrounding the KRNP is classified as agricultural. The majority of farms in the area are classified as general farms since a variety of crops and livestock are raised on any one particular farm. Most of the land in each of the project area counties is in agriculture. St. Clair County has the lowest percentage of land in agriculture, 75 percent, due to its urbanization, while Monroe County has the highest of the three with over 90 percent of its land area in agriculture.

Major field crops produced in the three counties concerned are corn, wheat, and soybeans, followed by hay, oats, and barley.

The project area is accessed by State Highways 3, 154, 13 and 15. River bridge crossings are at Evansville, New Athens and Fayetteville. New Athens is the largest town (pop. 2,000) on the waterway.

### *Kaskaskia River Navigation Project Master Plan*

In the 1970s, the State of Illinois prepared a Master Plan for the KRNP to address the current and future uses and management of the approximately 17,000 acres of acquired lands and waters and associated resources of the navigation project. The plan was approved in 1978 jointly by the key project partners, IDOT, the Corps, Kaskaskia Regional Port District and IDNR.

The outcome of the master planning process resulted in the identification of land use classifications for the project lands and waters. These classifications are listed in *Table 4–48*.

## Lower Missouri River Land Use

The general development of the lands surrounding the lower Missouri

*Table 4-48*
*Land Use Classifications – Kaskaskia River Navigation Project Master Plan*

| **Land acquired by the Corps of Engineers** | |
|---|---|
| Navigation Areas | |
| *Fee* | 433 acres |
| *O&M easement* | 2465 acres |
| *Flowage easement.* | 5593 acres |
| **Lands acquired by the State of Illinois** | |
| Natural Areas | 251 acres |
| Prime Industrial Areas | 670 acres |
| Wildlife/Resource Management Areas | 6297 acres |
| Low Density Recreation Areas | 403 acres |
| Intensive Use Recreation Areas | 222 acres |
| Multiple Use Management Areas | 8674 acres |
| **Total** | **16,975 acres** |

River in St. Charles and St. Louis Counties can be characterized as agricultural in nature, with the exception of the middle third of this reach. The middle third is a highly developed urbanized setting with subdivisions, factories, and commercial landings. The river is used for commercial navigation including gambling boats, tows, and tour boats, recreational boating, fishing, hunting, hiking the shoreline, bluffs and islands, and sight seeing. In addition, a portion of the Katy Trail courses along the river in St. Charles County.

St. Louis County continues to increase in population and St. Charles County ranks among the fastest growing counties in the United States. This continued population growth is placing tremendous pressure on the Missouri River floodplain. In both counties, the issue of green ways and green belts has surfaced as a major initiative to protect and enjoy the river. St. Charles County is better organized in this effort and appears to have the backing of the general public, business and the political establishment.

# 4.11.ECOLOGICAL RESOURCES

## Introduction

The Rivers Project region is comprised of two primary biotic environments, the impounded slackwater navigation pools and the open or unimpounded river and their respective floodplains. Over the last 100 years—and more specifically within the last 50 years—logging,

agricultural and urban developments and the structures, facilities and maintenance activities used to facilitate navigation and to protect urban and agricultural areas from flooding, have significantly affected fish and wildlife habitats and the natural ecological processes of the rivers and their floodplains. While these human impacts continue today, much is being done to minimize on-going impacts and restore and sustain the rivers ecological health while continuing to reap its socio-economic benefits. This section provides an existing condition overview of the ecological resources associated with the rivers.

## Large River and Floodplain Ecology Overview

Today's gently rolling agricultural landscape of the Upper Mississippi River basin is the result of intricate sculpting by massive glaciers during the Ice Ages. Blocks of ice scoured and filled the consolidated and semi-consolidated sedimentary bedrock of the valley, which consisted mostly of limestone, sandstone, and shale. Precambrian rocks underlie much of the present surface material, forming a basin in which many types of sediment occur.

A drier climatic period with strong winds followed the retreat of the glaciers, depositing fertile silt (loess) on top of the glacial drift that the sliding ice islands dropped as they melted. These silt deposits gave rise to the hilly prairies through which the Mississippi cuts its course. The river flows within a floodplain averaging from one to ten miles wide bordered by wooded hills and bluffs. In the Upper River, steep bluffs constrict the watercourse in many areas and the elevation drop from upstream to downstream is significant. Like many large rivers, the Mississippi's lower portion is prone to meander slowly and aimlessly through a broad and worn-down floodplain with little elevation drop. The streambed material is composed of reworked glacial deposits, modern sands, and gravel. In many areas, bedrock lies deep beneath the alluvial streambeds and the river drifts over as much as 200 feet of sand and gravel. In other areas, the bedrock is shallow and/or exposed.

The river molded the physiography and land forms which form the morphological setting for the ecosystem. Broad floodplains with gravel terraces, oxbow lakes, backwater areas, and periodically flooded bottom-land forests characterizes the valley ecosystem of this large alluvial river. The river affects and directs the dynamics of the ecosystem.

A river's floodpulse or natural river hydrograph, refers to the entire annual cycle of the water level, from low flow to flood crest and back to the low elevation (Junk et al. 1989). The annual flood pulse in the river valley controls the composition of the floral and faunal communities and recharges the floodplain with water, nutrients and sediments. In return, riparian communities donate nutrients to the river in the form of organic matter.

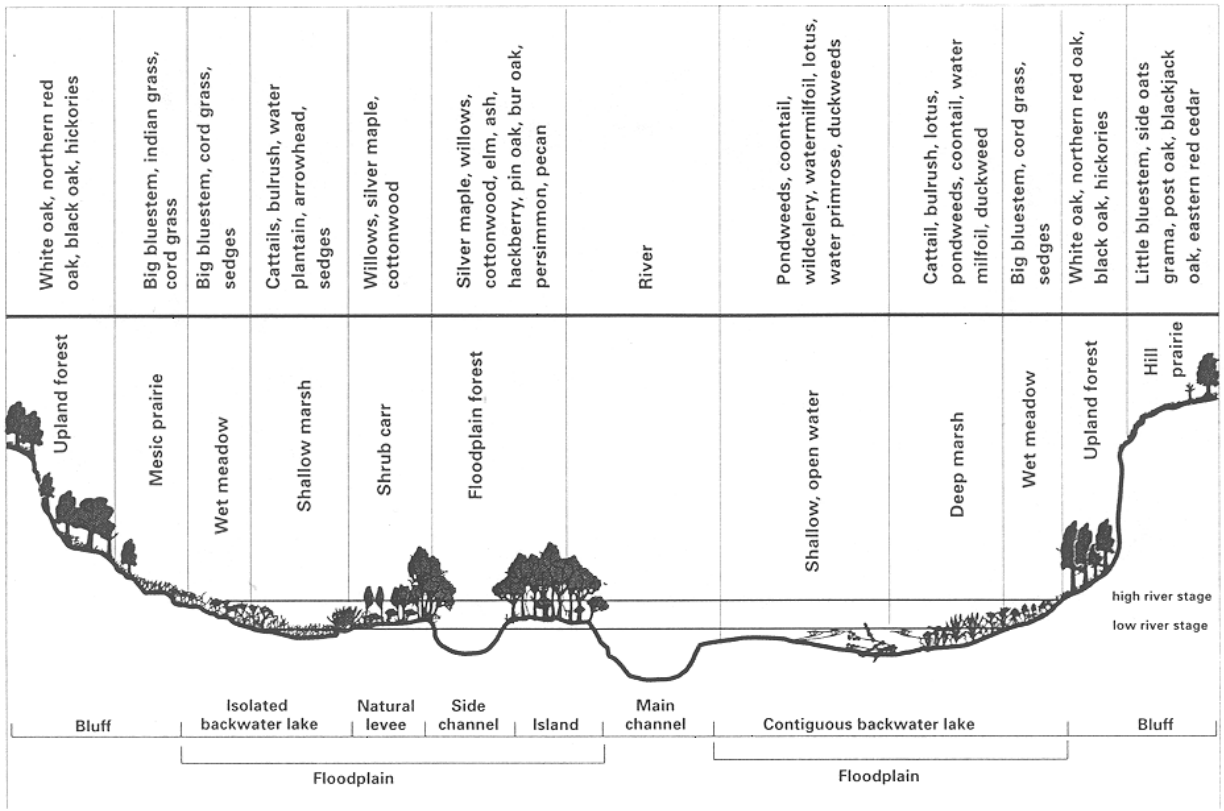
There may be more than one flood per year. During great floods, the floodplains do not merely store water, they become part of the flowing river itself, conveying water slowly downstream through the forests and Marshes. Over millennia, plant and animal species have adapted to exploit, tolerate or escape seasonal floodpulses. Exceptional great floods and droughts further create habitat and species diversity as well.

Riparian ecosystems are those natural associations of soil, flora, and fauna existing within the 100-year floodplain of a river and dependent for their survival on sufficiently high water tables and/or periodic flooding,

The riparian vegetational zones or types are directly related to elevations from the river, and to the frequency, duration, and depth of flooding.

Riparian communities are among the most diverse and productive on earth. Riparian ecosystems also provide habitat for animal species that

*Figure 4 – 49*
*Hypothetical Floodplain Cross Section Illustrating the Habitat Types likely to occur on the Upper Mississippi River System*




Source: John C. Nelson, Illinois Natural History Survey, Great Rivers Field Station, Alton, Illinois

use uplands; riparian zones depend on and fortify riverine environments. Therefore, they are inextricably linked to their neighboring ecosystems, and, because life on earth is one web of energy and matter exchanges, they are linked to all ecosystems.

The process of sediment deposition makes it possible for most riparian communities to include a primary succession component. The new soil is colonized by plants such as silver maple, cottonwood, willow, and, depending on location, other species that can survive in unstable substrates, stabilizing them for species characteristic of more mature seral, or successional, stages

Seedlings of cottonwood and willow need direct sunlight and are eventually shaded out by their parent trees. The closing of a cottonwood-willow canopy on the Mississippi River gives a competitive advantage to such species such as silver maple, green ash, river birch, box elder, mulberry, and elm. Underneath the forest canopy dense webs of poison ivy, trumpet vine, grape, bur cucumber, and wood nettle take the place of their shade-intolerant predecessors. On low, excessively moist sites, succession often stops at the silver maple or willow stage. In areas of the floodplain where sediment accumulation has raised the site, thus improving drainage and providing a drier, terrace with stable substrate, American elm, sycamore, white ash, hickory, pin oak, black walnut, river birch, box elder, bur oak, and pecan prevail. Here the understory may contain persimmon, red-osier dogwood, flowering dogwood, redbud, hackberry, black cherry, mulberry and tall paw-paw in an intermediate canopy that is usually absent in pioneer communities. The ground cover

typically contains such species as poison ivy, bur cucumber and wood nettle to name a few.

The fauna of the riparian ecosystem are also related to water levels and floodpulsing and to water surface area losses due to natural and human-induced sedimentation.

A wide variety of wildlife thrive in the unique ecological conditions of riverine forests and wetlands. Riparian ecosystems in their natural state provide many basic wildlife needs, such as early seral vegetation for foraging, water for drinking, and lush growth for hiding and nesting cover. Amphibians require a land-water interface to pass from larval to adult form. Aquatic furbearers, such as beavers, river otters, minks, and muskrats, require a healthy bank habitat to survive. Many unique floodplain habitat types harbor rare animal species that are highly dependent on one specific type of habitat. Bottomland hardwood forests, for example, provide irreplaceable habitat for gars, bowfins, and several turtle species that have changed little since prehistoric times.

There is also abundant and variable birdlife. Several species may be found at the extremes of their ranges, due to the mid-continental location, the climatic conditions of the sheltered valley, the merging of life zones, and overlapping species ranges.

In summary, the flood-adapted animals and plants, the seasonal floodpulses and infrequent great floods and droughts, the river and its channel, and the complex patchwork of floodplain habitats, together, constitute the dynamic and phenomenally productive river/floodplain ecosystem (Junk et al. 1989, Sparks 1995).

## Major Habitat Descriptions

### *The Aquatic Environment*

Aquatic habitat in the pooled portion of the Mississippi River has been defined and classified for the purpose of scientific study and fishery management (Sternberg, 1971). Six separate habitat types have been identified; these are: (1) main channel, (2) main channel border, (3) tailwaters, (4) side channels, (5) river lakes and ponds, and (6) sloughs. (See *Figure 4 - 50)* Approximately 100 species of fish and 30 mussel species are known to inhabit the project area waters.

#### Main Channel Habitat

The main channel habitat includes the 300-foot wide, 9-foot deep navigation channel and areas riverward of the ends of wing dikes. A current always exists, varying in velocity with water stages. Bottom type is usually a function of current. Sand predominates in the upper pools and sand over silt in the lower reaches. Rooted and floating vegetation is absent. Phytoplankton diversity is low. Of the six habitat types, the main channel supports the fewest number of fish and other aquatic organisms. Channel catfish, flathead catfish, sturgeon, drum, white bass, species of buffalo fish, paddlefish, shortnosed gars, mooneye, gizzard shad, and redhorse as well as some mussels are normally found in this habitat. Near the upper end of the pool, walleye and sauger are found.

#### Main Channel Border

The main channel border lies between the ends of wing dikes and the main river bank, islands or submerged parts of the old main river channel. The area may be thought of as being part of the main channel, but for fishery purposes is considered as separate habitat. Banks are frequently rip-rapped. Phytoplankton and zooplankton diversity is low and most concentrated near shoreline areas. Dredged material has been placed in some sections of this zone, sometimes covering wing dikes. The bottom is mostly sand in the upper sections of pools and silt in lower

reaches. Little or no aquatic rooted, floating or emergent vegetation is generally present, although efforts such as EPM are increasing vegetation in these areas. Mussel beds are often found in the main channel border. Channel catfish, white bass, carp, freshwater drum, paddlefish, sturgeon, flathead catfish, sauger and walleye are part of this habitat. Forage fish are generally abundant. This habitat accounts for approximately 25 percent of aquatic habitat types in the Rivers Project area.

### Tailwater Habitat

The tailwater habitat includes the area immediately downstream of dams. Turbulence from the passage of water through the gates of the dam characterize the habitat. Bottom conditions are rocky and devoid of rooted or attached aquatic vegetation. This highly aerated water attracts an abundance of forage fish and such predatory species as walleye, sauger, white bass, and catfish. The downstream boundaries for defining the tailwater fishery habitat have been set a distance of one-half mile below the dam.

### Side Channels

The side channels are off the main channel and main channel border and have a sustained current during normal river stages. These habitats vary in length from a few hundred yards to several miles, and in width as well as volume of flow. They are also sometimes called sloughs, running sloughs, chutes, cuts, cutoffs, and canals. Unless they are former main channel, the banks are usually unprotected. Undercut or eroded banks are common near their departure from the main channel. Closing structures or diversion dams are frequently present. The bottom type usually varies from sand at the upper reaches to silt in the lower. Rooted aquatic vegetation is absent in the swifter current, but may be common in shallower areas with silty bottoms. The habitat supports a diverse number of species such as channel catfish, sauger, drum, black bass, crappie, sunfish, carp, paddlefish, whitefish and buffalo spp. This diminishing habitat has been identified as one of the highest value fisheries in the study area.

### River Lakes and Ponds

River lakes and ponds are expanses of shallow water, normally having little or no flow. These habitats may or may not be connected with other water bodies. Bottoms are composed of muck or silt. Heavy growths of aquatic vegetation are normally present. Bullheads, carp, crappie and bowfin are a few of the many species of fish generally associated with this habitat. This habitat is heavily used by aquatic furbearers and waterfowl and other aquatic dependent waterbirds.

### Sloughs

Sloughs are similar to lake or pond habitat, except that they are relatively narrow branches or offshoots of other water bodies. They are characterized by their lack of current at normal water stages, muck bottoms, and abundance of submerged and emergent vegetation. Sloughs, and some of the ponds and smaller lakes in the floodplain, are representative of ecological succession taking place in the river bottoms. Catfish, buffalo, carp, and members of the sunfish family inhabit these areas. They are also heavily used by waterfowl, aquatic furbearers, reptiles and amphibians.

