Imagining the Futures and Impacts of a Naturalized Emiquon Preserve Using An Extended GIS

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ABSTRACT

River and floodplain naturalization activities in the state of Illinois have received much public and political support in recent years. The Illinois River, a major tributary of the upper Mississippi River and a major shipping channel in the state, has been the site of many floodplain and uplands naturalization activities. The current policy focus is to restore natural service flows while minimizing the negative effects on commercial flows from the Illinois River. The Nature Conservancy (TNC), a non-profit conservancy organization, has acquired Emiquon Preserve, a 7,600-acre site on old agricultural land on an historic floodplain in the middle reach of the Illinois, with an eye to reconnecting it to the River proper and naturalizing it beginning in a few years' time. Its goal is to restore pre-agricultural development ecological processes and habitats that sustain native species. The TNC also wants to be a good partner and has suggested facilitating tourism development in the region to ameliorate any negative financial impacts on the subject county and region. This paper presents a rudimentary spreadsheet model, *EmiquonViz*, to examine the economic, social environment, and fiscal impacts of "sticking" a park in one of the most economically depressed counties in the region as well as the effects on its cross-river neighbour. Ex ante impact assessment should inform and enhance the capability of planning so that beneficial and corrective actions are possible. *EmiquonViz* was implemented in ArcView 3.3™ using the CommunityViz™ Scenario Constructor™ extension. This project afforded also the opportunity to reflect on computer-based tools that support planning, their strengths and weaknesses, and their potential role in collaborative planning forums. The latter brings to bear the human dimension of large-scale projects that often goes unnoticed or underappreciated by experts and the powers that be.

INTRODUCTION

Developed and regulated river-floodplain ecosystems are increasingly being recognized for their potential to be naturalized or restored. Naturalization involves conversion of some components of human-altered ecosystems to a more naturalized state and at the same time involves maintenance or enhancement of existing social and economic uses (Sparks et al 2000). Restoration, in contrast, entails returning the ecosystem to some pre-development condition, which is largely infeasible because both basin and river generally include highly developed areas (Koel & Sparks 2002).

In the U.S., various partnerships among private landowners, non-governmental environmental organizations, and government agencies have been actively embarking on floodplain and uplands naturalization activities through buy-outs of agricultural levee districts and rehabilitation of degraded floodplain areas and problem riparian zones and watersheds (Sparks et al. 2000). In particular, the Illinois River, the study area of this paper, has been the focus of much research and field activities.

While there is little doubt as to the overall objective of river-floodplain naturalization, which is to increase or restore the flow of ecological service benefits with little or no net cost to society (Sparks 2000), in reality there is considerable uncertainty as to how naturalization will impact local economies and livelihoods. In many instances, eco-tourism is being touted as an economic panacea to circumvent any and all potential economic disbenefits from removing tracts of agricultural land from production as well as the loss of its associated property tax base (Blodgett, K.D. personal communication 2003). A-priori assessment of development impacts should help inform and enhance the capability of planning so that beneficial and corrective actions are possible (Barrow 1997).

In this paper, we describe and present the results of a simple spreadsheet model that was developed to examine the socio-economic dimension of developing an analogue state park and lodge on an historic floodplain that is planned to be naturalized. The overall objectives were to (1) examine quantitatively the social and economic impacts on two counties in the La Grange Reach of the Illinois River from tourism development; to (2) implement the scenario model using an extended version of a geographic information system (GIS) software; and, to (3) ruminate the potential of using this scenario tool in a planning framework. We see the potential to refine and extend this model further so that it can be reliably deployed in stakeholder workshops.

First, we give a primer on the history of development in the Illinois River region, followed by a description of the current status of the study area. We use census and economic data to sketch a picture of the two subject counties. Second, we review literature on development impact assessment, notably economic, fiscal, and social impacts. Third, we present the model logic, methodology, and functionality of EmiquonViz. We present additional literature germane to the methodology as well as about planning support tools and scenario analysis. We conclude the paper by presenting some sample results and suggestions for further research.

BACKGROUND

Development in the Illinois River basin in the past 100 years reflects the dynamics of changing social and economic values. The 326-mile long (525 km) Illinois River is a major tributary in the upper Mississippi River system and a major source of economic productivity in the State of

Illinois. At the turn of the 20th Century, the Illinois River basin was exploited for its bountiful resources and fertile land – in 1908, 10% of the total US harvest of freshwater fish came from the River; by 1930 more than 100,000 acres of floodplain (over 1/3 of current levee-protected area) had been converted to agriculture production (Sparks et al. 2000; Illinois River Strategy Team 1997). To allow for adequate water levels for shipping, a modern system of locks and dams was set in place by the 1930s, permanently altering water levels on the River and starving backwater areas (Sparks et al. 2000). By the 1950s, pollution and modified water levels had virtually destroyed all aquatic vegetation from the River and its backwater lakes (Illinois River Strategy Team 1997). The intensification of agriculture led to soil erosion and sediment loading, which directly caused an abrupt decline in the quality of fish and wildlife habitat (Sparks et al. 2000). Over 14 million tons of sediments are transported annually through the Illinois River watershed (Illinois River Strategy Team 1997).

In Illinois, there has been a concerted effort among different levels of government and agencies to cooperatively address the concerns of the aquatic and terrestrial regimes. For example, over US$500 million in federal and state funds have been committed over the next decade for riparian and watershed restoration and related activities that will address excessive yields of sediment, water, nutrients, and contaminants from agricultural land. Partnerships have been established to pull together the seemingly divergent interests of natural resource stewardship and local and regional economic and recreational development (Sparks et al. 2000).

Ultimately, for these activities to be sustainable, grassroots support must be strong and evident in order for decisionmakers, such as Congressional representatives, governors, and state representatives to act accordingly for their constituencies. In order to build strong grassroots foundation, the direct and indirect benefits that naturalization and related activities can bring to communities in terms of improved quality of life and enhanced local economies must be demonstrated (Sparks et al. 1999). The La Grange Reach of the Illinois River, where much of the naturalization activities in the state are taking place, is sparsely populated and economically depressed.

STUDY AREA

The study area comprised Fulton and Mason counties, which are on opposite banks of the Illinois River located between the Peoria and La Grange lock-and-dams, which bounds the La Grange Reach (Figure 1). The Nature Conservancy (TNC) has been an active player in promoting preservation and restoration in the Illinois River basin. During the 1990s, TNC acquired over 7,000 acres of previously farmed agricultural land (and historic floodplain) in Fulton County, now called Emiquon Preserve. Adjacent to Emiquon Preserve are several plots of land owned by US Fish & Wildlife (USFW). The closest municipality to the Preserve is the City of Havana (pop. 3,577), the county seat in Mason County. The City of Lewistown (pop. 2,522), the county seat in Fulton County, is located 4.5 miles northwest, while the City of Canton (2000 pop. 15,288), the closest large municipality, is located 14 miles due north (Figure 2).

(Figure 1 About Here)
(Figure 2 About Here)

TNC's vision for the Preserve is "to restore natural ecological processes and habitats that promote and sustain the native species and aquatic and terrestrial communities once found in this region of the Illinois River" using principles of adaptive management. The Preserve would be reconnected to the Illinois River proper. Success with Emiquon Preserve could predicate the success of

building constituency for future naturalization activities in Illinois and around the country. TNC's secondary objectives for the Preserve include the development of educational programs to attract visitors to interpret the cultural and ecological resources of the area; and, the development of opportunities for compatible and complementary recreational and economic activities (TNC 2003).

The city council in Lewistown has voiced its position by officially voting in opposition to the Emiquon Preserve project. By taking the land of agricultural production, the school district that covers the Preserve (and Lewistown) would lose out on a major source of its property tax revenues. The council may also perceive other potential impacts from naturalization that could explain its negative attitude towards the project. In order to show that it is indeed a responsible neighbour and partner, TNC has tentatively "set aside" a 100-acre area on the northern bluff of the Preserve that could be used to site a tourist lodge (Blodgett, K.D. personal communication 2003). The logic implied by this olive branch is that a lodge and a successfully naturalized Emiquon Preserve will attract non-local visitors and thus outside money into the local economy as well as enhance tourism development in the county and larger region. We can imagine Emiquon Preserve, in this case, as a state park and lodge in Illinois, but owned and operated wholly in private hands. The spreadsheet model, EmiquonViz, follows by helping us imagine what the impacts on Fulton County and its neighbour, Mason County, are, the latter having a relative advantage in terms of tourist infrastructure (i.e., proximity and access to the Preserve, accommodation).

Before we proceed with the literature review and methodology, we examine in the next three sub-sections the commuting patterns, economic specialization, and population and employment trends of these two economically distressed counties.

Commuting Pattern

The Illinois River acts as a divide in the La Grange Reach, which comprises Brown, Cass, Fulton, Mason, Morgan, Peoria, Schuyler, and Tazewell counties. The only passage across the River along the Reach, other than through the cities of Peoria (Peoria County) or Beardstown (Cass County), is through Havana in Mason County. In particular, highway access to Emiquon Preserve is limited. US Highway 136 runs east west through Mason (via Havana) and Fulton, where it intersects with US Highway 24, which runs through Lewistown. Traversing straight through Emiquon, and doubling as a north-south levee, is State Highway 97/78.

Accordingly, the US Census Bureau's 2000 Journey-To-Work statistics show a lack of commuting linkage between the counties that face each other across the River. The La Grange Reach may be a *region* in a geophysical sense, but it is not an economic region in the traditional sense of a core county and surrounding counties, which supply workers.

Both Fulton and Mason exhibited similar commuting patterns, as well as a lack of economic linkage with each other (Table 1). The majority of employed Fulton residents worked inside their own county (58%); just under half of employed Mason residents worked in the same county (49%). The second major destination of work for employed Fulton residents was Peoria (18%), followed by Tazewell (7%); only 2% commuted to Mason to work. For employed Mason residents, 14% commuted to Tazewell to work, 10% to Sangamon, and 3% to Fulton.

(Table 1 About Here)

Fulton and Mason are not attractors of employment (Table 2). The vast majority of workers in Fulton and Mason were made up of their own residents (86% and 76%). Interestingly, the next largest source of workers in Mason was Fulton at 8%, whereas the second largest source in Fulton was Peoria at only 3%. Workers from Mason made up only 2% of Fulton's workforce by place of work. In terms of job sufficiency, or whether a county has more jobs than employed residents, only Brown, Morgan, and Peoria had ratios greater than 1.0. Fulton had a ratio 0.68; Mason's was 0.65. A county having a ratio less than 1.0 means that it is supplying workers to other county(ies) and that it is not an employment hub. Whether a county is specialized in a particular industry requires an examination of Bureau of Economic Analysis and County Business Patterns statistics.

(Table 2 About Here)

Another measure of commuting patterns is the residential adjustment (Figure 3). The residential adjustment is the earnings of county residents working outside the county minus the earnings of non-residents working in the county. A negative number means that money is flowing out of the county; this is synonymous with a regional employment centre. Peoria exports jobs to surrounding counties, although not necessarily to neighbouring La Grange Reach counties as mentioned above. Fulton and Mason's residential adjustments have been increasing and are greater than the other counties.

(Figure 3 About Here)

Economic Specialization

Fulton and Mason counties were still primarily specialized in farming as of 1999 (Table 3). At the 3-digit North American Industry Classification System (NAICS) level, including farm and government employment, Fulton had over 1,000 extra farm jobs relative to the national per capita level; it was *specialized* in farming. Employment in local government and nursing and residential care facilities each represent over 300 extra jobs. In Mason, we see the same pattern, with farm employment representing over 500 extra jobs, followed, albeit with a large drop-off, by jobs in local government and primary metal manufacturing.

(Table 3 About Here)

Fulton and Mason lacked jobs in several notable industries relative to the national average (Table 4). At the 6-digit NAICS level, both counties showed a "deficit" in extra jobs in full-service restaurants and hotels and motels. In addition, Mason lacked jobs in general medical hospitals and offices of physicians. Canton, the largest municipality in Fulton, has a 124-bed hospital, whereas Havana has a much smaller 36-bed facility.

(Table 4 About Here)

Population and Employment Trends

In 2000, the census counted 38,202 people in Fulton County and 16,022 in Mason County. Fulton lost 6,000 people in the 1980s due in part to the closure of bituminous coal mines and the exit of International Harvester, where were major employers in the county and region (Sinclair,

B. personal communication 2003). The relative boom times of the 1990s saw Fulton's population stabilize, albeit with slight decreases in recent years. Mason's population also declined during the recession of the 1980's. The bull-market 1990s was a relatively stable period for both counties (Figure 4).

(Figure 4 About Here)

Between 1990 and 2000, the greatest gains in employment in Fulton came in finance, insurance, and real estate; construction, services; and, local government (Figures 5 and 6). All other major sectors experienced either small absolute gains or negative changes, with manufacturing and transportation and public utilities experiencing the greatest losses. In Mason, most of the major sectors gained jobs, with the leader being manufacturing. Only mining, military, and wholesale trade lost jobs. Only in Fulton did both farm employment and farm proprietor's employment decrease, which is consistent with the buy-outs of agricultural land.

(Figure 5 About Here)
(Figure 6 About Here)

In terms of absolute employment by place of work, the major employment sectors in both Fulton and Mason are services, retail trade, state and local government, and farming (Tables 5 and 6). However, time series charts of population-based location quotients (based on the county populations of La Grange Reach only) affirm that Fulton and Mason neither specialize in service and retail employment nor tending towards specialization (Figures 7 and 8). The location quotient measures the county employment per capita in a sector relative to a region; a ratio greater than one means that the county has more jobs per capita relative to the region, and vice-versa. In contrast, Peoria is specialized in these two sectors.