In general, backwater habitats, including river lakes, ponds, and sloughs, are characterized by having no current at normal water stage and muck bottoms. Sloughs generally have an abundance of aquatic vegetation. The species diversity and density of aquatic macrophytes, phytoplankton, zooplankton, benthic fauna, and fish are usually higher in backwater areas than in main channel habitats. These habitats are

critical for fish because they provide favorable spawning and nursery conditions which are scarce on the main channel areas.

### Open River

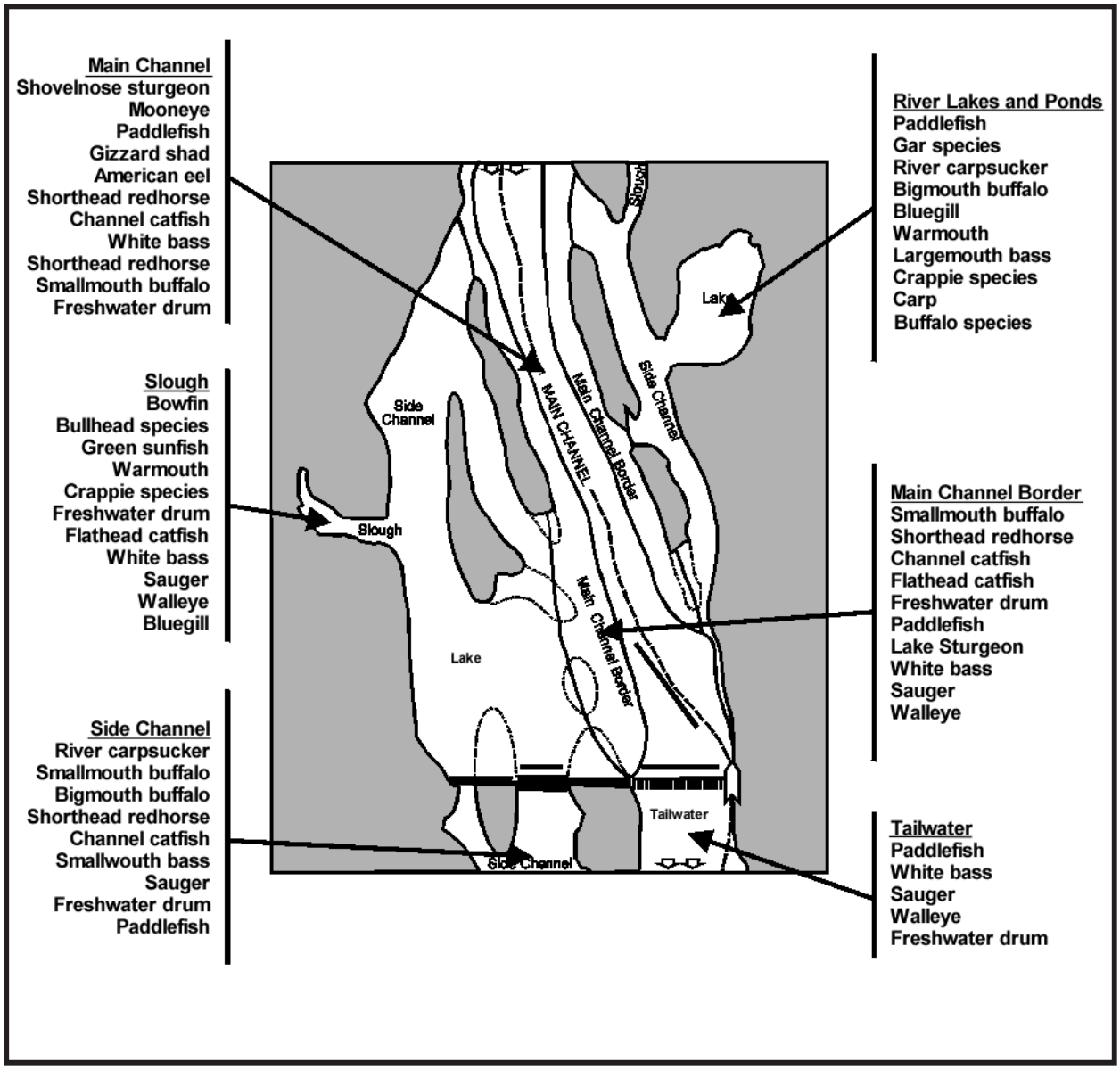
The Open River reach of the Mississippi River is lined with revetments, dikes and bendway weirs to provide the navigation channel. This reach is characterized by 23 existing side channels and other non-channel areas. These off-channel areas of high biological productivity constitute less than 5 percent of the total area today.

The open river differs substantially from the pooled segment of the river primarily because of: (1) higher currents, (2) greater water level fluctuations, (3) Increased turbidity and (4) different methods are used to maintain the navigation channel.

The open Mississippi River supports a diverse fish fauna. Over 100 species of fishes in the open river have been documented.

*Table 4 – 50*

*Species of Fish Found in Specific Aquatic Habitats*



Approximately 20 fish species may be classified as sport fish and 25 species are classified as commercial fish. Twenty species are cited as common to moderately common near the mouth of the Ohio River but relatively rare upstream from there. Eleven species are considered rare to extremely rare throughout the Open Mississippi River. The majority of the fish (Approximately 45 species) are of widespread or sporadic distribution with intermediate levels of abundance. In general, however, most species found in the open river are found in the pooled river. Unique open river species include sturgeon chub, sicklefin chub and pallid sturgeon.

#### Kaskaskia River

Approximately 100 species of fish are known to inhabit the Kaskaskia River and are evidence of the large number and variety of habitats along various portions of the river. Aquatic habitats along the channelized portion of the river include deep pools in the channel itself plus area off the main channel such as swamps, tributaries, and oxbows. These areas provide fish cover in the form of logs, exposed tree roots, fallen trees and sand-gravel riffles and pools. Conditions of the river itself are representative of a mid-western prairie stream, having a low stream gradient, turbid water, and a bottom of mud, clay, silt, or shifting sands (Yarbrough, et al, 1974).

Inhabitants of the channelized portion of the river include carp, crappie, bass, catfish, gizzard shad, and an occasional walleye.

### *The Terrestrial Environment*

Bottomland forest cover is most typical habitat type of the riparian borders and islands of the Rivers. Scattered permanent, seasonal, and ephemeral wetlands are also found on the floodplain proper. Many of these habitats provide highly productive food and cover vegetation used by a variety of wildlife species. More than 400 species of vertebrate animals other than fish, have been recorded utilizing the river and floodplain related habitats. The species and sub-species are composed of approximately 50 mammals, 300 birds and 80 reptiles and amphibians.

The five major habitat types that occur on the floodplain are: (1) sand bars and mud flats, (2) open wetlands, (3) old fields, (4) agricultural fields, and (5) floodplain forests.

#### Sandbars and Mud Flats

Sandbars and mud flats are found along shores where receding water levels have left flat exposed areas. They are also found behind dikes where deposition results in sandbars, downstream of locks and dams, and in the river where deposition has resulted in semi-permanent or permanent islands. Vegetation cover is generally herbaceous consisting of annual grasses, composites, and sedges. Willow, cottonwood, sycamore, and silver maple seedlings may be found. This habitat is subject to frequent inundation which often limits vegetation. Sandbars and mud flats comprise a very important habitat. It provides food and resting areas for shore birds, several species of reptiles and amphibians and mammals such as opossum, raccoon, muskrat, beaver, mink, otter and deer.

#### Open Wetlands

Open wetland areas include drainage ditches, lakes, ponds, marshes, hydric prairies and sloughs found in the project area. Water levels fluctuate in these areas, causing the presence of water-tolerant vegetation. Abundant edge habitat is available because backwater areas characteristically interrupt other types of habitat. Vegetation cover is

primarily a herbaceous layer comprised of arrowheads, millets, smartweeds, lotus, rushes and other hydric and semi-aquatic plants; the drier backwater areas support grasses, sedges, and shrub and tree seedlings. Seasonal floods frequently control vegetation types and abundances. Mammals present include muskrat, mink, raccoon, white-tail deer, otter and beaver. More than 140 species of birds, predominantly waterfowl, swimming, diving, wading, and shore birds use this habitat. A large variety of amphibians and reptiles, including salamanders, toads, frogs, turtles and snakes, thrive in these areas as well.

### Old Field and Disturbed Areas

Old Fields are generally abandoned, cultivated fields. Disturbed areas include similar habitats resulting from disruption including levees, roadsides, and other natural and constructed disturbances. The vegetation, such as weedy herbs, grasses, woody vines, shrubs, and tree saplings, is generally herbaceous. This habit is well-suited for small mammals, including eastern cottontail rabbit, skunk, opossum, fox squirrel, raccoon, and deer. Numerous birds, including several rare species, utilize the food and nesting resources of the old fields. Game birds include quail, ring-necked pheasant, woodcock, turkey and mourning dove. Reptiles and amphibians also use this habitat for food and cover.

### Cultivated Fields

Cultivated fields have little vegetational diversity. They consist predominantly of corn, soybeans, or wheat on the floodplain. Mammals that utilize this habitat include mice, pocket gophers, woodchucks, Norway rats, coyotes, red foxes, deer and skunks. Numerous shore birds and waterfowl species forage in these areas.

### Floodplain Forests

Common floodplain forests are a predominant habitat type in the river-associated ecosystem. They are generally confined to unprotected areas outside levees and to low and poorly drained areas behind levees. Bottomland forest associations often lack abundant ground cover, due to frequent flooding and deposition of alluvial material and debris. Therefore, small mammal ground dwellers are not encountered frequently in this habitat. Mammals found in the floodplain forest include opossum, fox squirrel, white-footed mouse, raccoon, coyote, gray squirrel, and white-tailed deer. Raccoon and deer prefer the edge habitat. More than 140 species of birds can potentially be found in the floodplain forest throughout the year. These areas are important for wood duck nesting. Numerous species of reptiles and amphibians also utilize floodplain forests.

## Floodplain Forest Communities

Floodplain forest communities that occur within the Rivers Project Area are described briefly below:

### *Willow Community*

Willow communities occur as narrow bands along river banks and sloughs. This important pioneering community also invades the sandy, frequently inundated ends of growing islands. Establishment of the willows increases deposition and extends sandy islands. Principal species are black willow (*Salix nigra*), sandbar willow (*Salix interior*), and rigid willow (*Salix rigida*). As these dense stands mature, they are generally replaced by cottonwood and silver maple.

### *Silver Maple-Cottonwood Community*

This community is the most extensive community along the Mississippi River and often occurs on the landward side of the willow bands and along sloughs. Although less flood tolerant than the willow community, it can withstand annual flooding and develops best on an unprotected floodplain. Silver maple (*Acer saccharinum*) dominates (75 percent), with cottonwood (*Populus deltoides*) as a principal species. Also, found in this community are Elm, willow, pecan, box elder, and ash. Ground cover is sparse. Pin oak sometimes occurs as a co-dominant with silver maple; such stands are designated as Silver Maple-Cottonwood-Pin Oak Communities.

### *Silver Maple-Cottonwood-Pin Oak Community*

This community is similar to the silver maple-cottonwood community; pin oak and silver maple are co-dominant. These forests are located primarily along the Mississippi River in areas bordering the silver maple-cottonwood community and the pin oak community.

### *Pin Oak Community*

Pin oak forests are most common on the protected (usually leveed) floodplain, but may occur in areas regularly subject to flooding. Species diversity is good, probably reflecting the more mesic conditions, and dominance is shared by several species. Species include pin oak (*Quercus palustris*), silver maple, pecan, deciduous holly, sugarberry, ash, Elm, red mulberry, and many other species.

### *Oak-Hickory Community*

The few small forested areas on Pleistocene river terraces, north of the confluence of the Illinois and Mississippi Rivers, consist of the Oak-Hickory Community. Species composition is not similar to the typical upland oak-hickory forests of the Midwest. Similar forests have not previously been described. Six species of oak and two species of hickory are found in this community; associated species include slippery elm, hawthorn, deciduous holly, and black walnut.

### *Cypress-Tupelo-Ash Community*

The Cypress-Tupelo-Ash community is a rare plant association that occurs in remnant oxbow lakes only in deep southwestern Illinois and southeastern Missouri. The trees are adapted to grow inundated in shallow water throughout most or all of the growing season. The dominant species are bald cypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), green ash (*Fraxinus pennsylvanicus*) and sweet gum (*Liquidambar styraciflua*).

## Waterfowl and Other Migratory Birds

### *Waterfowl Management*

The key purpose for the General Plan-Cooperative Agreement lands and waters addressed in this Master Plan is to sustain migratory bird populations. These lands and waters are also North American Waterfowl Management Plan (NAWMP) designated areas.

The Mississippi River is a migratory flight corridor for approximately 40 percent of all North American waterfowl and other migratory bird species. Common puddleducks using the flyway include mallard, wood ducks, green and blue-winged teal, pintail, gadwall, widgeon and shoveler. Common diving ducks include the lesser scaup, ringneck, bufflehead, goldeneye, canvasback, redhead and merganser. Canadian, snow and blue geese winter in the area as well. The importance of this area is highlighted by the NAWMP's designation of the Upper Mississippi

River as one of the waterfowl habitat areas of major concern in the U.S. Since 1970, trend analysis data shows a decreasing trend nationwide for waterfowl populations in general, and also specifically for mallards, the most abundant duck in the Mississippi flyway. The Upper Mississippi River is one of the most important areas for this species. The major factor attributed to this decline is deterioration of northern breeding grounds. However, habitat loss is also a concern in areas used by waterfowl for resting and feeding during migration and for wintering. Waterfowl are physically stressed during migration periods, and the effects of habitat loss and degradation or disease outbreaks in migration corridors is significant. Many areas, historically used by migrating waterfowl have been lost to agriculture, and other land and water uses and the quality of much of the remaining habitat has decreased substantially. The aim of the NAWMP is to ensure the preservation of enough high quality waterfowl habitat to sustain waterfowl populations at levels for a fall flight of more than 100 million ducks (i.e., the 1970 level). For the mallard, the goal is to return to 1970-1979 population levels (or approximately 15 million birds in the fall flight).

During the fall, moist soil plants provide a significant portion of the diet for many species of migrating and residential waterfowl in the region. These plants start from seed (artificially or naturally) on exposed mud flats during the summer, but must become subsequently inundated by 0.5 to 1.5 feet of water in the fall, which enables waterfowl to feed upon the seeds produced. Moist soil plants are especially sensitive to water levels during early growth when inundation can drown them. When water levels are dropped in the fall, as a result of navigation pool operations, the moist soil plants may be left stranded on mud flats. These plants then become inaccessible to waterfowl. To avoid this problem, many private hunting clubs and public agencies such as the Corps, USFWS, and state conservation agencies have built low levees adjacent to the pools to artificially control water levels to produce river conditions that are favorable for waterfowl use. These areas are not affected by normal fluctuations in river stage unless the levee is overtopped by flooding. Other important foods for migrating waterfowl include submerged aquatic plants, numerous species of aquatic invertebrates and fingernail clams (which are an important food source for diving ducks). Animal food sources are especially important to waterfowl during spring migration.

The spatial arrangement of project lands and their habitat conditions exert a strong influence on waterfowl numbers and distribution within the region. A large number of waterfowl use federal lands and waters administered by the Corps and the USFWS as wintering grounds or for resting and feeding during migration.

Pool 24 contains the USFWS Delair Refuge. MDC manages the Clarksville Refuge as well as Pharrs Island and Ted Shanks Conservation areas.

Pool 25 contains two federal refuges, Clarence Cannon adjacent to project lands in Missouri, and Batchtown Refuge on project lands and waters in Illinois. A number of Missouri and Illinois managed public hunting areas and private hunting areas also exist in Pool 25.