(Table 5 About Here)
(Table 6 About Here)
(Figure 7 About Here)
(Figure 8 About Here)

Fulton and Mason consistently had the highest unemployment rates among the eight La Grange counties and the entire state (Figure 9). The latest statistics show that unemployment rates are rising again across the board, reflective of the current national economic woes. In summary, these two counties have been and are still more distressed economically when compared to the other counties in the La Grange Reach and the nation.

(Figure 9 About Here)

IMPACT ASSESSMENT LITERATURE

In this section we review the literature pertinent to the assessment of economic, fiscal, and social impacts in the context of tourism development. In the methodology section, we present in greater detail the literature that directly informed the methods and parameters used in developing the spreadsheet model.

Economic Impacts

Development, such as a new shopping mall, residential subdivision, or a new amusement park, generates direct, indirect, and induced sales, employment, and income impacts from the construction phase through to operation (Burchell et al. 1994). In tourism development, the driver of economic impacts is spending by those visitors who do not reside in the study community. Non-local visitor expenditures (NLVE) represent "outside" money, as opposed to a simple recirculation of money brought about by local visitor expenditures. Economic impact analysis thus functions to measure the economic benefits that accrue to a community (Crompton 1993).

Germane to economic impact analysis is the multiplier concept. The multiplier represents the rippling effect through an economy from the change in final demand of an industry or sector. This rippling effect comprises a first round effect (direct impact), followed by second and subsequent rounds of economic activities and effects (indirect and induced impacts) (Crompton 1993).

Secondary and total impact of tourist expenditures can be derived from either an ad-hoc model or input/output model. The ad-hoc model is simple but aggregated; it takes as inputs the proportion of tourist expenditure remaining in the area after first round leakages, the propensity for local people to spend on local goods and services, and the proportion of expenditure of local people that accrues as local income. Input/output analysis, on the other hand, shows the interactions between industry sectors. Input/output analysis can be used to derive Type I (direct + indirect effects) or Type II (direct + indirect + induced effects) multipliers depending on whether households are exogenous or endogenous, respectively. Drawbacks to the input/output method include the static and linear natures of the sector interactions, and the resource cost of deriving and updating the technical coefficients. In the case of tourism, it is not unambiguous what sectors constitute it. (Pearce 1989; Fletcher & Archer 1991; Frechtling 1994; Kaiser et al. 1995; Murphy 1985; Bull 1991; Ryan 1991).

Tourism-related multipliers may be defined as the ratio of total economic effects to NLVE. The precise economic effect measured may be sales, employment, or income. The latter is the most useful of the three economic impacts because residents and decisionmakers are ultimately interested in how much extra income accrues to the host community from NLVE; for example, "an income multiplier measures the direct, indirect, and induced effect of an extra unit of visitor spending on the changes that result in level of household incomes in a host community" (Crompton 1993, p.20). Total sales effects are necessarily larger than income effects but they do not show what actually accrues to the community as income. Employment effects are the least reliable.

Economic impact analysis per se measures the benefits of visitor spending. To put the results in perspective, they should be compared to benefits derived from "equivalent investments designed to create economic stimulus in other sectors of the economy" (Crompton 1993, p.33).

Naturalizing agricultural land to natural conditions can potentially stimulate demand for recreational services, help diversify an otherwise agriculture-dependent economy, and induce new residential and commercial development (Sparks et al. 1999, 2000). However, tourism and recreation may not be the panacea that many believe them to be. Keith et al. (1996) found that those rural Utah counties that base their economy on tourism and recreation "exhibit annual employment variability much greater than those counties which rely on alternative economic activity" (p.96). They suggest that these counties would likely experience fiscal stress due to

confounding capital needs, variable employment cycles, and the lower-wage quality of employment. Fiscal and social impacts assessments can be used to gauge the public and social costs to the host community.

Fiscal Impacts

Fiscal impact analysis is essentially the estimation of the public service costs and revenue effects associated with various types of land uses on local governmental jurisdictions or other local service providers. Public costs comprise operating (recurring) costs and capital costs; public revenues comprise real property revenues, operating revenues, and capital revenues and credits (Siegel et al. 2000; Burchell et al. 1994; Edwards 2000).

Typically, a development will generate new residents and employees. The local municipality can disaggregate its current budget based on current residential and non-residential land uses, thus producing per capita and per employee unit costs and revenues. The number of new residents and employees generated by the new development are multiplied by the unit costs and revenues to yield the increase in public operating costs and revenues, respectively. Capital costs can be calculated from the cost of meeting the average incremental demand for a service standard, e.g. x police vehicles per 1,000 population; larger capital projects such as a wastewater treatment plant would need to have its cost capitalized to determine the annual debt. Property revenues are derived from the property value of the development and the current real estate tax rate (Siegel et al. 2000; Edwards 2000).

Although quite convenient in terms of data requirement and methodology, this average per capita/employee method fails to recognize that new development costs and revenues may be different from existing population and development; it does not consider the functional excess or deficient capacity in existing community facilities; the types and intensities of services consumed by new residents may be different from the existing population; it does not capture the interactions among land uses, the cumulative impacts of development, and, extra-jurisdictional fiscal impacts (Siegel et al. 2000; Edwards 2000). A case study method or econometric-based analysis, although more resource and time-intensive, can address some of these deficiencies (Burchell et al. 1994).

In the context of tourism development, revenues can be better derived from economic impact assessment methods. For costs, Frechtling (1994) suggests proportioning the cost of each public service by the number of visitors to the average census (the total number of residents, in commuters, and visitors present in the community for one year). Tatzin (1978) takes this approach one step further by explicitly considering the probability that a visitor type will use a service as well as the relative intensity of consumption (with respect to a resident). However, both of these methods are ex post and do not account for prospective impacts from new development. Marketing and advertising expenses constitute fiscal costs also.

A final criticism of fiscal impact analysis is that inputs (i.e., public expenditures) become the measure of well-being rather than outputs, such as some welfare-based level of service. Maintaining, or even increasing, current levels of expenditure per capita, for example, do not necessarily translate into maintaining prior levels of service (Heikkila & Davis 1997). These and other life-quality costs (Frechtling 1994), that affect current residents and are less amenable to quantitative measurement and aggregation, can be considered as social impacts.

Social Impacts

The social impacts of tourism can be wide-ranging and nebulous. What counts as a social impact for one person may not be the same in type, intensity, and direction for the next person. Common impacts from development include labour force displacement, structure of employment, land value, living standards, social and economic classes, and cultural. Also, measures of success of a tourist destination, like volume and type of visitors, duration of stay, and activity of tourists, can easily be turned around and used as indicators or factors of negative social impacts (Crandall 1994).

Crandall (1994) suggests using multiple methods to assess social impacts. Social impacts can still be reasonably examined as the quantitative changes in the social environment, driven by changes in population and employment stemming from a development, that cause (relatively qualitative) changes in the social wellbeing of the host community. Burchell et al. (1994) list a set of planning standards/service levels that represents a cross-section of public services that they suggest should be met on average, such as classroom size, library space, physicians, and fire service vehicles. The value-laden and subjective nature of social wellbeing is much more difficult to assess, and costly if primary data is required. Thus, instead, the emphasis has been marked by pragmatism by looking at quantitative baseline and projected social environment indicators (Burchell et al. 1994).

A comprehensive ex-post and ex-ante approach to assessing pre-development impacts involves looking at similar developments that have occurred in other areas of comparable social-economic, geographical, and cultural attributes. The inclusion of a third, control community allows ongoing changes to be isolated from developmental changes. Johnson & Burdge (1974) originally proposed this *comparative diachronic analysis* approach in response to large-scale natural resource development projects and the need to integrate social impact assessment within the framework of the environmental impact assessment. Its lens of inquiry starts from the policy and planning development phase through to project decommissioning (Johnson & Burdge 1974; Burdge & Johnson 1977; Burdge 1987; Burdge 1990).

METHODOLOGY

In this section we describe the structure of EmiquonViz and its calculation flows. The literature reviewed in the previous section helped to inform the design of this scenario spreadsheet model. Additional literature informed the logic behind the calculation flows, variables, and parameters. In this model we are interested only in the impacts generated from the presence of a realized Emiquon Preserve. EmiquonViz comprises three submodels: Tourism, Income, and Services (Figure 10). The model starts from the user supplying key information to the Tourism submodel, which drives the remaining two. Since EmiquonViz does not take time into explicit consideration, we assumed that the impacts are representative of the tourist area, Emiquon Preserve, at some equilibrium state, even though we use data and make assumptions primarily from the year 2000. The only explicit feedback in EmiquonViz is in the Tourism submodel. For detail information on look-up tables, variables, constants, automated themes and attributes, indicators, as well as qualitative description of calculations, please refer to the Appendices.

(Figure 10 About Here)

Tourism Submodel

The Tourism submodel incorporates user inputs, adjustable variables, and look-up tables to generate visitation rates by visitor type by season, which then are used as inputs in the Income and Services submodels. The results are fed into assorted indicator formulae and presented in the form of charts.

Visitor type and visitation rates are the primary variables driving the model in terms of income generation and service demand. Both of these variables are dependent on the facility class of Emiquon Preserve. Donnelly et al. (1998), in a study of four Colorado State Parks, found that as the number of facilities and types of activities in a park increases so too does direct visitor expenditure. Facilities include campsites, trails, boat ramps, electrical hookups, showers, and dump stations; they predicate activities like water and trail activities.

We surmised that since visitor expenditure is related to the type of person visiting the tourist area (see Income submodel), as well as to the number of "captured" visitors from the existing market for state parks that offer similar attractions and recreational opportunities and activities, then facility class could be made an independent and explanatory variable of visitor type breakdown and visitation rates. We constructed two look-up tables to encapsulate these two hypotheses.

What determines the facility class is the range and number of activities and accommodations available and allowable on the Preserve. In EmiquonViz, the user assumes the role of policymaker who can decide whether boating, fishing and hunting, camping, and a lodge are allowed on the Preserve. The first three are activities; camping also doubles as an accommodation. If all four "elements" are allowed, then the park is assigned a facility class of HIGH; if two or three of these recreational choices are allowed, then the facility class is MEDIUM; if fewer than two choices are allowed, then the facility class is LOW. To arrive at a gross number of park visitors, we used attendance records from existing state parks (i.e., the ones with lodges) and state conservation areas. If a lodge exists then attendance at Emiquon Preserve will be based on state park attendance. If not, then attendance will be based on those of state conservation areas in the vicinity of the Preserve (Table 7).

(Table 7 About Here)

The fair share principle underlies this technique of deriving demand. Simply stated, it assumes that a new facility, be it a park or grocery store, will attract at least its proportionate share of the aggregate market demand (Rutes et al. 2001). For example, we can make an assumption that Emiquon Preserve will capture 5% of Pere Marquette's market. We can adjust this number further by considering market penetration, as a percentage of this market fair share. So, if the naturalization of Emiquon Preserve turns out to be successful (i.e., pristine natural habitat combined with generous and pleasing views of the floodplain and abundant potential for active human recreation use) then we may, for example, want to assume a market penetration of 110% (i.e., the refined market fair share becomes 5.5%).

Visitors are classified by the type of accommodation they use or do not use: Day Only (DO), Paid Accommodation (PA; hotel, motel, and bed and breakfast patrons), Campers (CA), Friends and Relatives (FR), and Second Home Owners (SHO). We assumed that the duration of stay for each visitor type, except for Day Only of course, varies with the season (i.e., summer or winter). Thus, using the visitor type breakdown as a function of facility class and the duration of visit by season, EmiquonViz can derive an estimate of the potential visitation by visitor type by season to

Fulton and Mason counties. Based on Propst et al. (1993) the vast majority of visitors to recreational sites in the UMRS are DO. Attendance records for Pere Marquette and Starved Rock state parks also show that the number of campers make up only 1 – 2% of all visitors in a year. (Illinois Department of Natural Resources 2003).

The *actual* potential attendance will be different due to the current supply of bed spaces and assumed seasonal occupation rates in the vicinity of Emiquon Preserve. This constraint only affects PA and CA visitors; we assumed that there are (will be) sufficient beds for the other visitor types. The user can adjust the current bed supply in the look-up table, as well as assign "new" beds to the region to represent development in new paid accommodation facilities. The bed supply is calculated for both summer and winter seasons. A trip of one night is assumed to last two days. The smaller of the number of bed-nights and visitor-nights values are selected and used to revise the visitation estimates (i.e., visitor-days). PA and CA visitor-nights are subsequently used only to calculate hotel/motel/bed and breakfast (HMBB) room and campground site sales.

In deference to the Income submodel, we allocated the visitors to Fulton and Mason as well as the percentage of which are non-local residents. We allocated PA and CA visitors using the respective share of HMBB rooms and campground party sites, respectively, in the two counties. For example, if Fulton has 10% of HMBB rooms, then 10% of the visitor-days are assigned to that county. We allocated FR visitors by using the respective share in households in the two counties. For both DO and SHO visitors, we relied on user-adjustable variables. Non-local visitors were distinguished using a look-up table.

One major impact of nature-based tourism is that the physical attributes of the environs also draw interested parties wishing to develop non-primary residences in the area. To measure the amount of land demanded in Fulton County, we transformed the number of SHO visitors to parties, and then to households. We assumed each SHO household represent one new house on a single lot. We assumed a minimum lot size, based on the current Agricultural Conservation District zoning ordinance in Fulton County, for a residential dwelling. On the supply side, we generated a viewshed by selecting as a target view a partial outline of the old Thompson Lake on the Preserve. The viewshed map thus reveals the ridgeline on the bluff where one can see the lake outline. The viewshed areas are the gross amount of land that is presumably very attractive for residential development *without* considering other physical constraints, such as slope, soil conditions, access to highways, and tax regimes. We did not take into account land consumed for roads, easements, open spaces, and other non-residential land uses. We did not model the interactions between residential development, real estate valuation, employment, and fiscal impacts

The presence of Emiquon Preserve could conceivably raise the residential assessed valuation for townships in Fulton County where the Preserve is located. Previous studies have found that urban and large rural parks do have positive effects on proximate property values. What is less determinate is the magnitude of the proximate effect and the distance over which the impact of park land and open space extends (Crompton 2000). For example, in a 1971 study the townships of 15 park land acquisitions made in Pennsylvania by the US Corps of Engineers or Pennsylvania State Parks had land values increase "from 6% below the control areas values before acquisition, to 7% above them after acquisition" (p. 59). However, since the literature on large rural parks is relatively sparse, we chose not to incorporate the *proximate principle* into EmiquonViz.

Income Submodel

The Income submodel follows the methodology of the Money Generation Model (MGM), which was developed by the National Park Service (NPS) "to generate quick and inexpensive estimates of the economic impact of National Park visitor spending on the region's economy" (Stynes 1999, p. 4) as well as the more disaggregated update, Money Generation Model 2 (MGM2) (Stynes et al. 2000). The submodel takes the Tourism submodel output, actual visitation by visitor type by season by county, and visitor expenditures by spending category and multipliers to derive estimates for Fulton and Mason counties the total sales effects, local sales tax revenue, and total income effects.

Expenditure data came from the Upper Mississippi River System (UMRS) visitor spending profile survey conducted in 1989/90 (Propst et al. 1993; Chang 2003). The survey study area covered portions of Minnesota, Missouri, Wisconsin, Iowa, and Illinois (including the La Grange Reach), and account for spending at both U.S. Army Corps of Engineers lock and dam facilities and sightseeing areas that provide active and non-active recreational opportunities. Specifically, we used the table showing party-day trip spending by activity segments (Chang 2003). In this look-up table, there are nine spending categories for DO active visitors, DO non-active visitors, and Overnight visitors. Active participants, according to Chang (2003), comprise people who participated in boating, fishing, hunting, water-skiing, or cross county skiing. Therefore, if the user of EmiquonViz originally allowed for boating and/or fishing/hunting activities on the Preserve (see Tourism submodel), then these two spending categories would apply to all visitor types.

For DO visitors, if boating and/or fishing/hunting activities are allowed then we would use the "active" spending field for active DO visitors; if neither activities are allowed, then we would of course use the "non-active" spending field. This is because, by inspection, spending in other categories (i.e., groceries, auto and recreational vehicle) look to be related to whether the spender was an active or non-active visitor. Unlike for DO visitors, we did not proportion active and non-active overnight visitors; all applicable spending categories apply to them.

To determine the spending by PA visitors, we used all the spending categories in the UMRS survey, again depending if boating and/or fishing/hunting are allowed, except for hotels and motels. For example, if the user chose to build a lodge in Fulton County, HMBB spending was determined by first allocating the PA visitors in Fulton County to patrons of the lodge, to new HMBB development, and to the existing HMBB stock. Assuming a lodge room rate and average HMBB room rate, both of which are user-adjustable, we can calculate the spending on overnight accommodations. To perform a similar operation for CA visitors we utilized a user-adjustable Emiquon campground site fee. Instead of implementing a user-adjustable campground site fee, we used the value from the UMRS survey. We adjusted all spending for inflation using a consumer price index look-up table representative of the Midwest urban region (Bureau of Labor Statistics 2003).

The total sales effect for each county is the product of its share of non-local visitor expenditure (NLVE), the capture rate, and the Type II sales multiplier. The capture rate is simply the proportion of NLVE that accrues to local production. A rate of 80% for a particular good, for example, means that 20% of NLVE leaks out of the interested area to cover the costs of producing the good outside the area as well as transportation. A look-up table was constructed for each spending category. The Type II multiplier estimates the direct and indirect sales effects from the captured NLVE. The user can adjust the multiplier on the fly.

Local sales taxes are calculated from the direct expenditures of each spending category. In Fulton and Mason, the state sales tax on general merchandise is 6.25%, of which 5% goes to the state, 0.25% goes to the county, and 1% goes to the point of sale (i.e., the municipality in the county where the final acceptance of an order takes place; Illinois Department of Revenue 2003; Blessman, personal communication 2003).

The total income effects for each county are the product of its NLVE, capture rate, and Keynesian income multiplier. The income multiplier is the ratio of total income effects and direct sales. Like total sales effects, considerable uncertainty exists for this multiplier, which we left for the user to adjust freely. An alternative way of thinking about total income is to simply assume/guess a tourist income multiplier to multiply with NLVE. This multiplier is implicitly a product of the capture rate and Keynesian income multiplier (Stynes 1999).

Since income is considered the most important indicator of tourism economic activity, we decided to "normalize" it by placing total income effects in two different contexts. First, we divided into total income the earnings by place of work in 2000 to derive an indicator of full-time equivalent (FTE) jobs. This FTE indicator does not per se represent the expected number of jobs created from a given level of tourist expenditures – that would assume all existing employees are fully utilized and cannot be *utilized* beyond current levels (Crompton 1993), nor does it comprise the number of workers employed by the Preserve since that can be assumed explicitly elsewhere based on comparable park facilities. Further, the earnings variable can be adjusted since it does not necessarily represent the relatively low annual income of a typical employee working in the retail trade and service sectors (Keith et al. 1996), if indeed that is the objective of the indicator.

To put the total income generated in another context, we divided into it the portion of the median family income in 2000 that is spent on goods and services. The percent spending is an adjustable variable. The resulting indicator shows the equivalent number of new families that must come to the county that could generate the same annual income effects (Frick & Ching 1970). This indicator may suggest that given scarce resources and relative implications and costs, a county can decide to either invest in programmes that could attract people into the county to live (i.e., jobs), or invest in tourism programmes to draw visitors to spend money in the county.

Services Submodel

The Services submodel calculates social environment changes and some of the associated fiscal costs. Social environmental changes by season by county are determined using as input the average daily census, or the number of visitors in either county on any given summer or winter day, and assorted planning standards/service level factors from the *Development Impact Assessment Handbook* (Burchell et al. 1994). Using off-the-shelf factors is inherently problematic, however. These factors, better known as rule-of-thumbs, may represent planning concepts that are now obsolete and inaccurate. Since there is a myriad of service demands, we chose to include in EmiquonViz only fourteen factors. The user can readily add more factors to the model. Applying these factors to visitors directly assume that visitors behave like residents of the community. Also, the implicit assumption is that current service provision is maximized and that each visitor represents an incremental net increase in demand or burden on current service programs. We assigned costs to only law enforcement personnel and vehicles, both of which are based on county financial statements.

A considerable source of fiscal burden is the cost to maintain roads, which would experience much more traffic and wear with increased tourist traffic (Burdge & Wolf 1981). We took

advantage of the drawing ability of GIS to make the fiscal cost of road maintenance explicitly spatial. Users can "trace" over existing roads that may require maintenance. A unit cost is applied to the total length of roadway.

MODEL IMPLEMENTATION

We used the ArcView™ 3.3 extension Scenario Constructor™ 1.3 to implement EmiquonViz. Scenario Constructor is one of three modules in the CommunityViz™ planning support system, which was originally commissioned by the Orton Family Foundation for use in "smaller communities in Vermont to assist them in evaluating planning and regulatory choices as they grew" (Brail 2001, p. xvii). Scenario Constructor extends the conventional mapping and spatial analytic functionality of ArcView by allowing for spreadsheet capabilities. The other two modules, which were not used in EmiquonViz, allow for dynamic simulation (Policy Simulator) and 3-dimensional rendering (TownBuilder 3D) (Kwartler & Bernard 2001). In this section, we first give a primer on tools that support planning and the motivation for their development and use. We then highlight the functionality of EmiquonViz.

Tools Supporting Planning

Although EmiquonViz is essentially a spreadsheet model comprising non-dynamic interactions, and could have been implemented readily in any commercially available spreadsheet software, we decided to experiment with the usefulness of so-called planning support systems (PSS) that are being advertised as multi-faceted, integrated, and, frequently, GIS-based tools that specifically support rural, urban, and regional planning tasks.

A multitude of GIS-based or capable PSS is in development in academia and in the private sector (Brail & Klosterman 2001). Klosterman (1997) describes the perfect PSS as one that allows the user to select the appropriate tool from a planning toolbox; make the linkage to the appropriate database; perform the required calculations based on user assumptions of current and future conditions; and, instantaneous present the results in the form of charts, maps, and other media. Others have also laid out their views on what PSS should be and could do (Harris & Batty 2001; Harris 2001; Hopkins 1997).

The development of PSS in relation to GIS is not without theoretical and methodological challenges however. Harris & Batty (2001) are realistic in assessing that linking non-physical socio-economic models to GIS may not be a useful development and that "where GIS is to be used to support modeling, such [planning support] systems should be mainly based on using their representational and graphic capabilities to store, derive, and communicate data rather than extend their usage to modeling" (p.45). They do, however, hold out the hope that "GIS-like spreadsheets might find a role in planning support as frameworks for formal modeling, along lines already developed using standard spreadsheets for urban models and related planning techniques" (p.45). Rodriguez-Bachiller & Wood (2001) suggest "a strong need for early planning and careful consideration over the extent to which GIS will be useful in EIA…[because] the impacts suited to a spatial assessment using GIS appear to be those which exhibit continuous or semi-continuous variability over space and those which undergo diffusion or propagation through space, as opposed to through a functional structure such as the economy" (p.397).

One of the major motivations for seeing PSS come to fruition, and indeed for this project, is a view of planning as "a process for articulation and negotiation among stakeholders, [emphasizing] consensus building and dispute resolution" (Susskind & Cruikshank 1987 in Leung 2000, p.22). The keys to providing the basis for claiming validity of conclusions and actions are the design of institutions and the role of appropriate personnel to facilitate such rational, inclusive, and sincere conversations (Forester 1989; Innes 1998).

In particular, the ability for stakeholders to visualize alternative scenarios (and their impacts) using modern technologies and mediums and being able to participate in making and changing assumptions and learning about their implications in real time holds enormous potential transformative, learning, and/or, reaffirming powers in a workshop or charrette setting.

Functionality of EmiquonViz and Scenario Constructor

Since we only used Scenario Constructor, we direct the reader to Kwartler & Bernard (2001) for more details on the functionality of Policy Simulator and TownBuilder 3D. CommunityViz, and Scenario Constructor in particular, has the functionality to be useful to planners in performing their daily tasks as well as the potential to be used creatively in conjunction with other impact assessment techniques (Runyan 1977) in planning-oriented forums.

When the user loads EmiquonViz in ArcView, the Table of Contents in the Scenario View reveals two types of themes (Figure 11). Conventional themes include shapefiles and grids. Automated themes (differentiated by "**") are special shapefiles that have attribute tables that may be treated like a spreadsheet table. Each field can be embedded with a formula, which can reference user-adjustable variables, constants, and specific field values in the same theme, different themes, and/or look-up tables. The formula can also call up spatial functions, such as returning the nearest distance to a feature in a different theme. Or, the field can be used as a prompt; when a new feature of this theme is populated in the Scenario View, a dialogue box pops up to solicit responses from the user.

(Figure 11 About Here)

Each of the automated themes in EmiquonViz is essentially a one-record table with a formula embedded in each field. The **Visitation theme, when it is initially populated by the user in the Scenario View, queries the user several policy questions that drive the rest of the model. The questions are:

1. *Do you want to have public boating and other active recreational water activities on Emiquon Preserve?*
2. *Do you want campsites on Emiquon Preserve?*
3. *Do you want fishing and hunting on Emiquon Preserve?*
4. *Do you want a lodge/resort associated with Emiquon Preserve?*
5. *If so, in which county do you want to site the lodge/resort: Fulton County or Mason County?*
6. *Do you think Emiquon Preserve will be successfully naturalized?*

The first three questions, as previously described in the Tourism submodel section, determine the facility class, which controls for the breakdown in visitor type and market fair share. Also, if campsites are allowed on the Preserve, then Fulton County will see an increase in the supply of camping spaces for CA visitors. If the response to the fourth question is in the affirmative, then

the follow-up question tests the different impacts from siting the lodge in either Fulton or Mason counties. The final question, if affirmed, will increase the market penetration and vice-versa.

The user can then examine the model results to discern the tradeoffs in benefits and costs from having made decisions based on a priori or untested beliefs and values. The larger implication is the ensuing dialogue that can be spurred among officials from both counties and other interested parties.

To carry out calculations in the rest of the model, the user can populate the remaining automated themes: **Accommodations, **Expenditures, **Services, and **Road Maintenance. We decided to partition the calculations in several themes for ease of troubleshooting.

With all the necessary themes populated in the Scenario View, the user can examine the indicators in chart form. Indicators summarize theme attributes. They put in quantifiable terms outcomes or desired outcomes related to objectives that prompt the need for a decision (The Orton Family Foundation 2002). For example, an indicator in another project may show the total number of bus stops populated in a district; the objective may be to ensure a minimum number of bus stops. The indicator can then show whether this objective is being met and whether remedial or pre-emptive actions are necessary. In EmiquonViz, since most of our interested indicators come from the one-record automated themes, the indicators are simply referencing a single cell in the theme or making a formulaic calculation.