Pool 26 contains four federal refuges: USFWS managed Gilbert Lake Refuge; Calhoun (Swan Lake); Portage Islands and the Corps managed Ellis Bay Area. Godar Refuge, a state managed refuge is located on the Illinois River. Additionally, there are a number of Illinois and Missouri managed public hunting areas. There are also many well-managed private clubs that provide hunting opportunities and protect excellent waterfowl habitat that might otherwise be destroyed.

*Table 4–51*
*Peak numbers of mallards 1948-1996*

| Year | Illinois River | Central Mississippi River |
|---|---|---|
| **1948** | 1,617,575 | 181,405 |
| **1949** | 1,474,565 | 352,500 |
| **1950** | 1,403,425 | 157,245 |
| **1951** | 728,725 | 320,400 |
| **1952** | 1,029,075 | 463,200 |
| **1953** | 1,408,925 | 582,950 |
| **1954** | 1,362,600 | 600,300 |
| **1955** | 1,556,200 | 848,650 |
| **1956** | 1,200,495 | 612,350 |
| **1957** | 1,286,650 | 421,800 |
| **1958** | 663,720 | 421,850 |
| **1959** | 547,990 | 289,880 |
| **1960** | 593,420 | 470,850 |
| **1961** | 374,780 | 215,775 |
| **1962** | 538,150 | 274,850 |
| **1963** | 692,435 | 529,950 |
| **1964** | 507,900 | 822,300 |
| **1965** | 606,885 | 549,200 |
| **1966** | 853,970 | 339,625 |
| **1967** | 1,005,605 | 385,815 |
| **1968** | 564,550 | 595,075 |
| **1969** | 788,720 | 723,200 |
| **1970** | 944,690 | 717,050 |
| **1971** | 478,775 | 419,090 |
| **1972** | 577,830 | 333,045 |
| **1973** | 491,005 | 237,075 |
| **1974** | 415,535 | 288,365 |
| **1975** | 876,665 | 561,630 |
| **1976** | 676,105 | 513,630 |
| **1977** | 909,180 | 749,500 |
| **1978** | 1,252,800 | 1,080,265 |
| **1979** | 945,620 | 706,325 |
| **1980** | 413,235 | 260,645 |
| **1981** | 444,640 | 342,040 |
| **1982** | 326,325 | 278,990 |
| **1983** | 307,565 | 212,195 |
| **1984** | 259,465 | 155,510 |
| **1985** | 484,895 | 234,725 |
| **1986** | 328,930 | 193,270 |
| **1987** | 404,715 | 221,665 |
| **1988** | 344,735 | 171,470 |
| **1989** | 435,305 | 193,905 |
| **1990** | 272,775 | 229,370 |
| **1991** | 474,075 | 230,295 |
| **1992** | 246,605 | 171,225 |
| **1993** | 143,430 | 45,600 |
| **1994** | 590,650 | 175,300 |
| **1995** | 314,350 | 114,800 |
| **1996** | 159,320 | 114,225 |

## *Waterfowl Use*

The numbers and distribution of waterfowl passing through the region each fall vary among years and are influenced by weather conditions on the staging areas to the north as well as locally and the food and water conditions on traditional migration areas. Years of the grand passages through the flyway are exceptions, but they do occur as they did in 1955, 1956, 1957 and 1995.

The ability to monitor populations and habitat conditions on the breeding, migration and wintering areas is essential to the management of the waterfowl resource. The numbers of ducks and wetlands inventoried on the northern breeding grounds in May are critical factors in determining hunting season regulations in the ensuing fall. Monitoring populations and their distribution within states is also important for identifying critical areas of waterfowl concentrations and the habitats that support them. The current loss of approximately 90 percent of the natural wetlands in Illinois and Missouri requires that intense and flexible management strategies be implemented to sustain the waterfowl resource.

*Table 4-51* shows the peak number of mallards inventoried each fall in the Illinois and Central Mississippi River Regions.

*Figure 4-52* shows the three-year moving average of the peak numbers of mallards aerially inventoried during fall in the Illinois River and the central Mississippi River regions, 1948-1996. A five-year moving average is the average of the peak number for a specific year and the two previous years and is used to minimize annual fluctuations and to emphasize long-term trends.

*Table 4-53* shows the highest biweekly averages in fall and spring of the numbers for each species of waterfowl inventoried throughout Illinois and the percentage that this average represents of the sum of biweekly averages for a given species from September-April, 1972-1985.

*Figure 4-52 – Fall Inventory, Mallards 1948-1996*

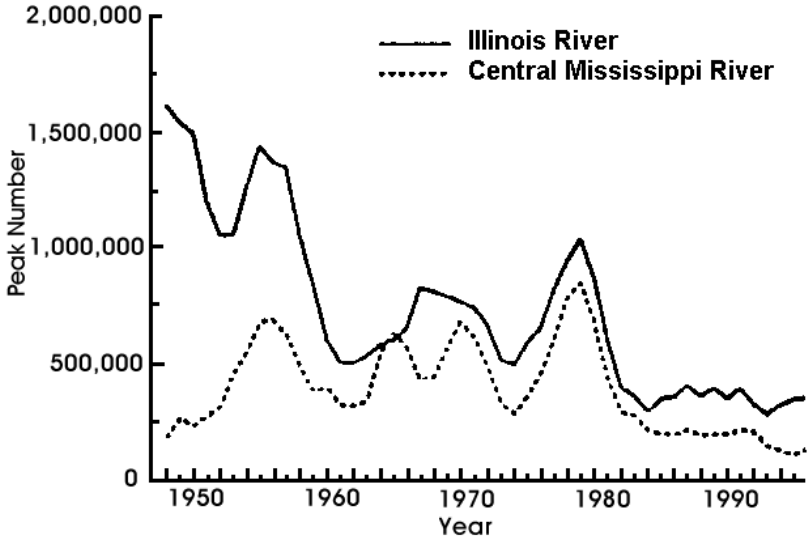



*Table 4-53*
*Highest Biweekly Averages for Waterfowl 1972-1985*

| | FALL | | | SPRING | | |
|---|---|---|---|---|---|---|
| Species | Highest average number | Biweekly period | Percent of entire period | Highest average number | Biweekly period | Percent of entire period |
| **Mallard** | 1,129,386 | 11/10-11/23 | 20 | 486,759 | 03/14-03/27 | 9 |
| **American black duck** | 26,254 | 11/24-12/07 | 19 | 12,247 | 03/14-03/27 | 9 |
| **Northern pintall** | 75,082 | 10/27-11/09 | 22 | 59,235 | 03/14-03/27 | 17 |
| **Blue-winged teal** | 47,925 | 09/01-09/14 | 28 | 29,516 | 04/11-04/24 | 17 |
| **Green-winged teal** | 23,211 | 10/13-10/26 | 19 | 13,144 | 03/28-04/10 | 11 |
| **American widgeon** | 110,666 | 10/27-11/09 | 20 | 120,643 | 03/14-03/27 | 22 |
| **Gadwall** | 8,086 | 10/27-11/09 | 15 | 10,003 | 03/14-03/27 | 19 |
| **Northern shoveler** | 1,879 | 10/13-10/26 | 3 | 21,195 | 04/11-04/24 | 33 |
| **All dabbling ducks** | 1,290,776 | 11/10-11/23 | 18 | 735,672 | 03/14-03/27 | 11 |
| **Lesser scaup** | 230,011 | 10/27-11/09 | 20 | 273,934 | 03/14-03/27 | 23 |
| **Ring-necked duck** | 41,822 | 10/27-11/09 | 14 | 86,291 | 03/14-03/27 | 29 |
| **Canvasback** | 77,509 | 11/10-11/23 | 14 | 118,737 | 03/14-03/27 | 22 |
| **Redhead** | 5,937 | 11/10-11/23 | 9 | 17,907 | 03/14-03/27 | 28 |
| **Ruddy Duck** | 3,582 | 10/27-11/09 | 15 | 4,113 | 03/14-03/27 | 17 |
| **Common goldeneye** | 32,496 | 12/08-12/31 | 14 | 38,995 | 02/15-02/28 | 17 |
| **All diving ducks** | 337,459 | 10/27-11/09 | 14 | 356,085 | 03/14-03/27 | 23 |
| **Common merganser** | 11,957 | 12/08-12/31 | 16 | 10,713 | 02/15-02/28 | 15 |
| **All Ducks** | 1,623,964 | 11/10-11/23 | 17 | 1,282,742 | 03/14-03/27 | 14 |
| **Canada goose** | 55,409 | 12/08-12/31 | 7 | 161,478 | 02/15-02/28 | 19 |
| **Lesser snow goose** | 25,424 | 10/27-11/09 | 17 | 21,611 | 03/14-03/27 | 14 |
| **American coot** | 400,010 | 10/13-10/26 | 24 | 235,944 | 03/14-03/27 | 14 |

*Figure 4-54 – Average Numbers of Mallards **

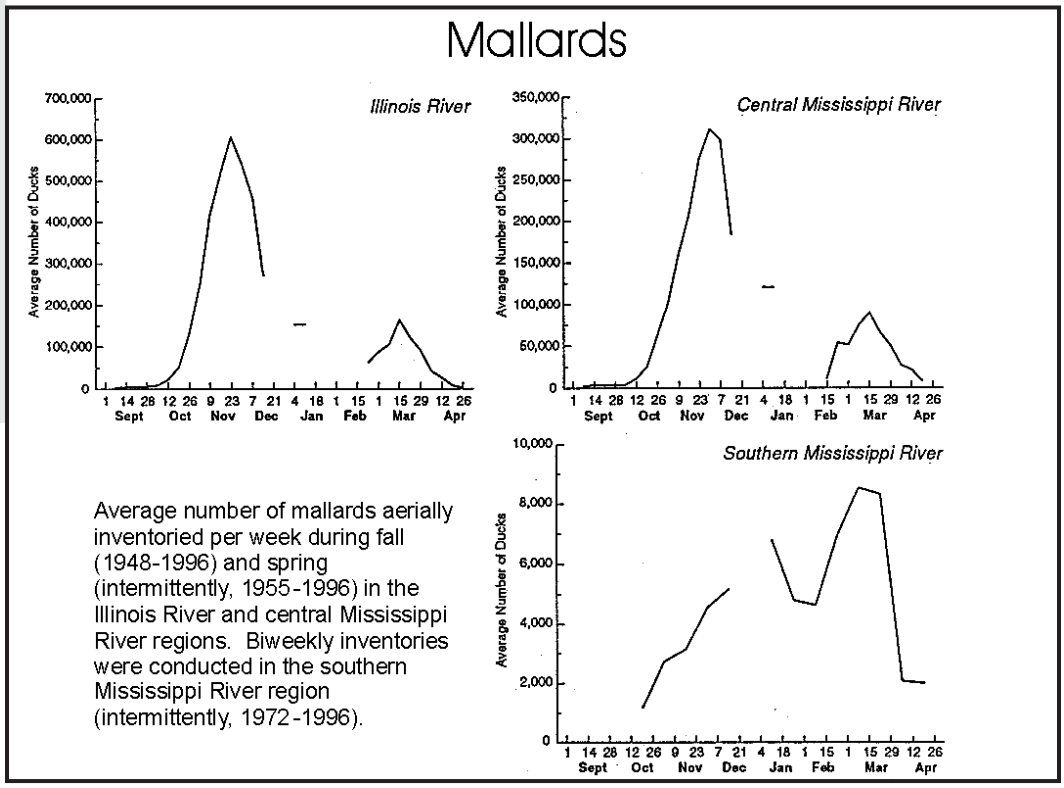



*Figure 4-55 – Average Number, All Ducks **

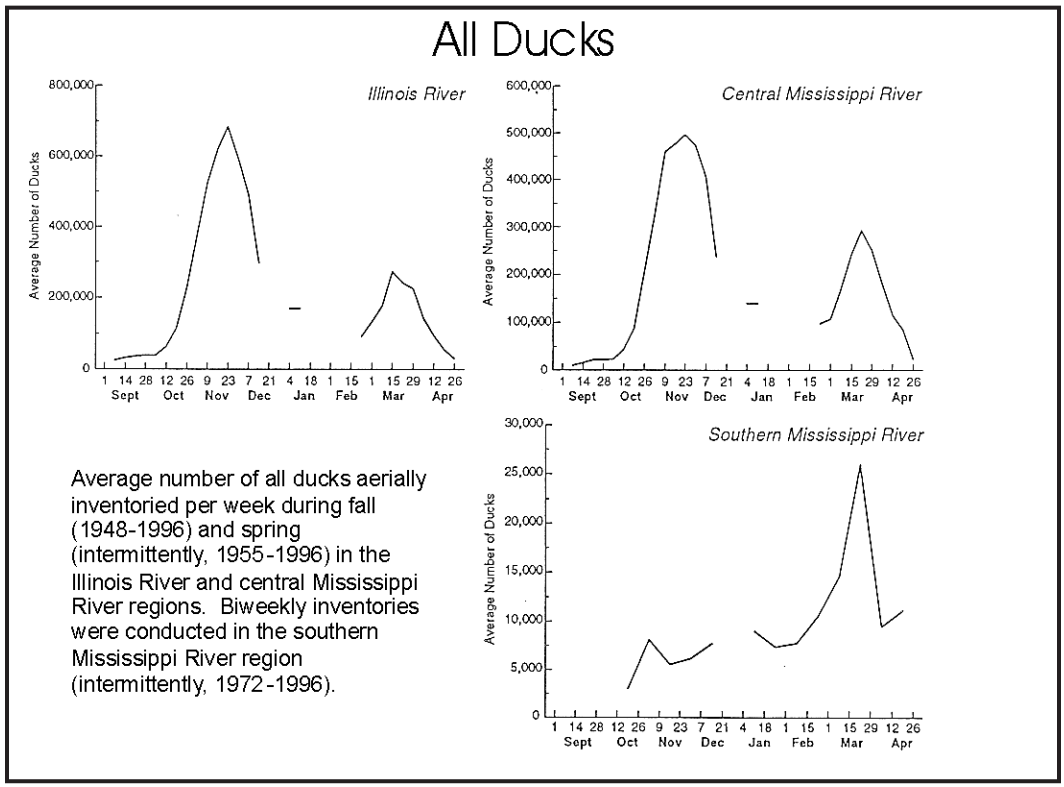
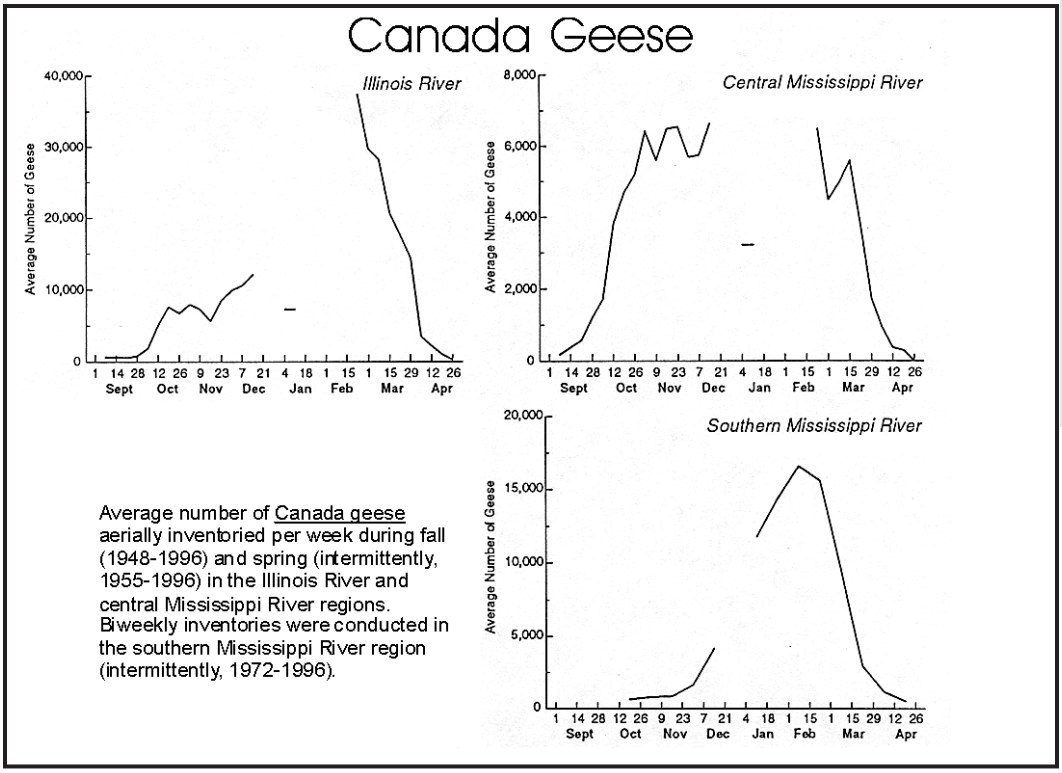


*Figure 4-56 – Average Number of Canada Geese **




* Source for Waterfowl Data: Havera, S.P. 1998. Waterfowl of Illinois: Status and Management. Illinois Natural History Survey Publication No. 22, Champaign, Illinois.

## *Geographical Definitions for Waterfowl Survey Data*

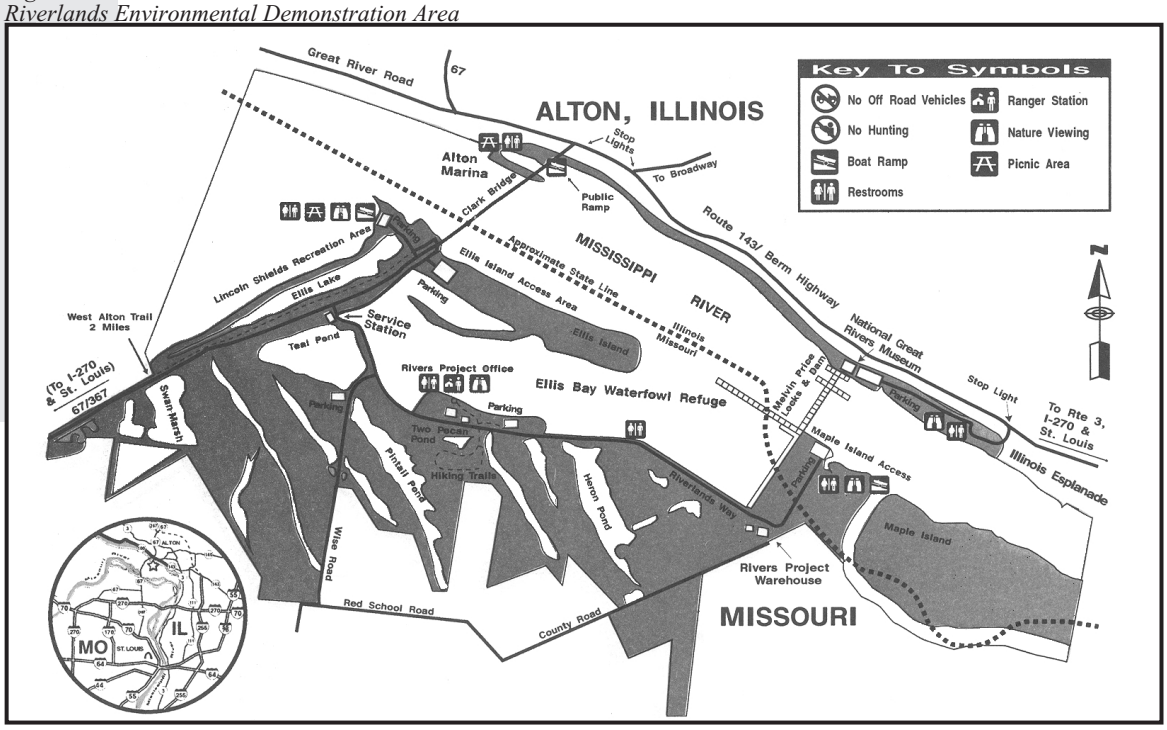
*Tables 4–51 and 4–53, Figure 4–52, and Figures 4–54* through *4–56* refer to the following geographical areas:

1. Illinois River. Flyway from Spring Valley to Meredosia, Illinois.

2. Central Mississippi. From Keokuk, Iowa to Alton, Illinois on the Mississippi and from Kampsville to Grafton, Illinois, on the Illinois River.

3. Southern Mississippi. From St. Louis, Missouri, to Cairo, Illinois.

*Figure 4 - 57*
*Riverlands Environmental Demonstration Area*




## Other Migratory Birds

The diversity and abundance of migratory birds throughout the Rivers Project region is of national and international significance and many natural resource management activities along the river corridor are dedicated to protecting and sustaining these species.

A general discussion on the diversity and abundance of migratory birds other than waterfowl in the Rivers Project region is well-documented at the Riverlands Environmental Demonstration Area. The following paragraphs summarize species use of this area.

*Figure 4 – 58*
*Seasonal Distribution of Shorebird Species at the Riverlands EDA (near St. Louis)*

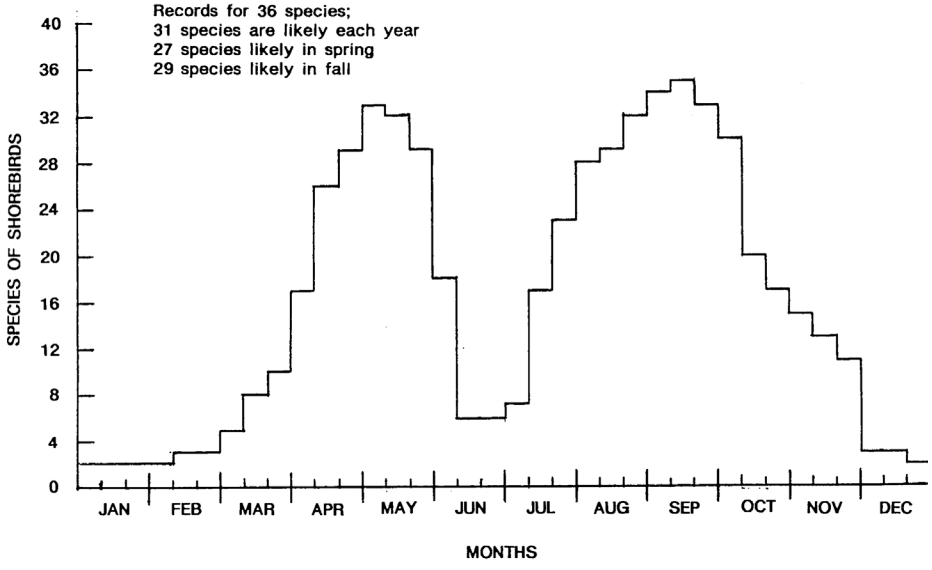
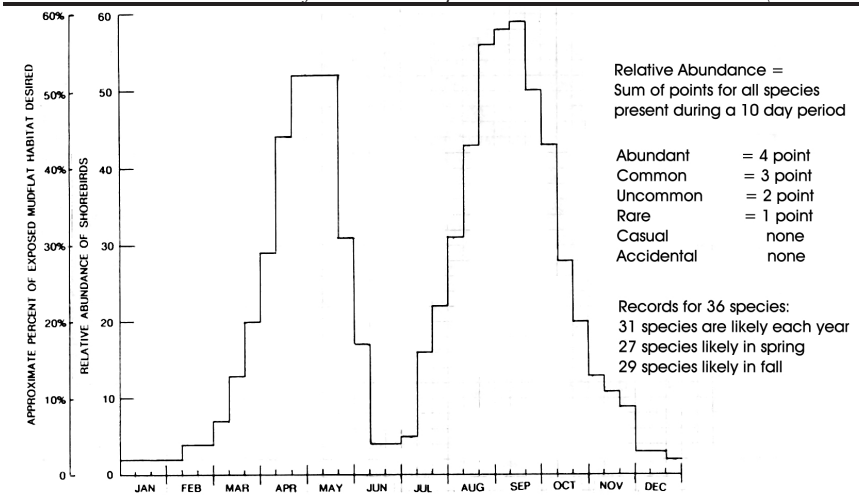


*Figure 4 – 59*
*Seasonal Relative Abundance of Shorebird Populations at the Riverlands EDA (near St. Louis)*




The Rivers Project Environmental Demonstration Area (EDA), a wildlife refuge, adjacent to the Melvin Price Locks and Dam near West Alton, Missouri, is one of the best Mississippi floodplain locations for observing species from all main groups of water-related migratory birds (waterfowl, wading birds, shorebirds, marsh birds, gulls, terns, birds of prey, etc.) A map of the EDA is shown in *Figure 4 – 57*.

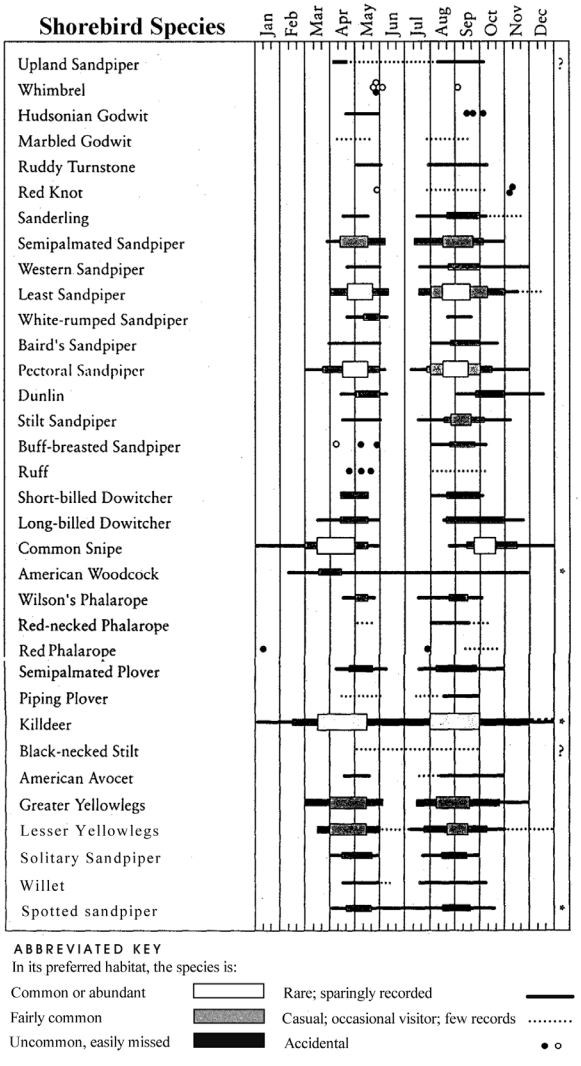
Seasonal habitat changes due to climate and water level fluctuations attract a wide variety of species throughout the year. Water levels on the Mississippi River change with natural floodpulsing, through Environmental Pool Management adjustments at Melvin Price Locks and Dam or though seasonal gravity flow water level manipulations by Riverland Rangers on the EDA Prairie–March restoration area to optimize habitat conditions.

Loons, grebe and waterfowl (including over 20 species of ducks) occur during migration. Many birds stop on Ellis Bay, Teal Pond or farther out in the river channel. Surface-feeding ducks fly in and out of the marsh slough in the prairie. Double-crested Cormorants are found in large numbers in spring, late summer, and fall.

Over 30 species of shorebirds are prevalent during fall and spring migration when water levels are low enough to produce mudflats; Wise Road marsh usually yields the greatest variety. Two Pecan Pond and Heron Pond (shown in *Figure 4 – 57*) are also productive.

Shorebirds can be viewed all along the shore of Ellis Bay and the slough at Ellis Island if mud edges along the shore are exposed. Migratory shorebirds generally arrive beginning in August, peak in September, but continue to drift through as late as November on their way to wintering grounds in the

*Figure 4 – 60*
*Shorebirds in the Mid-Eastern Missouri Area*



southern U.S., Central or South America. They pass through the area again from March through May on their way to their northern nesting grounds. Managing habitat for shorebirds entails adjusting water levels to provide suitable mudflats which they use for resting and feeding on macroinvertebrates during their migration periods.

The Missouri Audubon Society has done considerable research and documentation of shorebirds at the EDA. Their findings on species diversity, distribution and abundance are shown in *Tables 4 – 58* through *4 – 60*.

Pied-billed grebes nest in Teal Pond. King rail, Virginia rail, sora and common moorhead have been seen in the spring on the potholes on Ellis Island. All of the regular herons and egrets, including the snowy egret, are commonly found.

A variety of gulls are observed. Ring-billed gulls, usually the most common species, are present almost year round, but herring gulls will sometimes supplant the ring-bills entirely during winter cold snaps. Other gull species seen here include Franklin's and Bonaparte's (both regular migrants), Thayer's and glaucous (both scarce but regular in winter) and several rarer species such as great black-backed, lesser black-backed and Little gulls. The first Ross' gull to be seen in Missouri occurred on the EDA in late 1991 and early 1992. Migrant terns are seen primarily on Ellis Bay with Foster's, Caspian, and black tern the most regular species. A few jaegers have also been spotted.

The EDA is probably the closest and most accessible place from St. Louis to see large numbers of Bald eagles during the winter months. Other common winter raptors are northern harrier and red-tailed hawks. Rough-legged hawks appear sporadically, and short eared owls can be seen flying over the prairie area, usually after sundown. During migration osprey and peregrine falcons are seen. Neotropical migrants travel through the surrounding floodplain forests from late August to late October.

Perching Birds are less obvious, but many species are noted. Horned larks are common along the access road, sometimes accompanied by Lapland longspurs in winter. All swallows, especially Tree, are seen during migration. Fish crows are best observed in spring. Sedge wrens are common in prairie grasses in August, and common yellowthroat, dickcissel and grasshopper sparrows are breeding species on the EDA.

## Threatened and Endangered Species

### *Introduction*

The 1973 Endangered Species Act states that all federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of the Act. The purposes of the Endangered Species Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved and to provide a program for the conservation of such federally listed species.

The USFWS and the National Marine Fisheries Service (NMFS) are the lead agencies mandated by Congress to administer and enforce the law. It is the policy of the Corps that all project lands and waters will be managed in a manner which assists in the overall conservation of federally-listed endangered and threatened species, and the ecosystems upon which they depend. Species which are candidates for listing will also be given consideration. Conservation methods and procedures will be utilized which will enable the inventory and protection of these species of special concern and their habitat, as well as the participation in their recovery.

"Special Status Species" include any species which is listed or proposed for listing, as threatened or endangered by the USFWS or NMFS, under the provisions of the Endangered Species Act; any species covered by the Migratory Bird Treaty; any species designated by the USFWS as a "candidate" or "listing" species or "sensitive" species; any species which is listed and protected by state statute in a category implying potential endangerment of extinction.

Special status species and/or their critical habitats that occur on water resources development projects shall be protected and/or conserved in accordance with the Endangered Species Act, as amended, and with existing statutes. Endangered Species Recovery Plans prepared by the USFWS and/or NMFS shall be followed to protect and conserve federally listed species or their critical habitat on Corps administered lands and waters. Corps personnel will cooperate in the management of state-listed and protected species where feasible.

### *Illinois and Missouri Rare, Threatened, and Endangered Species*

#### Introduction

The States of Illinois and Missouri have all developed lists of species that they consider scarce within their respective states, Illinois designates species on the list as either "Endangered" or "Threatened" while Missouri designates their species as "Endangered" or "Rare". At a state level, a species is considered "endangered" if the species is threatened with extinction throughout all, or a significant portion of, its range within the state. A species is considered "threatened" or "rare" if it is likely to become endangered within the foreseeable future throughout all, or a significant portion of, its range within the state. These designations have similar definitions as the federal definitions, except that the status is at a state level. Many of the state-listed species are common over a much larger geographical area and are considered rare within a particular state because the area lies on the periphery of the species range and have smaller populations. There are some species, however, where the population decline occurs over the entire range of the species.