Each indicator is the final result of prior calculations. To examine all contingent variables, constants, and values, the user can open up a report detailing all related information. An alternative is to assess the sensitivity of the indicator to each user-adjustable variable (Figure 12). This functionality is immensely important in charrette settings, where users and participants may want to change “assumptions” on the fly to test out what-if scenarios.

(Figure 12 About Here)

There is much in the functionality to like about Scenario Constructor, but it has shortcomings. Many of the calculations referenced look-up tables, which were first created in Excel™ and then imported to Scenario Constructor as dbf files. Even though EmiquonViz does not require any explicitly spatial calculations, save for road maintenance, it was a drawback having to create dbf tables outside Scenario Constructor. Scenario Constructor lacks an efficient interface to conveniently copy formulae from one field to another as well. Ironically, Scenario Constructor has an arguably better interface to construct and troubleshoot formulae. Since EmiquonViz comprises mostly of calculations that reference dbf tables as well as if-statements, performance degrades noticeably. It is doubtful then whether Scenario Constructor is sufficiently dependable to be used in real-time public engagements for anything but to show the simplest calculations. Also puzzling is that only the sensitivity of indicators to user-adjustable variables can be tested; referenced values from dbf tables or other themes cannot be tested for their effects on indicators.

On a positive note, the charts in Scenario Constructor, although primitive, are by default simpler and much more convenient to present in public gatherings than are the ones in a spreadsheet. The powers of pictures and visual cues cannot be underestimated. Overall, even though Scenario Constructor lacks the efficiency and full functionality of common spreadsheet software, it is a noteworthy improvement in extending the traditional functionality of GIS software capabilities. If nothing else, Scenario Constructor exhibits the potential usefulness of GIS-based planning tools in analyzing scenarios collaboratively with stakeholders.

SAMPLE RESULTS

In this section we present results of two sample scenarios. We called these results samples because at the time of writing we have yet to deploy EmiquonViz in stakeholder workshops. The results embody the assumptions and objectives that we believe interested stakeholders may want to test given the opportunity. After EmiquonViz generates and presents the results, the user can decide whether that those particular objective have been met and at what cost. The user at this point may realize additional issues and interdependencies that he or she may not have been aware before. This feedback may inform new or revised objectives. The user can subsequently perform more runs to iteratively understand the underlying processes and sensitivity. These are the dynamics of using scenarios in collaborative planning forums.

In general, a scenario holds no claim as to the probability of something happening, but rather illustrates the contingent events that occur given key assumptions coming to fruition (Klosterman 2001). To generate a scenario is "to sketch a logical sequence of events in order to show how, under present conditions and assumptions, a future state or set of alternative states might evolve. A scenario then…is an imaginative narrative of possible alternative futures based upon assumptions and analyses regarding trends and events" (Vlachos 1977). In particular, Robinson (2003) has been at the forefront in promoting a form of scenario analysis, of which planners should be fairly familiar and cognizant. Rather than try to predict futures, we set goals and act to realize them. This process explicitly emphasizes the exploration of feasible and desirable futures. It should be evident then that scenario analysis is normative and should be a shared activity.

Each scenario stems from a primary objective: 1) To restore the ecological production of Emiquon Preserve to a state comparable to pre-agricultural development; and 2) To provide a functional and accessible open space that permits mostly passive recreation and enjoyment. Although these two objectives can be complementary, secondary and tertiary objectives can conflict each other. Of course, our application does not preclude the use of EmiquonViz as simply a fact-finding exercise to generate consequences given various actions (Hopkins 2001). Also, since the underlying premise of this exercise is the assessment of impacts from the presence of a naturalizing or naturalized Emiquon Preserve, EmiquonViz was not designed to evaluate a business-as-usual, or do nothing, scenario. The subsequent discussion reinforces the potential use of EmiquonViz in a structured dialogic framework.

Scenario 1

In this scenario, TNC wants to see Emiquon Preserve become an exemplar of adaptive ecosystem recovery. Allowing intrusive human activities like boating, fishing and hunting, and camping will certainly upset the sensitive habitats, which would be slowly recovering from a century of disconnect with the Illinois River proper.

Since TNC has shown intentions of being a good partner, it has offered to site a lodge on the northern edge of the Preserve. TNC believes a lodge will bring prestige to their project as well as needed money to the region, including Lewistown, which is opposed to the entire Emiquon naturalization project. TNC assures the county seat of Fulton County that a lodge will be a boon to the community at large.

In other words, TNC will make a lodge the frontispiece and one and only revenue generator to the region. TNC believes also that without a doubt their vision for a successfully naturalised Emiquon will come to fruition.

According to EmiquonViz, in any given year in an as yet undetermined future close to 560,000 visitors, or 140,000 parties, will visit Emiquon Preserve. Even though the facility class is low, the market penetration is 10% on top of the market fair share captured from Pere Marquette and Starved Rock state parks (fair shares of the other six state parks were set to 0). Expenditures made by non-local visitors during the year total $1.06 million in Fulton County and $1.41 million in Mason County. Including secondary economic effects, Fulton and Mason will receive $700,000 and $920,000, respectively, in total sales. In terms of total income, Fulton and Mason will receive $350,000 and $460,000, stimulating close to 20 FTE jobs in each county. Sales tax revenues accruing locally are very modest; Fulton will receive about $8,000, whereas Mason will do slightly better with $11,400. Interestingly, between 30 and 50 households coming to each county and spending 85% of their annual household income (based on the median household income of each county) would generate similar economic impacts.

The existing stock of HMBB rooms and campground sites is more than sufficient. This indicator suggests that marketing towards specific visitor types, in this case, patrons of paid accommodations and campers may capture unmet demand and additional benefits.

Because more visitors come during the summer months, the demand for law enforcement personnel is slightly higher during this season. In Fulton, at least two deputies are needed during the summer, and one during the winter. In Mason, three officers are needed in the summer, and one in the winter. This does not necessarily mean that new officers must be hired; there may already be enough law enforcement personnel in the region. Also reflecting the seasonal variation in visitation and trip duration, visitors will generate close to 3,000 lbs of solid waste per summer day in Fulton and 5000 lbs in Mason. Solid waste output will decrease by half during a typical winter day.

Scenario 2

The good folks in Lewistown, the County seat in Fulton County, have read the horror stories of what happened in Moultrie and Shelby Counties when Eagle Creek State Park came online (Burdge & Opryszek 1981). *Fulton County does not want a lodge. The influx of big city folk changed the character of the two counties.*

What they want are recreational activities that serve the needs of the people of the County. That means more boating, fishing, and hunting opportunities. Camping is a no-no; it just brings in rowdy RV folks that litter and make a ruckus! TNC has promised that old Thompson Lake will become usable as a clear water lake. Fulton County is less optimistic.

In this scenario, the key decision to not site a lodge will have broad implications for both counties (see Appendix D for all indicator results). More activities are allowed on Emiquon Preserve, which will have a facility class of medium. Even so, the lack of a lodge puts the Preserve into a league – not among other state park and lodge facilities – but with nearby state conservation areas. It is expected that the Preserve will capture only 156,000 visitors from existing users, based on year 2000 attendance figures, of Anderson Lake, Rice Lake, Sanganois, and Spring Lake. Like the previous scenario, DO visitors constitute the vast majority of visitors. During the summer months, there is an oversupply of paid accommodation beds and campground sites.

The clear winner economically is Mason. Mason will receive $900,000 million in NLVE, which is more than twice as much as what Fulton will receive. The NLVE will generate $290,000 in

total income effects for Mason compared to $140,000 for Fulton. In Mason, this income can support 13 FTE jobs; Fulton can settle for only 7 FTE jobs. Sales tax revenues are again small; Mason can expect to gain a little over $7,000, while Fulton can expect close to $3,500, both of which are marked demotions from Scenario 1.

Demand for additional law enforcement is minimal. Mason will need one dedicated officer during the summer season. In terms of calls to emergency services, Mason will get between 10 and 20 EMS calls during the summer, whereas Fulton will get less than 10. Finally, Mason will need to deal with 1,500 lbs of solid waste per day during the summer while Fulton will need to handle only half that amount. Winter values are one-half that of their summer counterparts.

INCONCLUSION

In deference to Klosterman (2001), who wrote about the exciting advances of PSS and the possibilities for urban and regional planning applications, we end this paper not with definite conclusions, but rather ruminate on the improvements needed for EmiquonViz to be useful in a well thought-out planning framework bringing together and empowering all interested parties to engage in rational and open discussions which questions all claims and assumptions, and wherein all alternatives can be tested and evaluated. This is also a statement of the ideal communicative rationality standard (Hopkins 2001). Akin to imagining the good city (Friedmann 2002), it is imperative we have visions of what could be and what should be in the face of prevailing barriers of convention, be that in academia or in the field.

The current state of EmiquonViz, although a good start, is very much rudimentary. Much like the QUEST model developed at the University of British Columbia (Robinson 2003), and the source of much inspiration, incorporating additional submodels can bring to bear the full richness of representing and assessing the processes inherent in policy and management-related actions and decisions made on human settlements at various scales. These may involve modeling the demographic structure, agricultural output, energy consumption, and transportation effects from decisions made about naturalization and tourism opportunities. But we must not lose sight of scale and context. In the context of floodplain naturalization, scenario analysis should be a community planning project and not simply that of a geographer or natural scientist. Assessing township-level impacts may be more appropriate in Fulton and Mason counties also.

Immediate opportunities to refine the model include gathering data from primary (i.e., surveys) and secondary sources (i.e., economic multipliers), and expert judgments to more accurately inform the baseline parameters in the Visitation and Income submodels. It is crucial to refine tourist demand on nature-based tourism since visitor-days predicate all impacts. Ideally, surveys should be conducted to gauge the existing and project demand from residents of the two counties and outside. New surveys should be conducted on existing Illinois state parks and state conservation areas to determine visitor demands, motivations and expectations, number of park destinations made during a typical trip, and breakdown in visitor type. Lastly, surveys of the number of local residents in Fulton and Mason counties who are willing to visit the Preserve can help correct or refine our assumptions of percent non-local visitors. Given that the user can freely allocate the percent of DO visitors to Fulton or Mason, and that the vast majority of visits are made by DO visitors (i.e., the visitor type breakdown look-up table), some effort should be expended to better justify the chosen percent allocation.

Surveys of spending profiles in current state parks and state conservation areas would yield more reliable results. The spending profiles used in EmiquonViz are based on spending within 30

miles of recreational sites in five subregions of the UMRS, which may not be reflective of visitors coming to Emiquon Preserve. Also, more accurate and precise economic multipliers should be researched from published sources, or developed entirely for the two counties, for each spending category (i.e., hotels and motels, grocery, fishing and hunting equipment, etc.). Currently, EmiquonViz uses a single sales multiplier, for example, for aggregated NLVE. This is unrealistic given that each sector exhibits different economic interactions. Also, a unique capture rates should be assigned for each spending category, as opposed to using one aggregate rate. Stynes et al. (2000) go into more detail in discussing potential sources of input and model errors in their MGM2 model.

The Services submodel, although the simplest submodel calculation-wise, is saddled with several methodological issues. Apart from the incorrigible problem of quantifying social impacts, surveys should be conducted to better understand the types of services and the magnitude of consumption that different visitor types exert in relation to residents (although the former is somewhat less problematic given that most public services/facilities are public goods and, hence, non-exclusive) (Tatzin 1978). The pertinent question is whether a DO visitor, for example, is equal to one resident. Existing capacity must be ascertained, otherwise the unreliable assumption of no unused service must be made. Associating costs to these services require an ex post examination of a comparable region, such as one of the state parks. The results then can be inferred if the contexts are equivalent (Hopkins & Burnell 1981). The alternative, and a very unreliable one, is to use a "per capita multiplier method", wherein the budgeted expenditures for a county or municipality is used to generate per resident-induced and per non-resident-induced cost multipliers (Siegel et al. 2000; Burchell et al. 1994; Edwards 2000). Also, the Services submodel would be the best recipient of a bottom-up approach to model development. Community members should be consulted as to what they perceive are important indicators of their social environment and social well-being. It is one thing to measure changes in the environment and another to look "for the relative values of the society or segments of society concerned in the evaluation of a project. This is inherently a 'value judgment' and cannot be based on scientific research into environmental systems. It may, however, be based on scientific surveys of constituencies to attempt to determine the preferences of affected groups" (Hopkins and Burnell 1981, p.338).

Aggregating impacts is another conceptual issue. As noted by Hopkins and Burnell (1981) it is a limit of the human mind to make a decision in the face of a myriad of disaggregated information. More general impacts should be identified and measured. An alternative would be to construct a measure that is a sum or product of the impacts being measured. Another level of complexity is aggregating effects across economic, fiscal, and social dimensions. An example of a final indicator is a happiness index, which, while sounding facetious, is implied whenever effects are transformed to monetary terms in a cost-benefit analysis.

The above statements speak to improvements that can be made as well as challenges that should be researched. The fact that we have not mentioned implementation is because it is dubious whether implementing EmiquonViz, as it is currently structured and rationalized, using an extended GIS is justifiably more beneficial that using a standard spreadsheet. If forecasting needs to be incorporated into the model, then using a spreadsheet is clearly the superior option.