In addition to the endangered, threatened and rare designations, each state has another category they list species in called "Special Concern" (or "Watch List" for Missouri), which is an advisory category. Special concern species are those species that are not rare, threatened, or endangered, but are extremely uncommon in an area or have unique or highly specific habitat requirements and deserve careful monitoring of its status. Species on the periphery of their range, that are not listed as endangered or threatened, may be included in this category along with those species that were once listed as endangered or threatened but now have increasing protected, or stable populations. In addition, the states include a category called "Extirpated". These species formerly occurred as a regular breeding species, but no longer reproduce within the state. Extirpated species still occur somewhere within their natural range but outside the listed state.

#### State Species Lists

The State of Illinois lists 30 fish, 25 freshwater mussel, 24 invertebrate, 9 mammal, 42 bird, 18 reptile and amphibian, and 363 plant species as endangered or threatened. Missouri lists 52 fish, 24 freshwater mussel, 62 invertebrate, 11 mammal, 29 bird, 28 reptile and amphibian, and 374plant species as endangered, rare, or watch list. The State Natural Heritage programs manage standardized information on endangered plants, animals and ecological communities.

The following lists of fish, mussels and other invertebrates, mammals, reptiles and amphibians, birds and plants that were determined to be

potentially occurring within the floodplain or spending a portion of their life within the river or adjacent habitats.

*Table 4–61*
*State Listed Endangered or Threatened Fish*

| Name | | IL | MO |
|---|---|---|---|
| **ASCIPENSERIDAE** | | | |
| Lake Sturgeon | *Acipenser fulvescens* | Endangered | Endangered |
| Pallid Sturgeon | *Scaphirhynchus albus* | | Endangered |
| **HIODONTIDAE** | | | |
| Mooneye | *Hiodon tergisus* | | Rare |
| **CLUPEIDAE** | | | |
| Alabama Shad Anadromous | *Alosa alabamae* | | Rare |
| **CYPRINIDAE** | | | |
| Sturgeon Chub | *Macrhybopsis gelida* | | Rare |
| Sicklefin Chub | *Macrhybopsis meeki* | | Rare |
| Pallid Shiner | *Notropsis amnis* | Endangered | |
| **CATASTOMIDAE** | | | |
| River Redhorse | *Moxostoma carinatum* | Threatened | |
| Greater Redhorse | Moxostoma valenciennesi | Endangered | |

*Table 4 – 62*
*State Listed Rae, Endangered or Threatened Mammals*

| NAME | SCIENTIFIC NAME | IL | MO |
|---|---|---|---|
| River Otter | *Lutra canadensis* | Endangered | |
| Bobcat | *Lynx rufus* | Threatened | |
| Long-Tailed Weasel | *Mustela frenata* | | Rare |
| Gray Bat | *Myotis grisescens* | Endangered | Endangered |
| Indiana Bat | *Myotis sodalis* | Endangered | |
| Plains Pocket Mouse | *Perognathus flavescens* | | Rare |
| Plains Spotted Skunk | *Spilogale putorius interrupts* | | Endangered |
| Swamp Rabbit | *Sylvilagus aquaticus* | | Rare |

*Table 4–63*
*State Listed Mussels*

| NAME | SCIENTIFIC NAME | IL | MO |
|---|---|---|---|
| Slippershell Mussel | *Alasmidonta viridis* | Endangered | |
| Rock-Pocketbook Mussel | *Arcidens confragosus* | | Rare |
| Spectacle Case Mussel | *Cumbeilandia monodonta* | Endangered | |
| Butterfly Mussel | *Ellipsatia lineolata* | Threatened | |
| Elephant-Ear Mussel | *Elliptio crassidens crassidens* | | Endangered |
| Spike Mussel | *Elliptio dilatata* | Threatened | |
| Snuffbox Mussel | *Epioblasma triquetra* | | Rare |
| Ebonyshell Mussel | *Fusconaia ebena* | Threatened | Endangered |
| Pink Mucket | *Lampsilis aorta* | | Endangered |
| Higgins Eye Mussel | *Lampsilis higginsii* | Endangered | Endangered |
| Scaleshell Mussel | *Leptodea leptodon* | | Rare |
| Sheepnose Mussel | *Plethobasus cyphyus* | Endangered | Rare |
| Fat Pocketbook Mussel | *Potamilus capax* | Endangered | Endangered |

*Table 4–64*
*Other Invertebrates*

| NAME | SCIENTIFIC NAME | IL | MO |
|---|---|---|---|
| Arogos Skipper | *Atrytone arogos* | Endangered | |
| Marbled Underwing Moth | *Catocala marmorata* | | Rare |
| Cobweb Skipper | *Hesperia metea* | Threatened | |
| Ottoe Skipper Butterfly | *Hesperia ottoe* | Threatened | |
| Elfin Skimmer | *Nannothemis bella* | Threatened | |
| Rattlesnake-Master Borer Moth | *Papaipema eryngii* | Endangered | |

*Table 4 – 65*
*State Listed Rare, Endangered or Threatened Reptiles and Amphibians*

| NAME | SCIENTIFIC NAME | IL | MO |
|---|---|---|---|
| Spotted Turtle | *Clemmys guttata* | Endangered | |
| Kirtland's Snake | *Clonophis kirtlandii* | Threatened | |
| Timber Rattlesnake | *Crotalus horridus* | Threatened | |
| Western Chicken Turtle | *Deirochelys reticularia miaria* | | Endangered |
| Great Plains Rat Snake | *Elaphe guttata emoryi* | Threatened | |
| Western Fox Snake | *Elaphe vulpina vulpina* | | Endangered |
| Blanding's Turtle | *Emydoidea blandingii* | | Endangered |
| Four-Toed Salamander | *Hemidactylium scutatum* | | Rare |
| Western Hognose Snake | *Heterodon nasicus* | Threatened | |
| Dusty Hognose Snake | *Heterodon nasicus gloydi* | | Rare |
| Illinois Mud Turtle | *Kinostemon flavescens* | Endangered | Endangered |
| Illinois Chorus Frog | *Pseudacris streckei illinoensis* | Threatened | Rare |
| Wood Frog | *Rana sylvatica* | | |
| Eastern Spadefoot | *Scaphiopus holbrookii holbrookii* | | Rare |
| Eastern Massasauga | *Sistrurus catenatus catenatus* | Endangered | Endangered |

*Table 4 – 67*
*State Listed Rare, Endangered or Threatened Birds*

| NAME | SCIENTIFIC NAME | IL | MO |
|---|---|---|---|
| Cooper's Hawk | *Accipiter cooperii* | Endangered | Rare |
| Sharp-Shinned Hawk | *Accipiter striatus* | Endangered | Rare |
| American Bittern | *Botaurus lentiginosus* | Endangered | Endangered |
| Red-Shouldered Hawk | *Buteo lineatus* | Endangered | |
| Great Egret | *Casmerodius albus* | Threatened | Rare |
| Veery | *Catharus fuscescens* | Threatened | |
| Brown Creeper | *Certhia americans* | Threatened | |
| Black tern | *Chlidonias niger* | Endangered | |
| Northern Harrier | *Circus cyaneus* | Endangered | |
| Little Blue Heron | *Egretta caerulea* | Endangered | Rare |
| Snowy Egret | *Egretta thula* | Endangered | Endangered |
| Peregrine Falcon | *Falco peregrinus* | Endangered | |
| Common Moorhen | *Gallinula chloropus* | Threatened | Rare |
| Sandhill Crane | *Grus canadensis* | Endangered | |
| Bald Eagle | *Haliaeetus leucocephalus* | Endangered | Endangered |
| Mississippi Kite | *Ictinia mississippiensis* | Endangered | Rare |
| Least Bittern | *Ixobrychus exiles* | Endangered | |

*Table 4-66*
*State Listed Rare, Endangered or Threatened Plants*

| NAME | SCIENTIFIC NAME | Known Distribution | Range Where Threatened or Endangered | IL | MO | FED |
|---|---|---|---|---|---|---|
| Spurge | *Euphorbia geyeri* | Throughout | Entire | E | E | - |
| Dotted Monardo | *Monarda punctata var Occidentalis* | Throughout | Entire | - | R | - |
| Black-seeded Mountain Rice | *Oryzopsis racemosa* | Throughout | Entire | - | U | - |
| Polvpremum | *Polypremum procumbens* | Throughout | Entire | - | E | - |
| Large-toothed -Aspen | *Populus grandidentata* | Throughout | Entire | - | U | - |
| Quaking Aspen | *Populus tremuloides var tremuloides* | Throughout | Entire | - | U | - |
| Rose Turtlehead | *Chelone oblique var speciosa* | Throughout | Entire | - | R | - |
| Southern Aster | *Arpaludsus subsp hemisphericus* | Throughout | Entire | - | R | - |
| Amethyst Shooting Star | *Dodecatheon radicatum* | Throughout | Entire | - | - | - |
| Alkali Yellowtops | *Flaveria campestris* | Throughout | Entire | - | E | - |
| Pineweed | *Lechea racemulosa* | Throughout | Entire | - | U | - |
| Red-berried Elder | *Sambucus pubens* | Throughout | Entire | - | R | - |
| Wild Sasaparilla | *Aralia nudicaulis* | Throughout | Entire | - | R | - |
| Small Spike Brush | *Eleochares parvula var auachaeta* | Throughout | Entire | - | R | - |
| Ditch Grass | *Ruppia maritime var rostrata* | Throughout | Entire | - | E | - |
| Strawberry Blight | *Chenopodium capitatum* | Throughout | Entire | E | R | - |
| Prairie White Fringed Orchid | *Habenaria 1euGophaea* | Throughout | Entire | - | R | - |
| False Aster | *Boltonia asteroides var decurrens* | Throughout | Entire | - | R | - |
| Cut-leaved Grape Fern | *Botrychium dissectum var dissectum* | Throughout | Entire | - | R | - |
| Shining Clubmoss | *Lycopodium lucidulum var lucidulum* | Throughout | Entire | - | R | - |
| Adder s Tongue | *Ophioglossum* | Throughout | Entire | - | R | - |
| Prickly Groundberry | *Rubus missouricus* | Throughout | Entire | - | E | - |
| False Mermaid | *Floerkea proserpinacoides* | Throughout | Entire | - | E | - |
| Arrow Arum | *Peltandra virginica* | Throughout | Entire | - | R | - |

### *Federal Threatened and Endangered Species*

Nine species (plant and animal) in the project area are designated as either Endangered, Threatened and Proposed under the authority of the 1973 Federal Endangered Species Act. These species are listed in the table below.

*Table 4– 68*
*Federal Endangered, Threatened and Proposed Species*

| Species Common Name | Scientific Name | Distribution | Status |
|---|---|---|---|
| Decurrent false aster | *Boltonia decurrens* | Throughout | Threatened |
| Higgins' eye pearly mussel | *Lampsilis higginsii* | Throughout | Endangered |
| Pallid sturgeon | *Scaphirynncus albus* | Throughout | Endangered |
| Sturgeon chub | *Macrhybopsis gelida* | Open river | Candidate |
| Sicklefin chub | *Macrhybopsis meeki* | Open river | Candidate |
| Bald eagle | *Haliaetus leucfocephalus* | Throughout | Threatened |
| Interior least tern | *Sterna antillarum* | Throughout | Endangered |
| Indiana bat | *Myotis sedalis* | Throughout | Endangered |
| Fat Pocketbook mussel | *Proptera capax* | Throughout | Endangered |

## Study Opportunities

In addition to rare and endangered species, several species and habitats are of scientific interest due to their spatial distribution. The resource provides and excellent opportunity for study of migratory waterfowl, rare and endangered species, relict populations and habitats, and species at the borders of their ranges. Areas peripheral to the project region provide study opportunities such as the unique hill prairie communities in Illinois.

# 4.12. ARCHAEOLOGICAL AND HISTORIC RESOURCES

## Mississippi and Illinois Rivers

### *Prehistoric Overview*

Four major prehistoric cultural periods are recognized in the Upper Mississippi River Valley. Each succeeding period exhibits increased cultural sophistication. Twelve thousand years ago, small bands of Paleo Indians, also known as Big-Game Hunters, lived in small and temporary camps along the margins of retreating glaciers. Archaeological evidence of this period is sparse, limited primarily to surface finds of projectile points.

The next cultural era, the Archaic period, lasted from 8000 BC to 1000 BC. Analysis of remains from this period indicate that the culture developed a settlement and subsistence pattern adapted to a forest environment. Hunting and food collecting depended on forest resources. The people were more sedentary than the Paleo Indians. Mound building began towards the end this period. The Eastern Archaic culture is considered by some to be the first indigenous New World cultural development.

A clear distinction between the Eastern Archaic cultural period and the subsequent Woodland culture, 1000 BC to 1400 AD, does not exist. The Woodland peoples lived in semi-permanent settlements, practiced horti-culture, made pottery, and built numerous mortuary mounds.

The Mississippian culture, 800 AD to 1500 AD, overlaps the Woodland period. Intensive horticulture, large population centers, and religious cults associated with crop and human fertility are noteworthy elements of the Mississippian culture. The Cahokia Mounds city and culture, near present day Collinsville, Illinois, originated, prospered and ultimately

disappeared during this period. European settlement in the region began during the later part of this period.

The Cahokia Mounds World Heritage Site is the largest Mississippian site as well as archaeological site in North America. At its zenith, around 800 years ago, the site covered more than five square miles and contained more than 120 temple mounds. The base of Monks Mound, the largest surviving mound at the site, is larger than the pyramid of Cheops in Egypt. Around 1200 AD, Cahokia is estimated to have contained between 10,000 and 20,000 residents. The site was supported by a number of smaller mound complexes.

### *Historical Overview*

The region's prehistoric and historic development is primarily linked to the river floodplain and adjacent uplands. The rivers provided water, fish and wildlife, and trade-route corridors for prehistoric peoples and early explorers. In addition, people used the river corridors for settlement, trade, and political boundaries for pioneers and settlers. Present uses of the river and their floodplains consist of industrial activities, commercial fishing, navigation, recreation, and educational opportunities. Numerous historic locations through-out the area represent the various river-oriented historical phases.

Father Jacques Marquette and Louis Joliet were the first Europeans to record explorations in the region. A large stone cross, located on Route 100 near Grafton, Illinois commemorates this event as the first entrance of European explorers into Illinois. They traveled with Native American guides in canoes, and repeatedly encountered Native American groups camped along the Mississippi River. The legendary Piasa monsters, painted on bluffs between Alton and Grafton, Illinois, were first recorded by Marquette.

Lewis and Clark left on their historic exploration from Wood River in 1804. Today, several memorials and markers commemorate this event. The Mississippi River became increasingly important for trade and transportation as settlers from the east began to converge on the Mississippi Valley following the return of the explorers in 1806. The well-known frontiersman, Daniel Boone, and Zebulon Pike, the explorer, influenced settlement of the area. Pike County, Missouri, is named for Zebulon Pike, and several historic sites in western St. Charles County are associated with the Boone family. Trade, agriculture, and migration to the area continued to increase in the 19th century. European immigrants, particularly German and Irish, settled here. In the 1840s, great numbers of farmer immigrants traveled into the region by wagon and boat. Ferries were established at several river crossings, and St. Louis became a center for navigation, trade, industry, education, and politics throughout the nineteenth century.

During the 18th and early 19th century, a thriving fur trade was the dominant commercial activity on the Mississippi, Illinois and Missouri Rivers. Canoes and dugouts were vessels of choice for the fur trade. River craft were designed with minimum draw to avoid the problems of changes in river depth, shifting sandbars, rapids, and hidden snags. Keelboats, flatboats, Mackinaws, and pirogues were used in conjunction with the canoes and dugouts during the later part of the period.