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APPENDICES

A. Scenario tables (ST) are dbf tables created in Excel. They can be accessed by clicking CommunityViz | Impact Analysis | Scenario Tables. The values in the tables below are default values in EmiquonViz. To add or delete entire tables, click View | Scenario View Properties and select the Tables button.

ST1. Visitor Type Breakdown

Facility Class	Day Only	Campers	Paid Accommodation	Friends and Relatives	Second Home Owners
Low	0.9600	0.0100	0.0100	0.0150	0.0050
Medium	0.9300	0.0200	0.0200	0.0250	0.0050
High	0.8700	0.0300	0.0400	0.0450	0.0150

ST2. State Park and Lodge Market Fair Share

Facility Class	Pere Marquette	Starved Rock	Giant City	Illinois Beach	White Pines	Wayne Fitzgerrell	Eagle Creek	Cave-In-Rock
Low	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00
Medium	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00
High	0.15	0.15	0.00	0.00	0.00	0.00	0.00	0.00

- Currently, the fair share captured from Pere Marquette and Starved Rock state parks only are based on user-adjustable variables in EmiquonViz (i.e., not referenced to this table)

ST3. State Conservation Area Market Fair Share

Facility Class	Anderson Lake	Rice Lake	Spring Lake	Sanganois
Low	0.10	0.10	0.10	0.10
Medium	0.30	0.30	0.30	0.30

ST4. Trip Duration by Season

Visitor Type	Trip Duration in Summer (days)	Trip Duration in Winter (days)	Trip Duration in Summer (nights)	Trip Duration in Winter (nights)
Day Only	1.0	1.0	0.0	0.0
Paid Accommodations	2.0	2.0	1.0	1.0
Friends and Relatives	2.0	2.0	1.0	1.0
Second Home Owners	6.0	3.0	5.0	2.0
Campers	4.0	2.0	3.0	2.0

ST5. Household Count (source: U.S. Census Bureau)

Place	Household Units	County
Havana	1587	Mason
Lewistown	1182	Fulton
Canton	6098	Fulton
Dunfermline	117	Fulton
Bath	153	Mason
Bryant	104	Fulton
Liverpool	69	Fulton
Topeka	36	Mason
Fulton County	16240	Fulton
Mason County	7033	Mason

ST6. Paid Accommodation Room Count (source: internet)

Place	Hotel/Motel/Bed & Breakfast Rooms	Default
Havana	69	69
Lewistown	20	20
Canton	130	130

ST7. Campground Site Count (source: internet and phone interviews)

Place	Campground Sites	Default
Canton	0	0
Havana	12	12
Lewistown	0	0
Topeka	325	325
St. David	32	32
Rice Lake Conservation Area	39	39
Anderson Lake Conservation Area	60	60

ST8. Non-Local Visitors

Visitor Type	Percent Non-Local
Day Only	75
Paid Accommodations	90
Friends and Relatives	50
Second Home Owners	70
Campers	80

ST9. Planning Standards/Service Levels (source: Burchell et al., 1994)

Type	Standard	Units
Dentists	0.53	Personnel per 1,000 pop
EMS Calls	36.5	Calls per 1,000 pop
Fire Personnel	1.65	Personnel per 1,000 pop
Fire Vehicles	0.20	Vehicles per 1,000 pop
Health Support Personnel	2.50	2.5 Personnel per 1,000 pop
Hospital Beds	4.00	Beds per 1,000 pop
Mental Health	0.50	Personnel per 1,000 pop
Nurses	4.50	Personnel per 1,000 pop
Sewage	65.0	Gallons per capita per day
Water	100.0	Gallons per capita per day
Physicians	1.50	Personnel per 1,000 pop
Police Personnel	2.00	Personnel per 1,000 pop
Police Vehicles	0.60	Vehicles per 1,000 pop
Resident Solid Waste	0.00175	Tons per capita per day

ST10. Consumer Price Index for Midwest Urban region (source: Bureau of Labor Statistics)

Year	CPI
1980	82.4
1981	90.1
1982	96.5
1983	99.9
1984	103.6
1985	106.8
1986	108.0
1987	111.9
1988	116.1
1989	121.5
1990	127.4
1991	132.4
1992	136.1
1993	140.0
1994	144.0
1995	148.4
1996	153.0
1997	156.7
1998	159.3
1999	162.7
2000	168.3
2001	172.8
2002	174.9

ST11. Party-day Spending (source: Chang 1996)

Spending Category	Day Only Non-Active	Day Only Active	Overnight
Hotels and Motel	0.00	0.00	13.91
Camping	0.00	0.00	3.38
Grocery	3.96	6.79	9.71
Restaurant	5.07	4.17	13.47
Auto and RV	3.71	8.89	10.35
Boat	0.00	12.13	6.63
Fish and Hunt	0.57	3.22	1.53
Entertainment	0.41	0.23	1.12
Miscellaneous	3.75	5.76	6.07
Total	17.47	41.19	66.18

- Chang's original table showed party-day expenditures within 30 miles of designated recreation sites in the Upper Mississippi River System
- Aggregation was performed to produce Day Only Non-Active, Day Only Active, and Overnight visitor segments

ST12. Fulton County Expenditures for Year ending November 30, 2000 (source: Clifton Gunderson L.L.C. 2000; Fulton County Tentative 280A Abstract of 2001 Assessments)

Type	Expenditures	Residential Share	Non-Residential Share
General government	1215202	63.44	36.56
County development	55201	63.44	36.56
Employee benefits	1450001	0.00	100.00
Public safety	1423828	100.00	0.00
Corrections	535601	63.44	36.56
Judiciary and court related	1368407	63.44	36.56
Public health	3288457	100.00	0.00
Public Welfare	408341	100.00	0.00
Transportation	2987272	63.44	36.56
Other	303802	63.44	36.56
Capital outlay	363256	0.00	0.00
Debt service principal and interests	99091	0.00	0.00

- Residential Share is the average of 1) the percentage of parcels in the county that is residential, and 2) the percentage of assessed value in the county that is residential; or, a judgment call is made whether the expenditure type is wholly associated, or not, with county residents.

ST13. Mason County Expenditures for Year ending November 30, 2000 (Clifton Gunderson L.L.C. 2000; Mason County Final Abstract of 2002 Assessments)

Type	Expenditures	Residential Share	Non-Residential Share
General and administration	825134	54.63	45.37
County development	36546	54.63	45.37
Public safety	981780	100.00	0.00
Judiciary and court related	396763	54.63	45.37
Public health and welfare	1053972	100.00	0.00
Transportation	1989055	54.63	45.37
Employee benefits	798802	54.63	45.37
Other expenditures	206360	54.63	45.37
Capital expenditures	303124	0.00	0.00
Debt service Principal and Interests	31897	0.00	0.00

B. Variables can be adjusted on the fly. They can be accessed either by clicking View | Scenario View Properties or CommunityViz | Impact Analysis | Assumptions. Only the sensitivity of indicators to variables can be tested; sensitivity of indicators to values in **Scenario Tables** cannot be tested. Also listed below are **Constants**, which can be accessed via View | Scenario View Properties and selecting the Constants button.

-- Beds --	
Hotel Unit Beds	2 beds per room
New Fulton Campsites	0 sites
New Fulton PA Rooms	0 rooms
New Mason Campsites	0 sites
New Mason PA Rooms	0 rooms
Summer Campground Occupancy Rate	80 %
Summer PA Occupancy Rate	50 %
Typical Lodge Occupancy Rate	71 %
Winter Campground Occupancy Rate	10 %
Winter PA Occupancy Rate	10 %
-- Census --	
Daily Commuters to Fulton	1,510 persons
Daily Commuters to Mason	1,114 persons
Fulton Employment POW	14,369 persons
Fulton Resident Population	38,202 persons
Mason Employment POW	6,581 persons
Mason Resident Population	16,022 persons
-- Emiquon Preserve --	
Emiquon Campsites	50 campsites
Emiquon Lodge Rooms	100 rooms
-- Expenditures --	
Fulton Capture Rate	50 %
Fulton Direct Income to Total Sales	30 %
Fulton Income Effects to Sales Effects	50 %
Fulton Sales Multiplier	1.3
Fulton Share of NLVE	30 %
Mason Capture Rate	50 %
Mason Direct Income to Total Sales	30 %
Mason Income Effects to Sales Effects	50 %
Mason Sales Multiplier	1.3
Percent Household Spending	85 %
Sales Tax to Local	1.25 %
State Income Tax	3 %
-- General --	
% Day Only Active	52 %
Annual Work Days	236 Days
Emiquon Campsite Rate	10 $
Emiquon Lodge Room Rate	50 $
Fulton Share of Day Only	30 %
Fulton Share of SHO	70 %

HMBB Room Rate	20 $
Market Penetration Adjustment	10 %
Minimum Lot Size	1 acres / lot
Party Size	4 persons per party
Pere Marquette Market Fair Share	15 %
Police Officer Salary	32,493 $
Police Vehicle Cost	30,000 $
Road Maintenance Cost	10,274 $/mile
Starved Rock Market Fair Share	20 %
Summer Days	184 days
Summer Visitors Percent	67 %
Winter Days	181 days
-- Socio-economic --	
Fulton Employee Earnings	19,063 $
Fulton Household Income	33,952 $
Fulton Personal Income	828,227,000 $
Mason Employee Earnings	22,093 $
Mason Household Income	35,985 $
Mason Personal Income	378,625,000 $

CONSTANTS

-- General --	
Convert Tons	2,000 lbs per ton
-- Units Conversion: Distance --	
Miles per Foot	0.000189394 mi / ft

C. Automated Themes are dynamically adjustable. Attributes in automated themes can reference other themes, scenario tables, variables, and constants. Only the ** Parklodges theme is explicitly spatial; the rest are one-record shapefiles. Attributes are grouped by categories. To modify automated theme properties, first activate the theme in the Table of Contents, then click Theme | Scenario Theme Properties... To edit automated theme features, click CommunityViz | Impact Analysis | Edit Features.

**** Visitation**

Calculation Flow:

1. User input determines the park's facility class.
2. Facility class determines the potential number of each visitor type and market capture.
3. Number of each visitor type and duration of stay determines visitor-day and visitor-night (PA and CA only) by season.
4. Feedback from **Accommodation determines the actual visitor-days for PA and CA.
5. Further calculations yield actual visitor-days/nights by season, actual visitors per year, and annual and seasonal average visitor daily census.
6. Additional feedback from **Accommodation determines each county's share of PA and CA visitors by season.

ATTRIBUTES	UNITS
-- User Input --	
Qboat	
Qboatscore	
Qcamp	
Qcampscore	
Qfishhunt	
Qfishhuntscore	
Qlodge	
QLodge Location	
Qlodgescore	
Qsuccess	
-- Actual Visitation --	
Actual Campers	Visitors
Actual Paid Accommodation	Visitors
Actual Summer Campers	Visitors
Actual Summer PA	Visitors
Actual Total Visitors	Visitors
Actual Winter Campers	Visitors
Actual Winter PA	Visitors
-- Actual Visitor Days --	
Actual Day Only Days	Visitor Days
Actual Overnight Visitor Days	Visitor Days
Actual Summer Camp Days	Visitor Days
Actual Summer Day Only Days	Visitor Days
Actual Summer FR Days	Visitor Days
Actual Summer PA Days	Visitor Days
Actual Summer SHO Days	Visitor Days
Actual Total Summer Days	Visitor Days

Actual Total Visitor Days	Visitor Days
Actual Total Winter Days	Visitor Days
Actual Winter Camp Days	Visitor Days
Actual Winter Day Only Days	Visitor Days
Actual Winter FR Days	Visitor Days
Actual Winter PA Days	Visitor Days
Actual Winter SHO Days	Visitor Days
-- Actual Visitor Nights --	
Actual Summer Camp Nights	Visitor Nights
Actual Summer PA Nights	Visitor Nights
Actual Winter Camp Nights	Visitor Nights
Actual Winter PA Nights	Visitor Nights
-- Census --	
Fulton Average Daily Census	Visitors (per day)
Fulton Summer ADC	Visitors (per day)
Fulton Winter ADC	Visitors (per day)
Mason Average Daily Census	Visitors (per day)
Mason Summer ADC	Visitors (per day)
Mason Winter ADC	Visitors (per day)
-- General --	
Facility Class	
ID	
Market Penetration	
Shapefile Name	
-- Share --	
Fulton Share of FR	%
Fulton Summer Share of Campers	%
Fulton Summer Share of PA	%
Fulton Winter Share of Campers	%
Fulton Winter Share of PA	%
-- Visitor Days --	
Summer Camper Days	Visitor Days
Summer Day Only	Visitor Days
Summer FR Days	Visitor Days
Summer PA Days	Visitor Days
Summer SHO Days	Visitor Days
Winter Camper Days	Visitor Days
Winter Day Only	Visitor Days
Winter FR Days	Visitor Days
Winter PA Days	Visitor Days
Winter SHO Days	Visitor Days
-- Visitor Nights --	
Summer Camper Nights	Visitor Nights
Summer PA Nights	Visitor Nights
Winter Camper Nights	Visitor Nights

Winter PA Nights	Visitor Nights
-- Visitors --	
Campers	Visitors (per year)
Day Only	Visitors (per year)
Friends and Relatives	Visitors (per year)
Paid Accommodation	Visitors (per year)
Potential Market	Visitors (per year)
Second Homes Owners	Visitors (per year)

**** Accommodation**

Calculation Flow:

1. Number of rooms/campsites and duration of season (i.e., summer and winter) determines existing bed-nights in each place by season.
2. Assumption of seasonal occupancy rate determines the "true" bed-night supply for new Emiquon Preserve visitors; the bed-night supply feeds into **Visitation to determine the actual visitation.
3. "Emiquon HMBB split" allocates PA visitors in each county by season to the Emiquon Preserve Lodge, if it exists, in proportion to the total number of HMBB rooms in a county. *In the future, the same operation should be created for Emiquon campground sites.*

ATTRIBUTES	UNITS
-- Bed Supply --	
Summer Campground Capacity	Bed Nights
Summer PA Capacity	Bed Nights
Winter Campground Capacity	Bed Nights
Winter PA Capacity	Bed Nights
-- Beds --	
Summer Campground Anderson Lake	Bed Nights
Summer Campground Canton	Bed Nights
Summer Campground Emiquon	Bed Nights
Summer Campground Havana	Bed Nights
Summer Campground Lewistown	Bed Nights
Summer Campground New	Bed Nights
Summer Campground Rice Lake	Bed Nights
Summer Campground St.David	Bed Nights
Summer Campground Topeka	Bed Nights
Summer Lodge Emiquon	Bed Nights
Summer PA Canton	Bed Nights
Summer PA Havana	Bed Nights
Summer PA Lewistown	Bed Nights
Summer PA New	Bed Nights
Winter Campground Anderson Lake	Bed Nights
Winter Campground Canton	Bed Nights
Winter Campground Emiquon	Bed Nights
Winter Campground Havana	Bed Nights
Winter Campground Lewistown	Bed Nights

Winter Campground New	Bed Nights
Winter Campground Rice Lake	Bed Nights
Winter Campground St.David	Bed Nights
Winter Campground Topeka	Bed Nights
Winter Lodge Emiquon	Bed Nights
Winter PA Canton	Bed Nights
Winter PA Havana	Bed Nights
Winter PA Lewistown	Bed Nights
Winter PA New	Bed Nights
-- General --	
Fulton S Emiquon HMBB Split	%
Fulton W Emiquon HMBB Split	%
ID	
Mason S Emiquon HMBB Split	%
Mason W Emiquon HMBB Split	%
Shapefile Name	

**** Expenditures**

Calculation Flow:

1. Allowable activities determine the type and magnitude of spending by visitors in each county by season.
2. PA HMBB room and CA campground site sales are calculated separately because they depend on visitor-nights, as opposed to visitor-days.
3. Non-local percentages for each visitor type determine those money accruing to the county from non-residents (i.e., NLVE).
4. Fulton and Mason NLVE feed into economic impact indicators.

ATTRIBUTES	UNITS
-- Campground Sales --	
Fulton Summer CA Campground Sales	$
Fulton Winter CA Campground Sales	$
Mason Summer CA Campground Sales	$
Mason Winter CA Campground Sales	$
-- General --	
Fulton NLVE	$
Fulton Summer NL CA Camping Sales	$
Fulton Summer NL PA HMBB Sales	$
Fulton Summer Total NL Sales	$
Fulton Winter NL CA Camping Sales	$
Fulton Winter NL PA HMBB Sales	$
Fulton Winter Total NL Sales	$
ID	
Mason NLVE	$
Mason Summer NL CA Camping Sales	$
Mason Summer NL PA HMBB Sales	$
Mason Summer Total NL Sales	$
Mason Winter NL CA Camping Sales	$

Mason Winter NL PA HMBB Sales	$	
Mason Winter Total NL Sales	$	
Shapefile Name		
-- Hmbb Sales --		
Fulton Summer PA HMBB Sales	$	
Fulton Winter PA HMBB Sales	$	
Mason Summer PA HMBB Sales	$	
Mason Winter PA HMBB Sales	$	
-- Sales --		
Fulton Summer Camper Sales	$	
Fulton Summer DO Full Activity Sales	$	
Fulton Summer DO Half Activity Sales	$	
Fulton Summer DO No Activity Sales	$	
Fulton Summer DO Sales	$	
Fulton Summer FR Sales	$	
Fulton Summer PA Sales	$	
Fulton Summer SHO Sales	$	
Fulton Winter Camper Sales	$	
Fulton Winter DO Full Active Sales	$	
Fulton Winter DO Half Activity Sales	$	
Fulton Winter DO No Activity Sales	$	
Fulton Winter DO Sales	$	
Fulton Winter FR Sales	$	
Fulton Winter PA Sales	$	
Fulton Winter SHO Sales	$	
Mason Summer Camper Sales		$
Mason Summer DO Full Activity Sales	$	
Mason Summer DO Half Activity Sales	$	
Mason Summer DO No Activity Sales	$	
Mason Summer DO Sales	$	
Mason Summer FR Sales	$	
Mason Summer PA Sales	$	
Mason Summer SHO Sales	$	
Mason Winter Camper Sales	$	
Mason Winter DO Full Activity Sales	$	
Mason Winter DO Half Activity Sales	$	
Mason Winter DO No Activity Sales	$	
Mason Winter DO Sales	$	
Mason Winter FR Sales	$	
Mason Winter PA Sales	$	
Mason Winter SHO Sales	$	

**** Social**

Calculation Flow:

1. Annual or seasonal average visitor daily census and planning standards determine social environment impacts in each county by season.
2. *In the future, costs can be affixed to the increase in service units demanded. Currently, only approximate costs for police personnel (i.e., salary) and police vehicles are known.*

ATTRIBUTES	UNITS
-- General --	
Fulton Fire Vehicles	
Fulton Police Vehicles	
ID	
Mason Fire Vehicles	
Mason Police Vehicles	
Shapefile Name	
-- Summer --	
Fulton Summer EMS Calls	calls
Fulton Summer Fire Personnel	personnel
Fulton Summer Health Support Personnel	personnel
Fulton Summer Hospital Beds	beds
Fulton Summer Nurses	nurses
Fulton Summer Physicians	physicians
Fulton Summer Police Personnel	personnel
Fulton Summer Sewage	gallons (per day)
Fulton Summer Solid Waste	lbs (per day)
Fulton Summer Water	gallons (per day)
Mason Summer EMS Calls	calls
Mason Summer Fire Personnel	personnel
Mason Summer Health Support Personnel	personnel
Mason Summer Hospital Beds	beds
Mason Summer Nurses	nurses
Mason Summer Physicians	physicians
Mason Summer Police Personnel	personnel
Mason Summer Sewage	gallons (per day)
Mason Summer Solid Waste	lbs (per day)
Mason Summer Water	gallons (per day)
-- Winter --	
Fulton Winter EMS Calls	calls
Fulton Winter Fire Personnel	personnel
Fulton Winter Health Support Personnel	personnel
Fulton Winter Hospital Beds	beds
Fulton Winter Nurses	nurses
Fulton Winter Physicians	physicians
Fulton Winter Police Personnel	personnel
Fulton Winter Sewage	gallons (per day)
Fulton Winter Solid Waste	lbs (per day)
Fulton Winter Water	gallons (per day)

Mason Winter EMS Calls	calls
Mason Winter Fire Personnel	personnel
Mason Winter Health Support Personnel	personnel
Mason Winter Hospital Beds	beds
Mason Winter Nurses	nurses
Mason Winter Physicians	physicians
Mason Winter Police Personnel	personnel
Mason Winter Sewage	gallons (per day)
Mason Winter Solid Waste	lbs (per day)
Mason Winter Water	gallons (per day)

****Fiscal**

Calculation Flow:

1. Number and assessed value of residential parcels determine residential share of county expenditures.
2. Per capita costs and average visitor daily census determine visitor costs.

ATTRIBUTES

-- General --	
Fulton Summer Visitor Costs	$ (per day)
Fulton Winter Visitor Costs	$ (per day)
ID	
Mason Summer Visitor Costs	$ (per day)
Mason Winter Visitor Costs	$ (per day)
Shapefile Name	
-- Public Costs --	
Fulton Per Capita Costs	$ / capita
Fulton Per Employee Costs	$ / employee
Fulton Visitor Costs	$ (per day)
Mason Per Capita Costs	$ / capita
Mason Per Employee Costs	$ / employee
Mason Visitor Costs	$ (per day)
-- Residential Share --	
Fulton Avg Residential Share	%
Fulton Residential Parcel Share	%
Fulton Residential Value Share	%
Fulton Total Assessed Value	$
Fulton Total Parcels	parcels
Mason Avg Residential Share	%
Mason Residental Value Share	%
Mason Residential Parcel Share	%
Mason Total Assessed Value	$
Mason Total Parcels	parcels

**** Road Maintenance**

Calculation Flow:

Creation of new line features and assumption of unit cost determine annual road maintenance cost.

ATTRIBUTES	UNITS
ID	
Length	ft

**** Parklodges**

Calculation Flow:

The number of rooms in each park lodge, average room rates, and an assumed occupancy rate determine the number of room-nights (multiplying by the number of beds per room yields visitor-nights), annual receipts, the number of visitors using the lodge, and the percentage of all visitors to the park that stayed overnight at the lodge (*note that this percentage is comparable to campers).*

ATTRIBUTES	UNITS
2000 Attendance	
Average Receipts	$
Double Rate	$
Lodge Rooms	rooms
Lodge Visitors	visitors
Name	
Percent Visitors using Lodge	%
Room Nights	room nights
Single Rate	$
Visitor Nights Used	visitor nights

D. Indicators are measured or computed values associated with objectives. To modify indicators click View | Scenario View Properties..., and select the Indicators button. To display or create indicator charts, click CommunityViz | Impact Analysis | Charts or CommunityViz | Impact Analysis | Indicators. The indicators shown below were derived for Scenario 2.

Sample calculations:

1. Total Sales Effects = County NLVE x capture rate x Type II Sales Multiplier

2. Local Sales Tax = County NLVE (excluding HMBB room and campground site sales) x capture rate x Type II Sales Multiplier x Local Sales Tax Rate

3. Total Income Effects = Total Sales Effects x Income-to-Sales Effects Multiplier

4. FTE Jobs Stimulated = Total Income Effects / County Earnings per Employee by POW

5. Equivalent Households Effecting Similar Impacts = County NLVE / (County Median Household Income x Percent Household Spending) x Consumer Price Index adjustment

-- Bed Supply And Demand --	
Summer Campground Capacity	68,890 Bed Days
Summer Campground Demand	6,259 Visitor Days
Summer Paid Accommodation Capacity	16,376 Bed Days
Summer Paid Accommodation Demand	4,173 Visitor Days
Winter Campground Capacity	304,949 Bed Days
Winter Campground Demand	2,055 Visitor Days
Winter Paid Accommodation Capacity	28,996 Bed Days
Winter Paid Accommodation Demand	2,055 Visitor Days
-- Economic Impacts --	
% Fulton Personal Income	0.02 %
% Mason Personal Income	0.04 %
FTE Jobs Increase Fulton	7 FTE Jobs
FTE Jobs Increase Mason	13 FTE Jobs
Fulton Equivalent Household Income	14 Households
Fulton NLVE	427,422 $
Fulton Sales Tax Revenue	3,456 $
Fulton Total Income Effects	138,912 $
Fulton Total Sales Effects	277,824 $
Mason Equivalent Household Income	29 Households
Mason NLVE	904,051 $
Mason Sales Tax Revenue	7,318 $
Mason Total Income Effects	293,817 $
Mason Total Sales Effects	587,633 $
-- General --	
Emiquon Visitation by Area	14 Visitors / acre
Fulton Police Vehicles	3,600 $

Mason Police Vehicles	7,800 $
Road Length	8.77 miles
Second Home Development	195 acres
Viewshed Area	1,267 acres
-- Potential Attendance --	
Actual Potential Emiquon Market	155,677 Visitors
Camp Visitors	3,114 Visitors
Day Only	144,779 Visitors
Friends/Relatives	3,892 Visitors
Paid Accommodation	3,114 Visitors
Potential Emiquon Market	155,676 Visitors
Second Home Owners	778 Visitors
-- Public Costs --	
Fulton Summer Visitor Costs	264 $ (per day)
Fulton Winter Visitor Costs	129 $ (per day)
Mason Summer Visitor Costs	633 $ (per day)
Mason Winter Visitor Costs	313 $ (per day)
-- Social And Service Impacts --	
Fulton Road Maintenance	90,078 $
Fulton Summer EMS Calls	7 calls
Fulton Summer Law Enforcement	0 personnel
Fulton Summer Sewage	13,065 gallons per day
Fulton Summer Solid Waste	704 lbs per day
Fulton Summer Water Demand	20,100 gallons per day
Fulton Winter EMS Calls	4 calls
Fulton Winter Law Enforcement	0 personnel
Fulton Winter Sewage	6,305 gallons per day
Fulton Winter Solid Waste	340 lbs per day
Fulton Winter Water Demand	9,700 gallons per day
Mason Summer EMS Calls	16 calls
Mason Summer Law Enforcement	1 personnel
Mason Summer Sewage	27,820 gallons per day
Mason Summer Solid Waste	1,498 lbs per day
Mason Summer Water Demand	42,800 gallons per day
Mason Winter EMS Calls	8 calls
Mason Winter Law Enforcement	0 personnel
Mason Winter Sewage	13,520 gallons per day
Mason Winter Solid Waste	728 lbs per day
Mason Winter Water Demand	20,800 gallons per day
-- State Conservation Area Attendance --	
Anderson Lake	138,546 Visitors
Rice Lake	113,401 Visitors
Sanganois	74,830 Visitors
Spring Lake	249,802 Visitors
-- State Park Attendance --	
Cave-In-Rock	526,239 Visitors