The arrival of the steamboat at St. Louis in 1817 began the colorful steamboat era that peaked in the "Golden Age of the Steamboat," 1840-1860. The small river towns became agricultural trade centers and steamboat landings.

The first federal efforts to improve navigation on the Mississippi River were carried out from 1878 to 1907. A four and one-half foot channel was

engineered by dredging, contraction of the river by closure of chutes, revetment work, reservoirs, and wing dams that directed the flow of water into narrow channels. The channel was subsequently deepened to six feet, and in the 1930s, the modern diesel towboat began to replace the paddlewheelers.

With the development of locks and dams, and the nine-foot channel in the 1930s, river commerce on the Upper Mississippi became more economical than land traffic. Welded steel barges and powerful diesel towboats were introduced in the 1940s to transport coal, raw materials, manufactured goods, grains and raw materials used in food processing.

## Archaeological Resources in the Project Area

In Missouri and Illinois, the greatest concentrations of archaeological sites are found in the river corridors which are the most fertile and accessible areas. The Mississippi River Valley and its tributaries constitutes an area of great archaeological potential, based on a large number of physiographic and ecological features. Following the adoption of horticulture around 1,600 years ago, the region experienced a significant population increase.

Professional surveys conducted along the Mississippi, Illinois and Kaskaskia Rivers has identified thousands of prehistoric archaeological sites. Evidence of prehistoric cemeteries, burial mounds, temporary camps, farmsteads and village sites are found in significant numbers throughout the project area.

More than 8,000 prehistoric and historic sites are known to exist in the Rivers Project area, including more than 65 archaeological and historic districts on the *National Register of Historic Places*. Major concentrations of archaeological sites have been identified near three types of land features: (1) the confluences of the Mississippi with major tributaries such as the Illinois, Salt, Missouri, Meramec and Kaskaskia Rivers; (2) sand ridges and terraces in the Mississippi floodplain; and (3) blufftops and their slopes.

Since the early 1970s, with the passage of NEPA, full-time archaeological research has been conducted in the project area. During this period researchers have uncovered literally thousands of archaeological sites with the location of thousands of others presently unknown. All sites are believed to have originated during the previous 13,000 years.

Thousands of studies and reports exist in academic and agency files which document the existing state of knowledge of cultural resources in the project area. All Project development and management plans have to be sensitive to the fragility of these cultural resources and should incorporate measures to protect and conserve them.

## Historical Properties Legislation and Corps Compliance

Selected laws and executive orders relating to archaeological resources include:

- 1906 - Antiquities Act (16 U.S.C. 433)
- 1935 - Historic Sites Act (16 U.S.C. 461-467)
- 1960 - Reservoir Salvage Act (PL 86-523)
- 1966 - Historic Preservation Act (PL 80-915)
- 1971 - Executive Order 11593
- 1978 - American Indian Religious Freedom Act (AIRFA) (42 U.S.C. 1996)

- 1979 - Archaeological Resources Protection Act (ARPA) (16 U.S.C. 370)
- 1980 - National Historic Preservation Act, (16 U.S.C. 469-470) [Amended the 1966 Historic Preservation Act]
- 1990 - Native American Graves Protection and Repatriation Act (25 U.S.C. 3001-3013)

In accordance with these authorities, archaeological investigations are undertaken for projects that have the potential of disturbing the ground surface.

The operation and maintenance of navigation on the rivers creates a number of potential concerns in preserving cultural resources. These concerns pertain to development induced by the presence of the waterway, and to channel maintenance activities.

Continued transformation of existing private shoreline land uses to industrial uses can be expected. Exact locations for development cannot be predicted, but any substantial land-use change may affect unknown cultural resources. Prior to developing shorelines, a 404 and/or Section 10 permit from the Corps must be obtained. The Corps can require an archaeological survey to be performed by the applicant as a prerequisite to obtain a permit in areas where ground disturbance has the potential to damage significant archaeological remains.

Channel maintenance activities such as dredging and bank stabilization operations also have the potential of damaging important archaeological sites. Dredging operations rarely utilize land disposal areas, and therefore rarely require cultural resource compliance concerns. However, the construction of dikes and placement of riprap along the shoreline can adversely affect cultural resources. An established procedure is in place to perform archaeological surveys in areas prior to construction. If sites are located, appropriate testing, evaluation, and compliance procedures will be followed before construction will occur.

In general, historical, archaeological, architectural or other cultural artifacts, relicts, remains of objects, inadvertently discovered in the course of routine management, surveillance or development of public lands will not be disturbed or removed. The Corps District Engineer or his or her representative will be immediately notified to ascertain the appropriate protection and compliance requirements. Proposed management of development activities that may impact historic or pre-historic cultural resources on Cooperative Agreement lands requires that the managing agency (USFWS, IDNR or MDC) conduct appropriate compliance actions and/or procedures in consultation with the Corps and the State Historic Preservation Officer (SHPO) to ensure proper compliance and/or approvals prior to implementation.

On public lands leased (outgranted) for recreation of industrial purposes, the lessee is responsible for achieving cultural resource compliance as specified by the SHPO prior to implementing any proposed development.

## 4.13. RECREATION

### General Description

The Mississippi, Illinois and Kaskaskia River segments in the St. Louis District provides major opportunities for water based recreation in the region. Natural vegetation, variable topography, accessibility to water and the proximity of the river to a large population are significant features that enhance its attractiveness for recreational purposes. The demand for outdoor recreation is continually increasing. Some popular forms of outdoor recreational activities are bicycling, bird watching, camping, fishing, hiking, hunting, power boating, sailing, sightseeing, swimming, and water skiing (See *Table 4 – 69*.)

### River Recreation Use Characteristics– Mississippi and Illinois Rivers

Recreational use intensity is a function of the available physical resources, access, management, and proximity of population centers. The recreational resource is dependent on the physical, biological and water quality characteristics of any given segment of the system. These characteristics will determine, to a large extent, the types of recreational activities occurring within any given reach. This relationship will not hold true, however, when access is limited or where high urban concentrations are the major factor in determining recreational use intensity and density.

High public demands for use of these resources in selected reaches of the UMRS (particularly in urban areas) are expected to intensify. Much of the System's shoreline is presently privately owned and large sections of the rivers are paralleled by railroad tracks, impeding access. Furthermore, the majority of public lands along the Rivers are managed for fish and wildlife purposes which may be incompatible with some recreational uses.

Towns and metropolitan areas exert a high demand on the recreational resource. The St. Louis metropolitan area continues to project deficiencies in the availability of access for water-based recreation. This high demand produces intensive use of the resource, especially during weekends and holidays. Conflicts between river users periodically occur during high activity periods, primarily in Pool 26. Major motorboating, sailing, water-skiing and jet-skiing activity occurs in the navigation channel and the main channel border. Major hunting and fishing activity occurs along the main channel border, side channels and backwaters. Camping, picnicking, hiking and nature studies occur primarily on islands, sandbars and along the shoreline.

The expanse of water created by the locks and dams of the navigation project provide additional opportunities for recreation use and enjoyment of the Upper Mississippi River System corridor. Conflicts periodically exist between recreation use and maintenance of the channel and commercial navigation use. Portions of the navigation pools have very shallow areas and stump fields. While these areas provide good fish nursery and waterfowl areas, they are hazards to the boater unfamiliar with the river. Channel structures, such as dikes and dams, used to help maintain the navigation channel, also present a hazard to the novice or inexperienced boater.

Beaches created with dredged material and by natural deposition receive intensive public use. These beaches are used for camping, swimming, sunbathing, picnicking and partying. They form base locations for water skiing, hunting and fishing groups and provide important destination points for recreation visits.

*Table4 – 69*
*Estimated Ranking of the Top Recreational Activities Pursued in Illinois (SCORP 1994)*

1. Pleasure Walking*
2. Pleasure Driving/ Sightseeing*
3. Picnicking*
4. Observing Wildlife /Birdwatching*
5. Swimming – Pool
6. Bicycling*
7. Fishing*
8. Swimming – Other*
9. Softball – Baseball
10. Running/Jogging*
11. Motorboating*
12. Golf
13. Hiking*
14. Outdoor Basketball
15. Tennis
16. Tent Camping*
17. Water Skiing*
18. ORV / ATV Use
19. Canoeing*
20. Horseback Riding*
21. Vehicle Camping
22. Rock/Fossil Collecting*
23. Hunting*
24. Sailing*
25. Soccer
26. Snowmobiling
27. Cross Country Skiing*
28. Ice Fishing*
29. Trapping*

*Activities that are accommodated on Rivers Project Public Lands and Waters

Public access to Navigation Pools 24 - 27 is generally limited to the 47,641 acres of dispersed federally owned shoreline lands, located predominantly in the lower reaches of the pools. The Corps, the USFWS, the IDNR and the MDC manage most of the public access areas and facilities adjacent to the navigation pools. There are also numerous commercial marinas offering river access and other recreational services, most which are on privately owned shoreline lands.

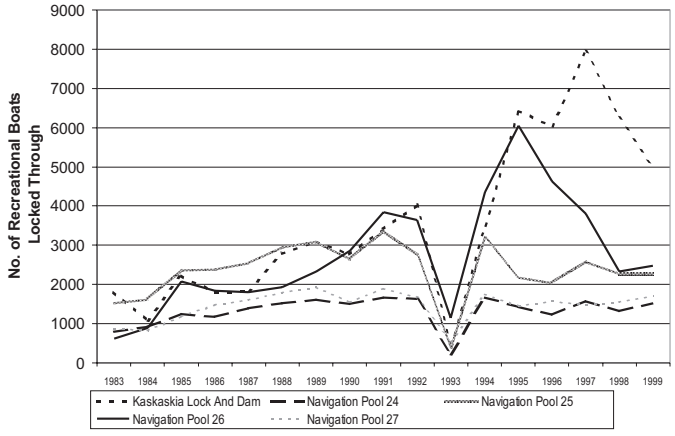
Opportunities for public access in the open river reach is limited due to private ownership of the shoreline and intervening lands between the highways, railroad tracks, and the river. The most visual identification with the river downstream of St. Louis occurs at bridge crossings and at river communities.

Most of the public land that is available in this reach is located in state parks, state conservation areas, USFWS refuges and Forest Service lands. Roadside parks, points of interest, and city parks comprise a minor amount of the total acreage. Fuel stops for recreational boaters along this reach are very limited, forcing most boaters to carry extra fuel and provisions.

*Table 4-71*
*Total Annual Number of Recreation Boats Locked Through*

| Year | Lock & Dam 24 | Lock & Dam 25 | Locks & Dam 26 | Locks 27 | Kaskaskia Lock And Dam |
|---|---|---|---|---|---|
| 1983 | 803 | 1,535 | 625 | 875 | 1,804 |
| 1984 | 922 | 1,628 | 897 | 820 | 1,066 |
| 1985 | 1,250 | 2,365 | 2,069 | 1,179 | 2,231 |
| 1986 | 1,192 | 2,384 | 1,833 | 1,480 | 1,798 |
| 1987 | 1,407 | 2,555 | 1,810 | 1,600 | 1,813 |
| 1988 | 1,528 | 2,947 | 1,940 | 1,793 | 2,792 |
| 1989 | 1,624 | 3,097 | 2,330 | 1,925 | 3,094 |
| 1990 | 1,507 | 2,634 | 2,855 | 1,550 | 2,770 |
| 1991 | 1,673 | 3,372 | 3,839 | 1,900 | 3,400 |
| 1992 | 1,633 | 2,746 | 3,650 | 1,650 | 4,018 |
| 1993 | 227 | 394 | 1,141 | 555 | 398 |
| 1994 | 1,681 | 3,186 | 4,360 | 1,750 | 3,497 |
| 1995 | 1,432 | 2,178 | 6,050 | 1,460 | 6,424 |
| 1996 | 1,233 | 2,043 | 4,620 | 1,574 | 6,039 |
| 1997 | 1,577 | 2,596 | 3,816 | 1,484 | 7,941 |
| 1998 | 1,333 | 2,271 | 2,323 | 1,544 | 6,251 |
| 1999 | 1,537 | 2,275 | 2,480 | 1,692 | 4,999 |

*Figure 4 – 70*
*Number of Recreational Boats Locked Through*




Regardless of the constraints on the use of the river and related land resources, the existing recreational resources and the cooperative efforts among governmental agencies and private enterprise combine to provide numerous opportunities to experience the diversity of the river's recreational, natural, cultural, and historic values.

Some specific examples of areas with high recreation potentials are:

- The confluences with major tributaries – the Illinois, the Missouri, the Meramec and the Kaskaskia Rivers;
- Major islands;

- Scenic bluff or river hills areas, e.g. Alton to Grafton Bluffs, Fountain Bluff, and Grand Tower in Illinois and the river hills at Clarksville and Louisiana in Missouri;
- The Pere Marquette State Park area along the Lower Illinois River; and
- The Melvin Price Locks and Dam and Alton Riverfront area.

None of the federal or state agencies dealing with outdoor recreation have more than a partial authority for planning and management of the recreational resources. Coordination of planning for public recreational purposes needs to be improved. A standardized system of collecting recreation use data for the river corridor is non-existent, which impedes the coordination of activities for enhanced recreation opportunities.

Recreational boating use patterns and levels of use for each segment of the Rivers Project Service Area can be realized in relative terms by analyzing Recreational Boat Lockage statistics in the St. Louis District (*Figure 4– 70*, Table 4– 71, *Table 4 – 76*, and *Figure 4 – 75*.)

A study on the types of recreational boats, projections on boater uses and impacts of recreational boating on the Mississippi and Illinois Rivers is currently being prepared as part of an on-going comprehensive Upper Mississippi and Illinois River Navigation Study being conducted by the Corps. *Figure 4 – 72*, *Table 4 – 73*, and *Figure 4 – 74* are from this Draft Study and provide a brief summary on the types and sizes of recreational boats utilizing the river in the St. Louis region and existing and projected boat use of the pools in the St. Louis District.

## Kaskaskia River Navigation Project

The Kaskaskia River Navigation Project land and water offers a variety of recreational resources. The channelized portion of the river is used heavily for motor boating along with other water-oriented pursuits such as water-skiing, fishing and swimming. The oxbow portions of the river provide a good environment for fishing, hunting and nature studies. The smaller tributaries of the Kaskaskia (Nine Mile, Little Plum, Doza, Silver, Camp, Horse and Richland Creeks) have the potential for providing a suitable canoeing waters.