Eagle Creek	341,014 Visitors
Giant City	1,217,714 Visitors
Illinois Beach	2,540,340 Visitors
Pere Marquette	1,186,865 Visitors
Starved Rock	1,653,903 Visitors
Wayne Fitzgerrell	1,698,597 Visitors
White Pines Forest	344,728 Visitors

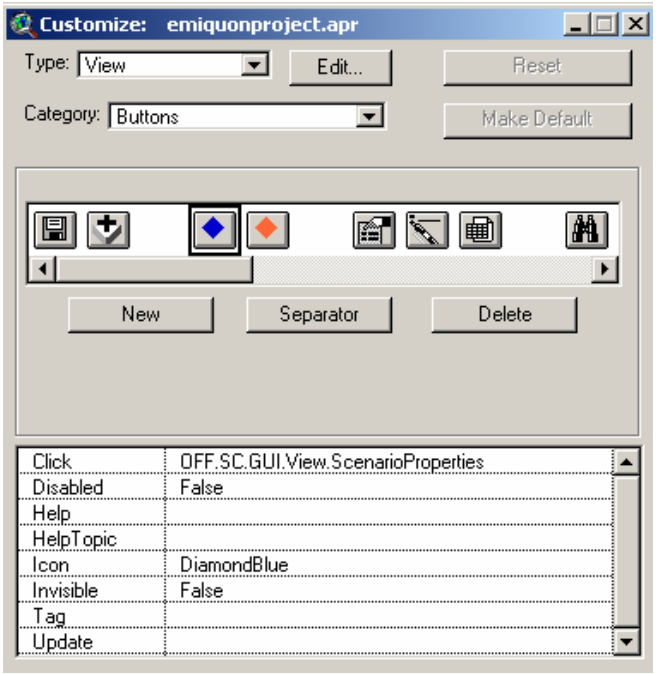
E. Operating EmiquonViz

1. Load up ArcView. Make sure CommunityViz is activated as an extension (go to File|Extensions…)

2. Open the existing ArcView project by going to ILLriver\EmiquonViz\emiquonproject.apr in Urban-server6. Alternatively, you can go to File|Load Scenario and open *emiquon1* in the EmiquonViz folder. Note: Urban-server6 was mapped using the U: designation during the course of this project.

3. If the automated themes have not been populated, do so now (zoom out to see whether the automated themes symbols are visible in the Scenario View window). Go to CommunityViz | Impact Analysis | Edit Scenario, select the theme you want to populate, then "sketch" a point on the Scenario View. Populate the themes in the following order: **Visitation, **Accommodation, **Expenditures, **Social, and **Fiscal. You may also populate **Road Maintenance by tracing over the features of various road themes.

4. Instead of having to click on "View|Scenario View Properties…" or "Theme|Scenario Theme Properties…", you can click on the blue or red diamond buttons, respectively. If these two buttons are not visible or if you want to create your own customized buttons, double click in any space between existing buttons on the toolbar interface. A window will pop up. Select "View" in Type and "Buttons" in Category. Click on the New Button. Double click on the Click field below, scroll down and select OFF.SC.GUI.View.ScenarioProperties for the first button. To put an icon on the button, double click on the icon field and select a figure. Repeat the same steps for the OFF.SC.GUI.Theme.ScenarioThemeProperties button.



F. Important Data Files

Below are the names, locations, and notes of select data files that were either acquired or developed and used in some way during the course of this project as well as the in development of EmiquonViz.

ArcView:

emiquonproject.apr

- Urban-server6\ILLriver\EmiquonViz
- This is the ArcView project file for EmiquonViz
- The scenario folder is in Urban-server6\ILLriver\EmiquonViz\emiquon1, which contains all associated scenario tables and automated shapefiles; normal shapefiles are stored in the EmiquonViz folder.

Access:

LaGrange.mdb

- Urban-server6\ILLriver\EmiquonViz
- Database of County Business Patterns (1999) and Journey-To-Work (1990); students of Professor Andy Isserman's UP406 will be familiar with the derivation and structure of the database
- Can examine specialization at the six-digit NAICS level and commuting linkages

Excel:

Fulton TrenDandy.xls
Mason TrenDandy.xls

- Urban-server6\ILLriver\EmiquonViz
- Can examine employment by sector from 1969 through 2000
- Again, students of UP406 will recognize the structure of the file

EmiquonViz_Spreadsheets.xls

- Urban-server6\ILLriver\EmiquonViz
- Most, if not all, of the scenario tables (.dbf files) were generated within the worksheets

LAU Time Series.xls

- Urban-server6\ILLriver\EmiquonViz
- Local area unemployment statistics; includes time series chart of unemployment rate in the La Grange Reach region

Earnings_Income.xls

- Urban-server6\ILLriver\EmiquonViz
- Time series charts of location quotients of services employment, retail employment, farm employment, residential adjustment, residential adjustment as % of earnings by place of work

Havana Visitor Information.xls

- Urban-server6\ILLriver\EmiquonViz
- Listing of hotels, motels, bed and breakfasts, grocery stores, gas stations, etc. in Havana.
- Provided by Terry Svob, economic development coordinator at the City of Havana

population pyramid.xls
- Urban-server6\ILLriver\EmiquonViz
- Population pyramid of Fulton and Mason counties (2000)

PowerPoint:
EmiquonViz Conceptual Framework.ppt
EmiquonViz Conceptual Framework1117.ppt
- Urban-server6\ILLriver\EmiquonViz
- First draft pictorial of conceptual framework
- Presented at progress meeting to Illinois River team on June 26, 2003 (present: Zorica Nedovic-Budic, Doug Johnston, Dave White, and Raymond Kan)

EmiquonViz Model Framework.ppt
- Urban-server6\ILLriver\EmiquonViz
- Update of conceptual framework; this version *does not* reflect completely the current version of EmiquonViz. No subsequent update to the conceptual was planned.

EmiquonViz Presentation.ppt
EmiquonViz Presentation_backup.ppt
- Urban-server6\ILLriver\EmiquonViz
- Created as part of Memorandum-of-Understanding with CommunityViz
- Presented to Illinois River team on August 8, 2003 (present: Doug Johnston, Dave White, Rip Sparks, Raymond Kan)
- Updated

FromTNC.ppt
- Urban-server6\ILLriver\EmiquonViz
- Maps of Emiquon Preserve and concept plans
- Provided by Doug Blodgett of The Nature Conservancy, April 2003

Word
EmiquonViz_Paper.doc
EmiquonViz_Paper_backup.doc
- Urban-server6\ILLriver\EmiquonViz
- Final report in support of EmiquonViz project

Charrette_notes.doc
- Urban-server6\ILLriver\EmiquonViz
- Notes taken from charrette session on February 21, 2003 (Present: Zorica Nedovic-Budic, Doug Johnston, Dave White, Rip Sparks, Raymond Kan)

SWOT Analysis of LaGrange Region.doc
- Urban-server6\ILLriver\EmiquonViz
- Presentation of charrette session in the form of a Strengths-Weaknesses-Opportunities-Threats table

Mason_Fulton_Notes.doc
- Urban-server6\ILLriver\EmiquonViz
- Notes on LaGrange.mdb database and TrenDandy files

JournalArticleNotes.doc
- Urban-server6\ILLriver\EmiquonViz
- Notes on several journal articles; in preparation of progress meeting on June 26, 2003

TNC_Vision_Emiquon.doc
- Urban-server6\ILLriver\EmiquonViz
- TNC's vision statement for Emiquon Preserve
- Provided by Doug Blodgett of The Nature Conservancy, April 2003

rptMonthAttend2000.doc
rptMonthAttend2001.doc
rptMonthAttend2002.doc
- Urban-server6\ILLriver\EmiquonViz
- Monthly attendance records for state parks, conservation areas, etc.
- Provided by Karen Andrews of Illinois Department of Natural Resources

rptAttendance2002.doc
- Urban-server6\ILLriver\EmiquonViz
- Annual attendance records for state parks, conservation areas, etc.
- Provided by Karen Andrews of Illinois Department of Natural Resources

RptCampAttendw_ChartPM.doc
RptCampAttendw_ChartSR.doc
- Urban-server6\ILLriver\EmiquonViz
- Pere Marquette and Starved Rock camp attendance (1997 – 2001): number of campers, campsite days, camper days, number of permits, camping revenue
- Provided by Karen Andrews of Illinois Department of Natural Resources

G. Key Contacts

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ILLUSTRATIONS

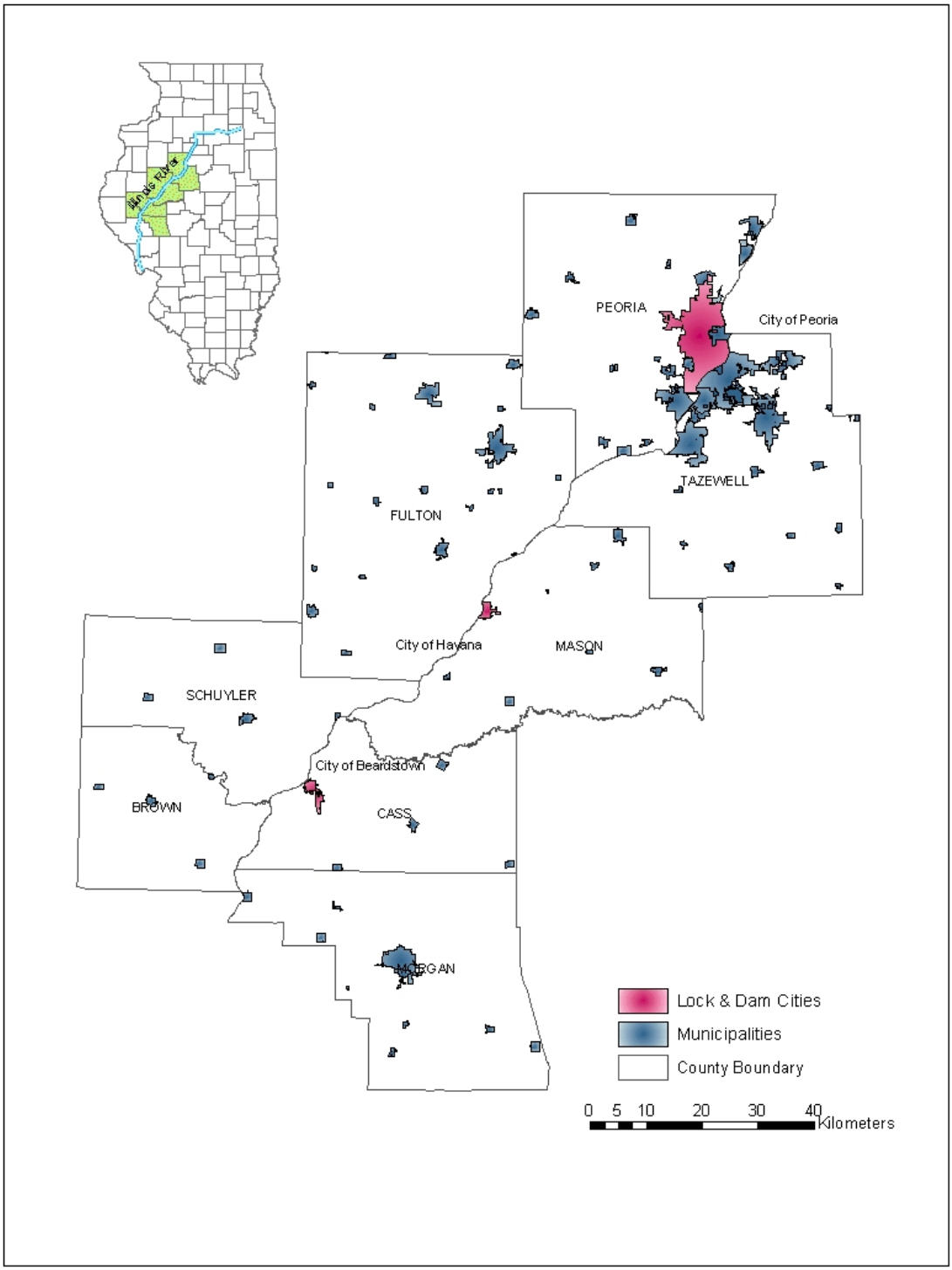

Figure 1. The Illinois River is part of the upper Mississippi river system. The La Grange Reach is the 124-km stretch of the Illinois River bounded by lock and dams at the cities of Peoria and Beardstown.