The IDNR managed Kaskaskia River State Fish and Wildlife Area (KRFWA) is one of the largest state-owned and managed sites in Illinois. Located 35 miles southeast of St. Louis, Missouri, the area comprises more than 20,000 acres of lands and waters and extends along the Kaskaskia River Navigation Project in St. Clair, Monroe, and Randolph counties. IDOT acquired the lands along the river and IDNR manages it for fish, wildlife and

*Figure 4-72*
*Boat Observations on the Upper Mississippi River System Summer 1996 (Grafton, Il)*

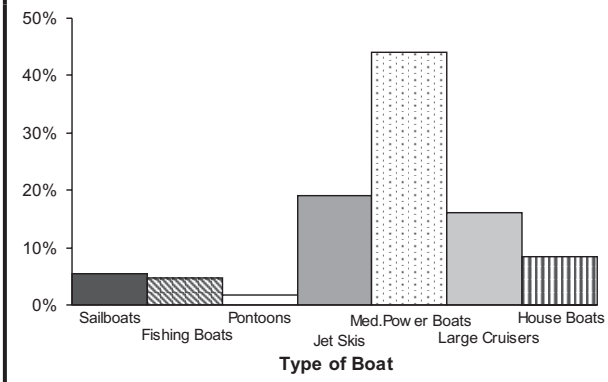



*Figure 4 – 73*
*Distribution of Boats by Length*

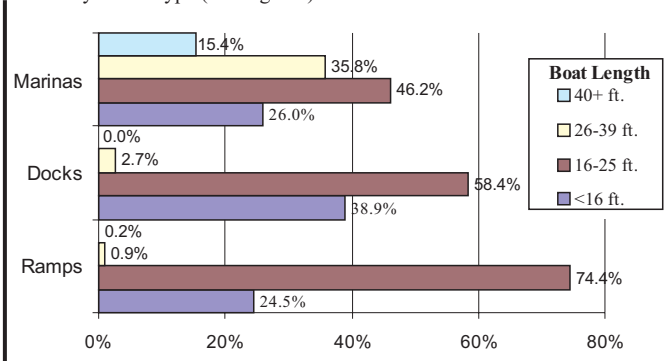
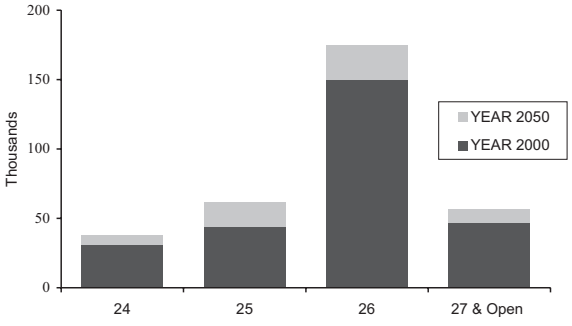



*Figure 4 – 74*
*Boating Use Projections (Unconstrained) in the St. Louis District*



other recreational activities. Approximately 16,000 acres of public lands and 2,200 acres of Kaskaskia River channel and backwater areas are managed for recreation and environmental stewardship.

Baldwin Lake, a 2,018-acre reservoir built by Illinois Power Company, is managed as part of KRFWA. This lake serves as a source of cooling water in operating a nearby electric generating station. Baldwin Lake is open to the public for fishing and is a major part of the waterfowl refuge of the area.

*Figure 4 - 75*
*Commercial and Recreational Lockages 1996*

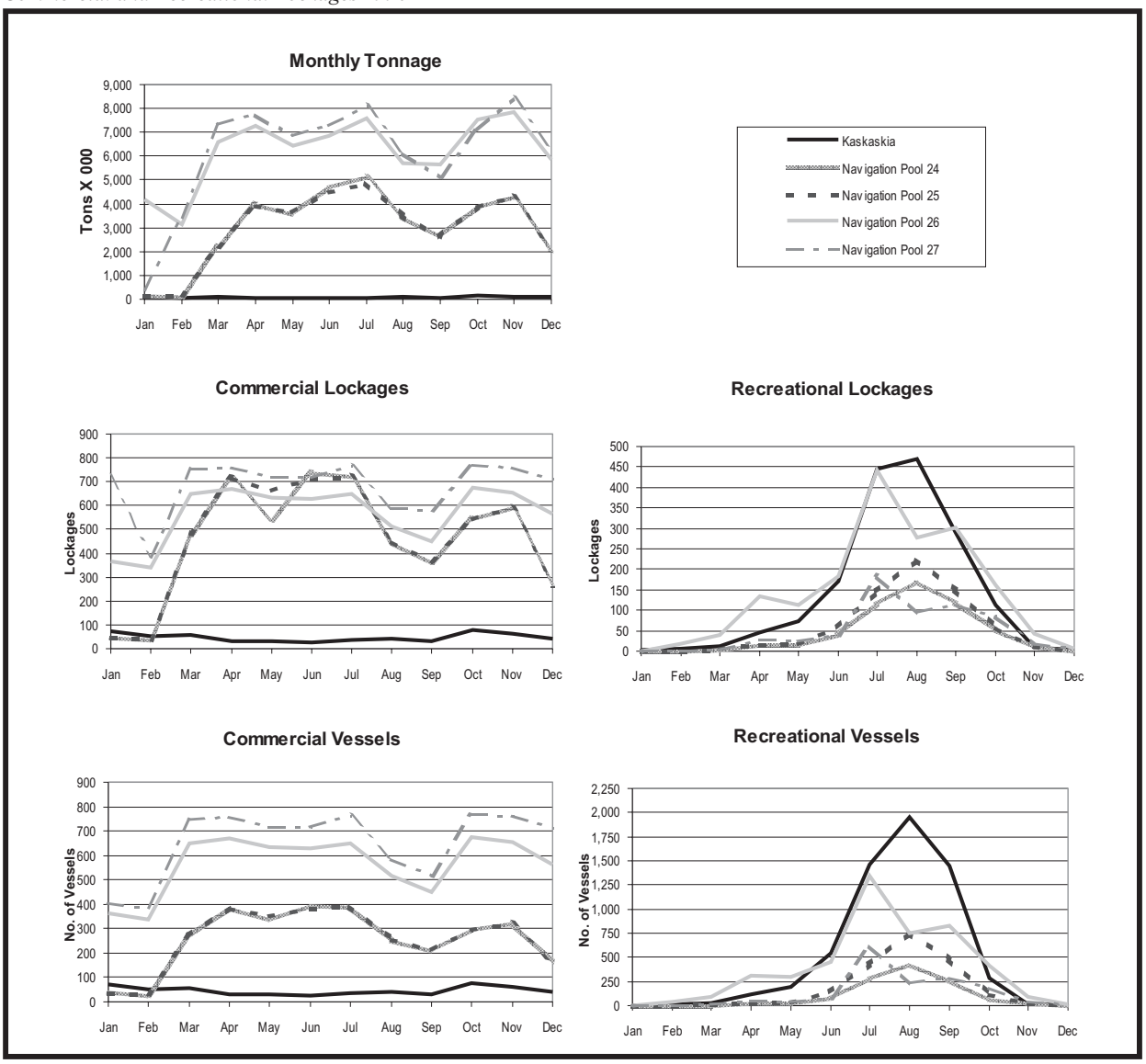


*Table 4 – 76*
*1996 Monthly Commercial Tonnage and Commercial and Recreational lockages and Vessels (Upbound and Downbound Combined.)*

**1. Monthly Tonnage**
**2. Commercial Lockages**
**3. Recreational Lockages**
**4. Number of Commercial Vessels**
**5. Number of Recreational Vessels**

| Month | | Kaskaskia | Navigation Pool 24 | Navigation Pool 25 | Navigation Pool 26 | Navigation Pool 27 |
|---|---|---|---|---|---|---|
| Jan | 1 | 107,600 | 156,327 | 156,327 | 4,172,850 | 419,007 |
| | 2 | 71 | 47 | 47 | 365 | 725 |
| | 3 | 2 | 0 | 2 | 0 | 0 |
| | 4 | 71 | 41 | 36 | 364 | 404 |
| | 5 | 4 | 0 | 6 | 0 | 0 |
| Feb | 1 | 78,400 | 114,920 | 130,920 | 3,137,093 | 3,404,526 |
| | 2 | 51 | 37 | 38 | 339 | 382 |
| | 3 | 6 | 0 | 0 | 17 | 0 |
| | 4 | 51 | 28 | 29 | 339 | 382 |
| | 5 | 12 | 0 | 0 | 42 | 1 |
| Mar | 1 | 116,800 | 2,176,361 | 2,180,241 | 6,569,562 | 7,321,766 |
| | 2 | 58 | 477 | 483 | 650 | 754 |
| | 3 | 11 | 3 | 6 | 40 | 2 |
| | 4 | 58 | 267 | 270 | 650 | 748 |
| | 5 | 23 | 5 | 13 | 86 | 7 |
| Apr | 1 | 75,200 | 3,997,624 | 3,950,559 | 7,296,618 | 7,736,976 |
| | 2 | 31 | 719 | 717 | 671 | 759 |
| | 3 | 46 | 16 | 14 | 134 | 28 |
| | 4 | 31 | 386 | 386 | 671 | 759 |
| | 5 | 113 | 25 | 29 | 309 | 57 |
| May | 1 | 75,200 | 3,575,510 | 3,672,737 | 6,437,758 | 6,851,658 |
| | 2 | 29 | 539 | 667 | 633 | 716 |
| | 3 | 72 | 15 | 17 | 113 | 24 |
| | 4 | 29 | 336 | 351 | 633 | 716 |
| | 5 | 194 | 26 | 40 | 299 | 43 |
| Jun | 1 | 65,600 | 4,718,365 | 4,498,012 | 6,856,185 | 7,267,960 |
| | 2 | 27 | 736 | 710 | 627 | 719 |
| | 3 | 171 | 41 | 59 | 184 | 40 |
| | 4 | 26 | 395 | 382 | 627 | 718 |
| | 5 | 539 | 81 | 147 | 450 | 80 |
| Jul | 1 | 64,000 | 5,140,026 | 5,195,542 | 7,568,660 | 8,134,417 |
| | 2 | 39 | 721 | 723 | 649 | 763 |
| | 3 | 446 | 115 | 146 | 442 | 183 |
| | 4 | 37 | 390 | 390 | 649 | 762 |
| | 5 | 1,459 | 279 | 430 | 1350 | 625 |
| Aug | 1 | 96,200 | 3,465,349 | 3,502,984 | 5,689,489 | 6,125,702 |
| | 2 | 42 | 445 | 449 | 515 | 584 |
| | 3 | 468 | 170 | 224 | 278 | 95 |
| | 4 | 41 | 250 | 254 | 515 | 584 |
| | 5 | 1,948 | 430 | 755 | 745 | 238 |
| Sep | 1 | 76,800 | 2,592,310 | 2,611,565 | 5,649,651 | 5,119,862 |
| | 2 | 29 | 360 | 364 | 450 | 582 |
| | 3 | 291 | 118 | 150 | 303 | 113 |
| | 4 | 29 | 210 | 213 | 450 | 516 |
| | 5 | 1,442 | 264 | 484 | 823 | 290 |
| Oct | 1 | 140,800 | 3,865,554 | 3,871,520 | 7,553,286 | 7,142,312 |
| | 2 | 77 | 545 | 546 | 676 | 768 |
| | 3 | 113 | 53 | 57 | 163 | 86 |
| | 4 | 77 | 297 | 298 | 676 | 768 |
| | 5 | 279 | 68 | 111 | 412 | 183 |

*Table 4 – 59 (continued)*

**1. Monthly Tonnage**
**2. Commercial Lockages**
**3. Recreational Lockages**
**4. Number of Commercial Vessels**
**5. Number of Recreational Vessels**

| Month | | Kaskaskia | Navigation Pool 24 | Navigation Pool 25 | Navigation Pool 26 | Navigation Pool 27 |
|---|---|---|---|---|---|---|
| Nov | 1 | 113,600 | 4,308,747 | 4,307,892 | 7,827,281 | 8,435,991 |
| | 2 | 64 | 593 | 591 | 653 | 761 |
| | 3 | 9 | 12 | 13 | 43 | 19 |
| | 4 | 62 | 324 | 322 | 653 | 761 |
| | 5 | 18 | 23 | 27 | 91 | 40 |
| Dec | 1 | 99,200 | 2,067,506 | 2,017,410 | 5,883,576 | 6,216,890 |
| | 2 | 43 | 271 | 269 | 563 | 711 |
| | 3 | 4 | 1 | 0 | 6 | 5 |
| | 4 | 43 | 164 | 161 | 563 | 711 |
| | 5 | 8 | 2 | 1 | 13 | 10 |
| Cumulative for 1996 | 1 | 1,134,600 | 36,181,599 | 36,088,706 | 73,873,169 | 79,440,582 |
| | 2 | 563 | 5,590 | 5,604 | 6,814 | 8,543 |
| | 3 | 1,639 | 544 | 688 | 1,723 | 595 |
| | 4 | 557 | 3,088 | 3,092 | 6,813 | 7,845 |
| | 5 | 6,039 | 1,233 | 2,043 | 4,620 | 1,574 |

The public lands along the river includes an extensive mixed bottomland forest comprised of pecan, soft maple, burr oak, pin oak, shellbark hickory, and willow. Many cultivated and fallow fields, native grass patches, brushy areas, and other “open” areas are interspersed with the stands of mature bottomland timber. Due to this great diversity of habitats, good wildlife populations exist in the area and hunting and nature study are popular uses of the KRFWA.

Approximately 14,000 acres are available for hunting of forest game, small upland game and waterfowl. Hunter check stations are maintained in the area and access is primarily from the boat ramps and parking lots.

Fishing is the most popular activity on the Kaskaskia River, with its 36 miles of channelized river, plus additional oxbows, creeks, and floodplain lakes. Channel catfish and flathead catfish, largemouth bass, crappie, bluegill, carp and freshwater drum are the most sought after sport fish.

Boat launch ramps are provided on the Kaskaskia River at Fayetteville, New Athens, on Highway 154 west of Baldwin, and at Evansville.

Weekends and holidays throughout the summer receive the most recreational boat use, and congestion and boater safety is a serious concern.

Primitive camping and picnicking is permitted on lands adjacent to the river and developed picnicking areas are located at Ballwin Lake.

A 12-mile trail system exists and is used by hunters, hikers, birdwatchers and other outdoor enthusiasts.

## Greenways and Urban Recreation

The St. Louis region was founded and developed around the confluence of five rivers: the Mississippi, Missouri, Meramec, Illinois and Kaskaskia. Over the last 100 years, many river communities in the region have disregarded their riverfront areas as areas of growth. That has changed, however, particularly since the late 1980s as cities are rediscovering their riverfronts for economic and quality of life purposes as leisure time and recreation demand continues to grow. These river corridors are excellent areas to develop Greenways.

Greenway corridors (linear open spaces connecting recreational, cultural, and natural areas) are traditionally recognized for their environmental protection, recreation value and aesthetic appearance. Often, trails and bikeways are the center or core of a greenway and usually represent the first use, with additional acreage added to solve environmental problems or to enhance the aesthetic qualities, natural habitat and recreation opportunities.

Greenway users typically think of biking, hiking, canoeing or fishing, but there are other benefits. By forestalling floodplain development, greenways reduce the damage caused by flooding. They provide natural filters that help trap and break down pollutants. They also provide places for plants and animals to live and travel through. Trees along greenways can shield unsightly land use, repair past land abuses or act as barriers from the sound of traffic on highways. These linear corridors can link parks, natural reserves, cultural features and historic sites so that people can enjoy the synergistic effect of these links.

Since the early 1990s, a concerted multi-partnered initiative to develop a St. Louis regional greenway and trail system has been developing. The centerpiece of the many cooperating greenway projects in the region is the Confluence Greenway, a large complex or mosaic of independent, yet coordinated greenway projects.

The Confluence Greenway is planned as a perpetually sustainable, 40-mile riverside recreation and conservation area on both banks of the Mississippi, extending from the Gateway Arch in downtown St. Louis to the confluence with the Missouri and Illinois Rivers. The Confluence Greenway will provide parks and trails with unprecedented access to the riverfront and will provide opportunities for walking, biking, fishing, birdwatching, river watching and other recreational activities. This unique resource will help to stimulate regional economic growth and present educational opportunities. Many components of the Confluence Greenway are either complete and operational or under various stages of planning and development. (*Figure 4 - 77,* page *78*)

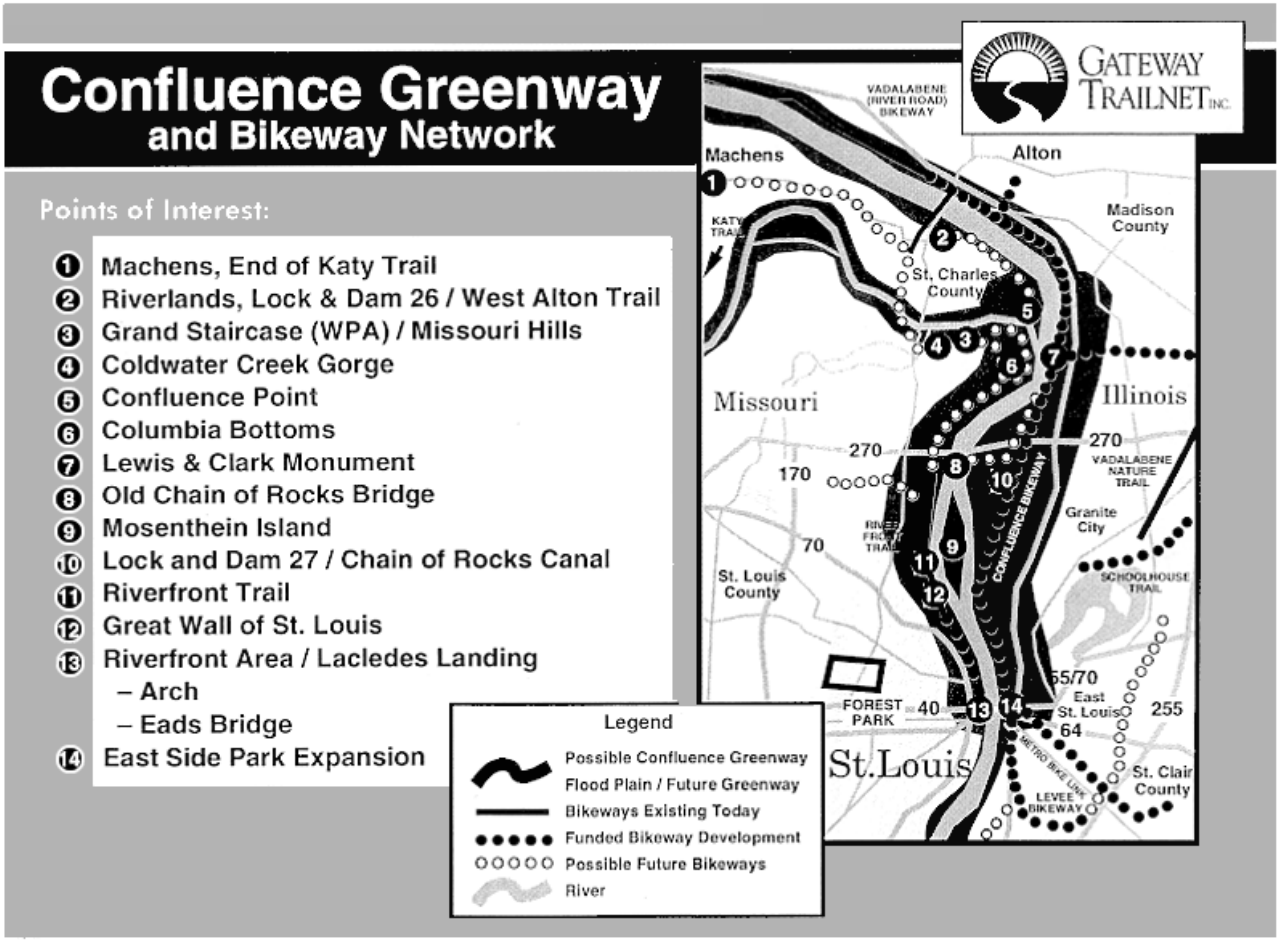
Greenway and trail corridor projects in the region include:

- The Katy Trail, a 200-mile trail that parallels the Missouri River through the region and is part of the coast-to-coast American Discovery Trail.
- The Old Chain of Rocks Bridge, Gateway Trailnet has led the funding and renovation effort for this historic (Route 66) River Bridge as a bicycle and pedestrian crossing that connects with trails on both sides of the Mississippi River.
- The Confluence Bikeway, a 24-mile trail from Alton to Locks 27 that connects with the Chain of Rocks Bridge Bike/Hike Crossing to the Missouri Trails as well as wetlands along the Mississippi River.
- The Riverfront Trail, a 12-mile trail in Missouri from the Gateway Arch north to the Chain of Rocks Bridge Crossing.
- The Levee Trail, an 11-miles along the Illinois levees from the Eads Bridge through Cahokia and on toward Belleville.
- Grant's Trail, a six-mile trail and greenway near Grant's Farm and the Ulysses S. Grant National Historic Site.
- Meeting of the Great Rivers National Scenic Byway which includes the 30-mile Vadalabene Bikeway and adjacent viewsheds being preserved by the Great Rivers Land Trust.

- Columbia Bottoms, a large 4,300 floodplain previously owned by the City of St. Louis transferred to the MDC as part of a large greenway along the river in 1997.
- The Meramec River Greenway, a twenty-year old effort to protect the green corridor and its adjacent floodplains along the Meramec River.
- The River Des Peres, winding through south St Louis. The flood of 1993 destroyed many homes along this corridor and those properties are being returned to open green spaces.
- The Limestone Bluffline, a scenic corridor from Alton to Chester on the American Bottoms along the rivers bluffs.

Plans to protect additional greenways in the region are being pursued through partnering by various federal, state, county and municipal agencies and non-profit organizations such as the St. Louis based trail advocacy group, Trailnet. The St. Louis District is involved in several of these greenway efforts associated with existing Corps projects and lands and waters.

*Figure 4 – 77*
*Confluence Greenway and Bikeway Networks in the Project Area*




## Marina Developments

Private and commercially owned and operated marinas located on private lands are listed in *Table 4 – 78*. Pool 26, because of its location in the metropolitan area, has the greatest number of large marinas in the

bi-state region. Boating is a principle recreational activity on Pool 26. Sailing is more popular near the Alton area where the river pool is wide and deep rather than on the upstream end of the pool where the lake has a five mile per hour current and, with the exception of the channel, is shallow. Most boaters on Pool 26 are from the St. Louis Metropolitan area.

There are 26 full service marinas on Pool 26 which collectively provide more than 3,000 wet boat slips. These marinas range in size from as few as 40 slips to as many as 300 slips.

Houseboats and larger cruisers are the most common boats using the marinas and, consequently, several of the marinas on the pool have covered docks, lifts, storage yards and repair facilities necessary for larger boats. The predominance of the large boats and cruisers on Pool 26 is not evident on other lakes and rivers in the region with the exception of the Lake of the Ozarks.

Development of additional marina facilities both on and in the vicinity of Pool 26 is expected to occur in the future.

Only a few leased marina services are located on public lands. These areas are listed on *Table 4 – 79*. All marinas and boat clubs identified in *Tables 4 - 78* and *4 - 79* are also identified on the appropriate Management Area plates.

*Table 4 – 78*
*Private Marinas in the Rivers Project area*

| Map ID Number | Marina or Other Facility Name | State, County, City | River Mile and Bank | No. of Boat Slips | Other Services and Features |
|---|---|---|---|---|---|
| POOL 24 | | | | | |
| 24-2 | Louisiana Boat Club | MO, Pike, Louisiana | 283 R | N/A | Launching |
| 24-3 | Clarksville Boat Club | MO, Pike, Clarksville | 273.2 R | N/A | Launching |
| POOL 25 | | | | | |
| 25-1 | Timberlake Marina | MO, Lincoln, Elsberry | 257.7 R | 50 Slips | 40 Camping sites 11 Cabins |
| 25-2 | Pirys Marina | MO, Lincoln, Winfield | 241.5 R | N/A | Launching |
| 25-3 | Port of Winfield | MO, Lincoln, Winfield | 240.2 R | N/A | Launching |
| POOL 26 | | | | | |
| 26-1 | Johns Boat Harbor | MO, St. Charles | 231.5 R | 100 Slips | |
| 26-2 | Two Branch Marina | MO, St. Charles | 231.3 R | – | |
| 25-3 | Riverside Harbor | MO, St. Charles | 227.0 R | – | |
| 25-4 | Gooses Landing | MO, St. Charles | 226.5 R | – | |
| 26-5 | South Shore Marina | MO, St. Charles, Kampville | 226.0 R | 80 Slips | |
| 26-6 | Yacht Club of St. Louis | MO, St. Charles | 225.2 R | 200 Slips | |
| 26-7 | Lake Center Marina | MO, St. Charles, | 224.4 R | 272 Slips | |
| 26-8 | Heartland Marina | MO, St. Charles, | 223.0 R | – | |
| 26-9 | Woodland Marina | MO, St. Charles, St. Charles | 222.2 R | 300 Slips | |
| 26-10 | North Shore Yacht Club | MO, St. Charles, St. Charles | 222.0 Rat Hinge Point | 185 Slips | |
| 26-11 | Viking Boat Harbor | MO, St. Charles, | 221.7 R | – | |
| 26-12 | Anchor Marine | MO, St. Charles | 221.5 R | 110 Slips | |
| 26-13 | Duck Club Yacht Club | MO, St. Charles | 221.0 R | 114 Slips | |
| 26-15 | Hideaway Harbor | MO, St. Charles, Portage Des Sioux | 214.0 R | 60 Slips | |
| 26-16 | Venetian Harbor | MO, St. Charles, Portage Des Sioux | 213.0 R | 160 Slips | |
| 26-17 | Sioux Yacht Club | MO, St. Charles, Portage Des Sioux | 212.8 R | – | |

*Table 4 – 78 (continued)*

| | | | | | |
|---|---|---|---|---|---|
| 26-18 | Palisades Yacht Club | MO, St. Charles, Portage Des Sioux | 212.3 R | 200 Slips | |
| 26-19 | My River Home Boat Harbor Inc. | MO, St. Charles, Portage Des Sioux | 212.4 R | 195 Slips | |
| 26-20 | Valley Sailing Association | MO, St. Charles | 211.5 | – | |
| 26-21 | St. Louis Sailing Club | MO, St. Charles | 211.6 | – | |
| 26-24 | Harbor Point Yacht Club | MO, St. Charles, West Alton | 204.5 R | 226 Slips | |
| 26-25 | Pilot House Yacht Club | MO, St. Charles, West Alton | 204.2 R | 225 Slips | |
| OPEN MISSISSIPPI RIVER | | | | | |
| O-1 | Hoppies Marina | MO, Jefferson, Kimmswick | 158.5 R | – | |
| O-2 | Plattin Rock Boat Club | MO, Jefferson, Crystal City | 149.8 R | N/A | Launching |
| O-2 | Marina De Gabouri | MO, Ste. Genevieve, Ste. Genevieve | 122.5 R | – | Restaurant, Fuel, Shipstore |
| LOWER KASKASKIA RIVER | | | | | |
| K-1 | Kaskaskia River Marina | IL, St. Clair, New Athens | 28.2 L | 50 Slips | 27 Campsites, Shipstore, Restaurant, Boat Services |

– Information Not Available
N/A Not Applicable at this Site

*Table 4 – 79*
*Commercial Concession Recreational Marina and Boat Club Developments on Public Lands*

| Map ID Number | Marina or Other Facility Name | State, County, City | River Mile and Bank | No. of Boat Slips | Other Services and Features |
|---|---|---|---|---|---|
| POOL 24 | | | | | |
| 24-1 | Two Rivers Marina | IL, Pike, | 283.0 L | 125 Slips | |
| POOL 25 | | | | | |
| 25-4 | Calhoun Sportsman Club | IL, Calhoun, Batchtown | 242.0 L | N/A | Launching and Mooring |
| POOL 26 (Including Illinois River) | | | | | |
| 26-14 | Sherwood Harbor | MO, St. Charles, | 219.0 R | 112 Slips | |
| 26-22 | Alton Boat Club | IL, Jersey, | 209.5 L | 80 Slips | Upper Piasa Creek |
| 26-23 | Piasa Harbor | IL, Jersey, | 209.5 L | 216 Slips | |
| 26-26 | The Alton Marina | IL, Madison, | 202.0 L | 182 Slips | |

N/A Not Applicable at this Site

## Recreational Uses and Economic Significance on the UMRS

The value of the Upper Mississippi River System (UMRS) as a nationally significant resource is widely recognized. The system is vital in supporting ecological systems, commercial navigation and a wide variety of recreational activities.

In order to learn more about the types and economic significance of recreational use of the UMRS, Congress authorized a study in 1986 (Public Law 99-88) to measure the economic importance of recreation in the UMRS. The study was fully completed and published in April 1995.

In summary, the study estimates that throughout the UMRS over 12 million daily visits by recreationists took place during the study year. These visits resulted in direct and secondary expenditures of over $1.2 billion that helped maintain over 18,000 jobs.

Other study findings of relevance to the Rivers Project area are as follows:

- More than 2.3 million recreational party trips to the UMRS were made to developed areas, sightseeing/visitor center areas, marinas and permitted docks during the study period. These trips equate to over 12 million daily visits.

- Boating, fishing and sightseeing were the most popular activities. Half of all visitors boated.
- Over 60 percent of the people made their trips to developed public recreation areas, with the remaining trips being made to marinas, primarily on private lands (26 percent), sightseeing/visitor center areas (7 percent) and permitted docks (4 percent).
- Residents of counties that border the UMRS accounted for the majority of the trips, ranging from two-thirds to three-fourths for all types of access. Single day trips were predominant (around 75 percent) when compared with trips that included overnight stays. Average party sizes were larger for trips to permitted docks and marinas.
- Visitors spent over $190 million on items consumed on trips during the study year. Spending on durable items amounted to over $150 million during the study year. The average spending per visitor per day for items consumed on trips was $15.84. Most of this spending was for food, gas, lodging, and boating expenses.
- Patterns in spending were evident. The most influential factors were distance traveled, length of trips (daily or overnight), and use or non-use of boats. These patterns can be used in future studies in the UMRS.
- Spending on durable items used on trips, such as boats and fishing gear, averaged $12.54 per visitor per day. Most of this spending was on boating equipment, camping vehicles, and fishing gear.
- Visitors to marinas spent more, on average, than visitors to other areas. The value of all boats in marinas was approximately $600 million.

Recreational activities in the 76 counties bordering the UMRS during the study year resulted in direct and secondary expenditures of $400 million that helped maintain 7,200 jobs. Service industries, retailers, manufactures and finance and insurance providers were affected most.

One-third of all spending in the 76 corridor counties was made by nonresidents, representing “new dollars” to the region.

*Table 4 – 81*
*Recreational Use of the Upper Mississippi River System by Access*

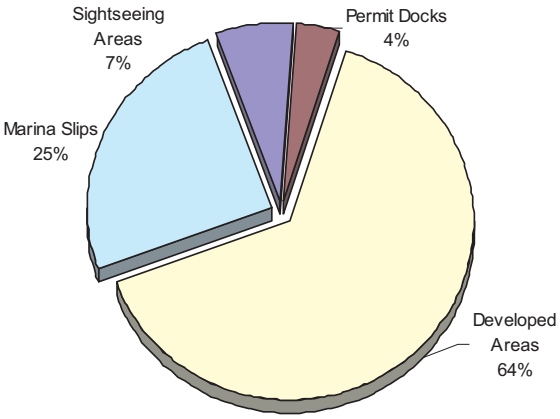



*Figure 4-82*
*Summary of Recreational Activities For Entire UMRS*

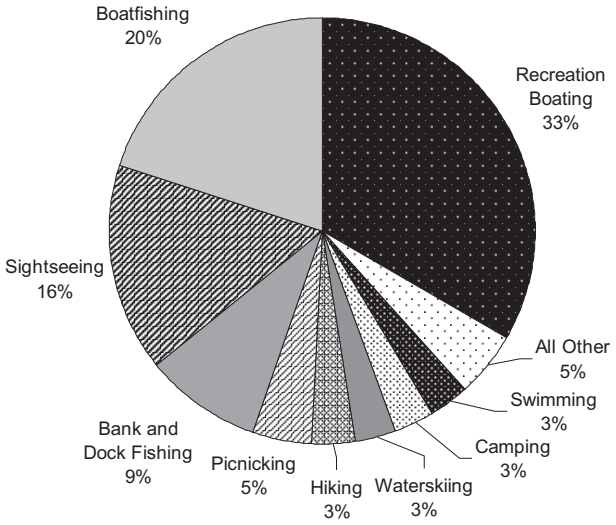



*Figure 4-83*
*St. Louis District Recreational Activities Based on Surveys*