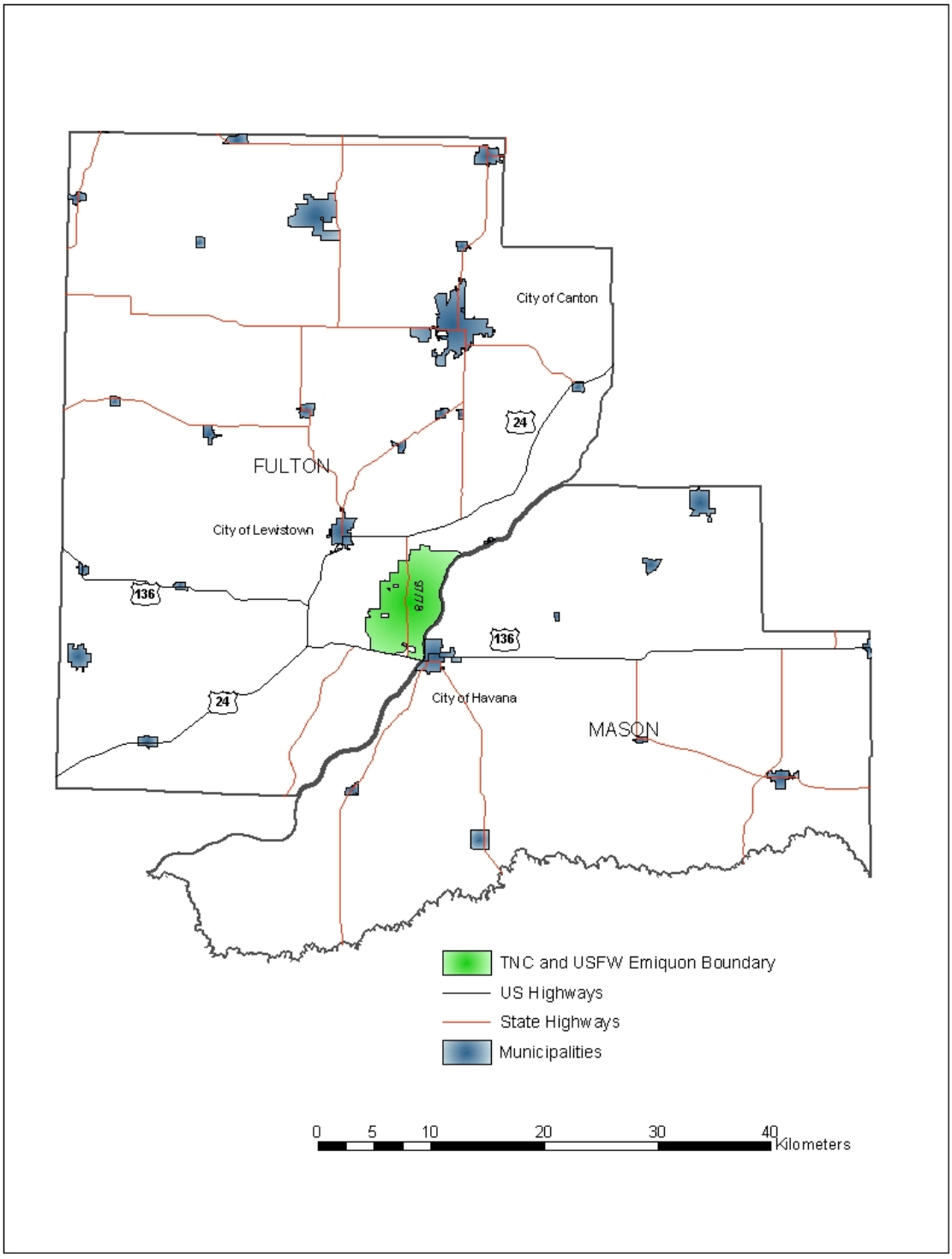

Figure 2. Both TNC and USFW own former agricultural land in the Emiquon area. Major routes to the area are State Highway 97/78 and US Highways 24 and 136.

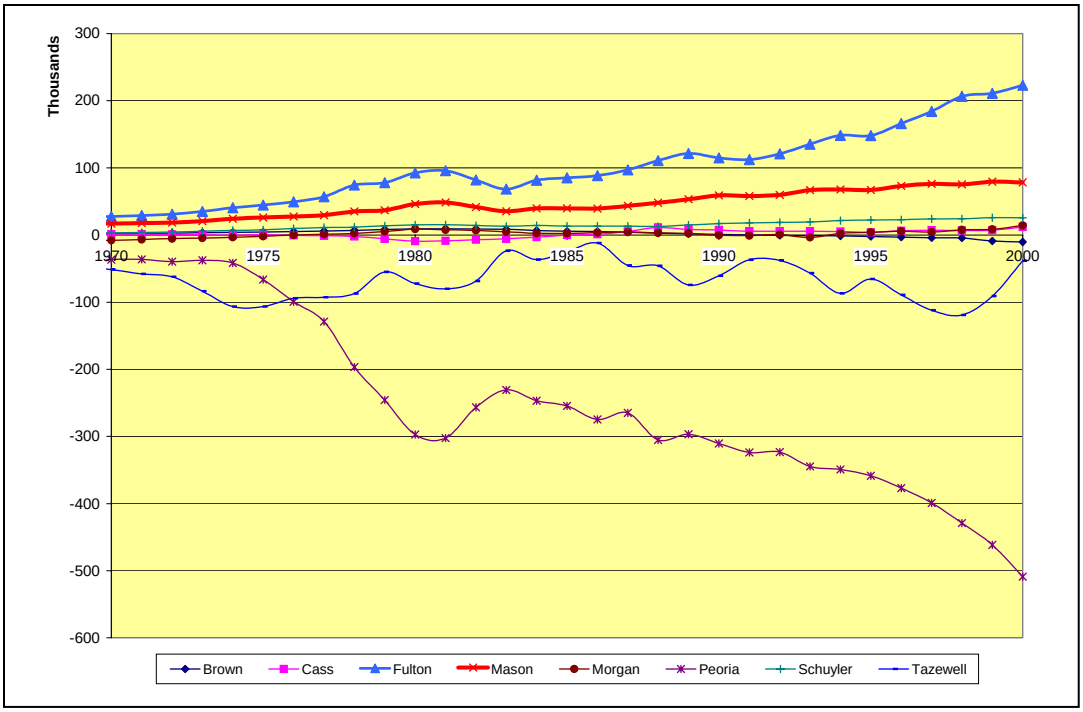

Figure 3. Time series chart of residential adjustment, in thousands of dollars.

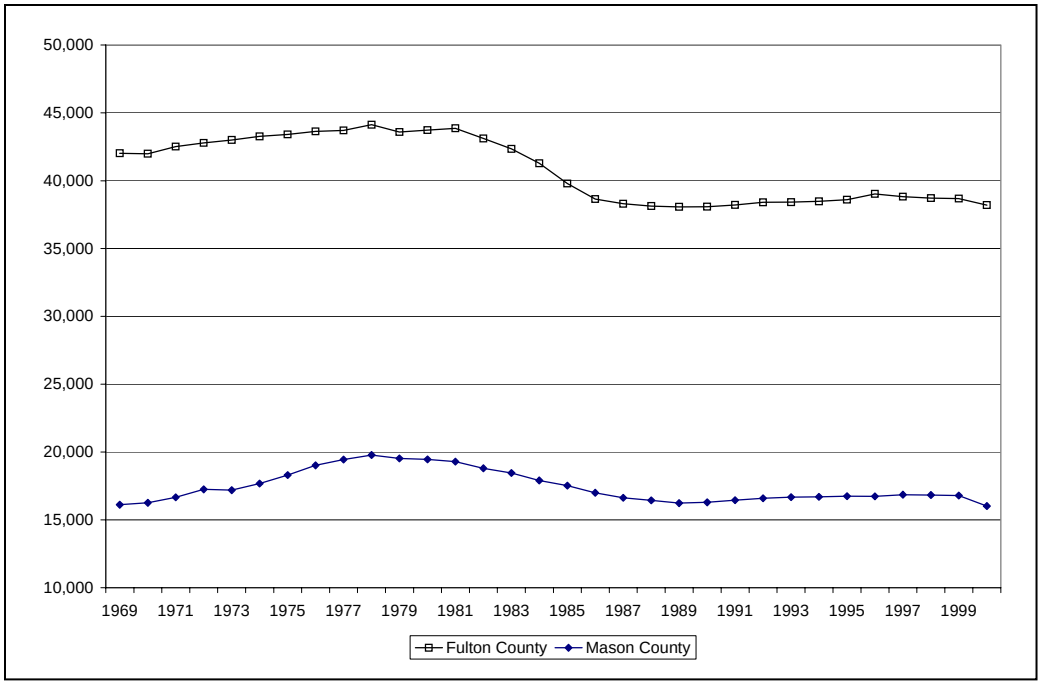

Figure 4. Population trend in Fulton and Mason counties. The recession in the 1980's and the closing of bituminous mines drove the decline in population in both counties.

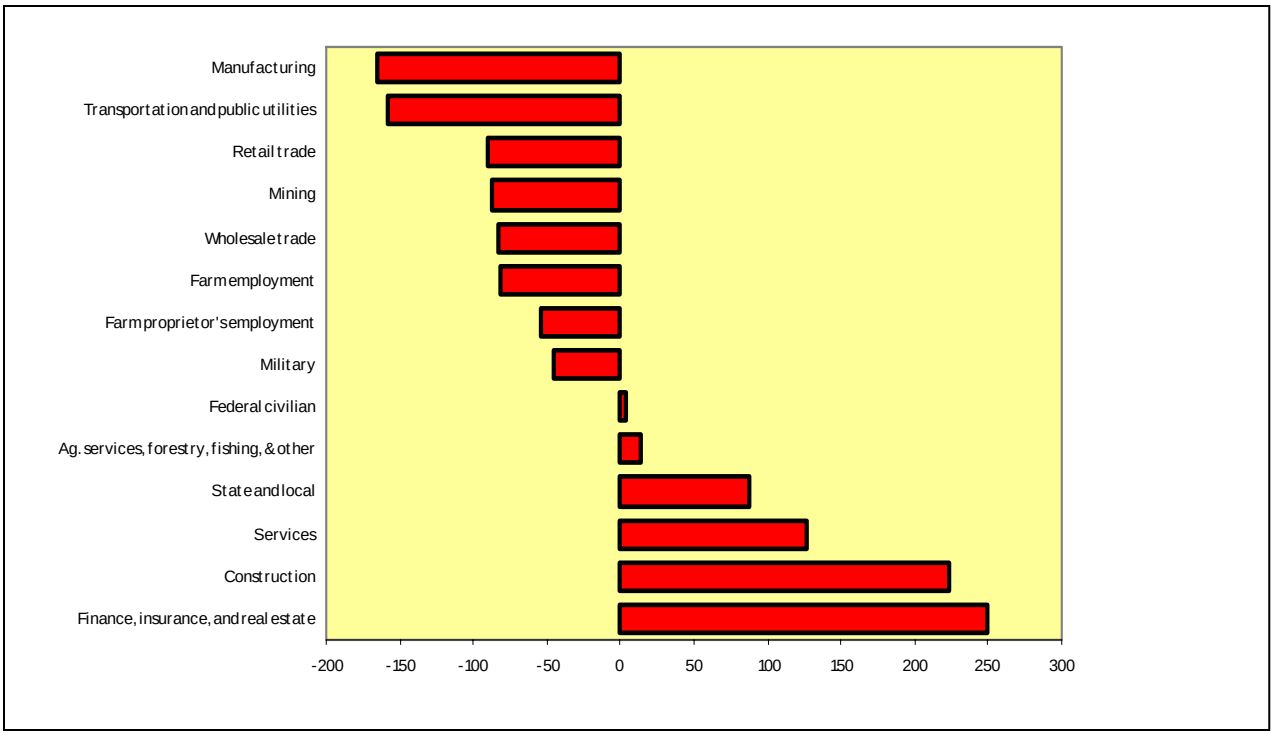

Figure 5. Change in employment (number of jobs) in Fulton County, 1990-2000. The greatest gains were in finance, insurance, and real estate; construction; services; and local government.

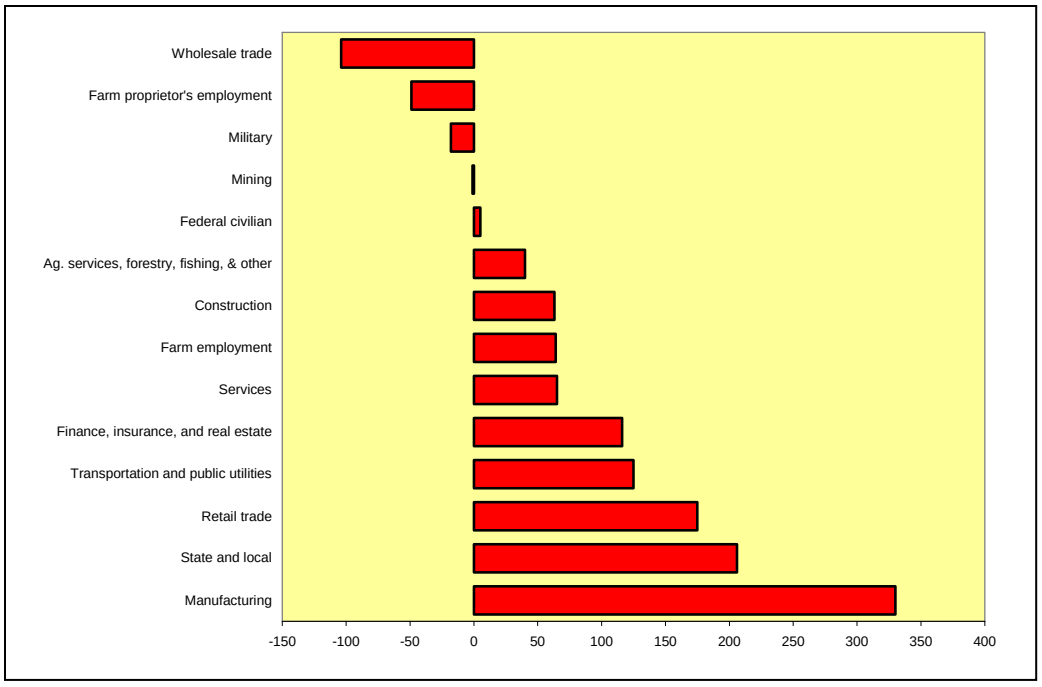

Figure 6. Employment change (number of jobs) in Mason County, 1990-2000. The greatest gains were in manufacturing, local government, retail trade, transportation, and finance.

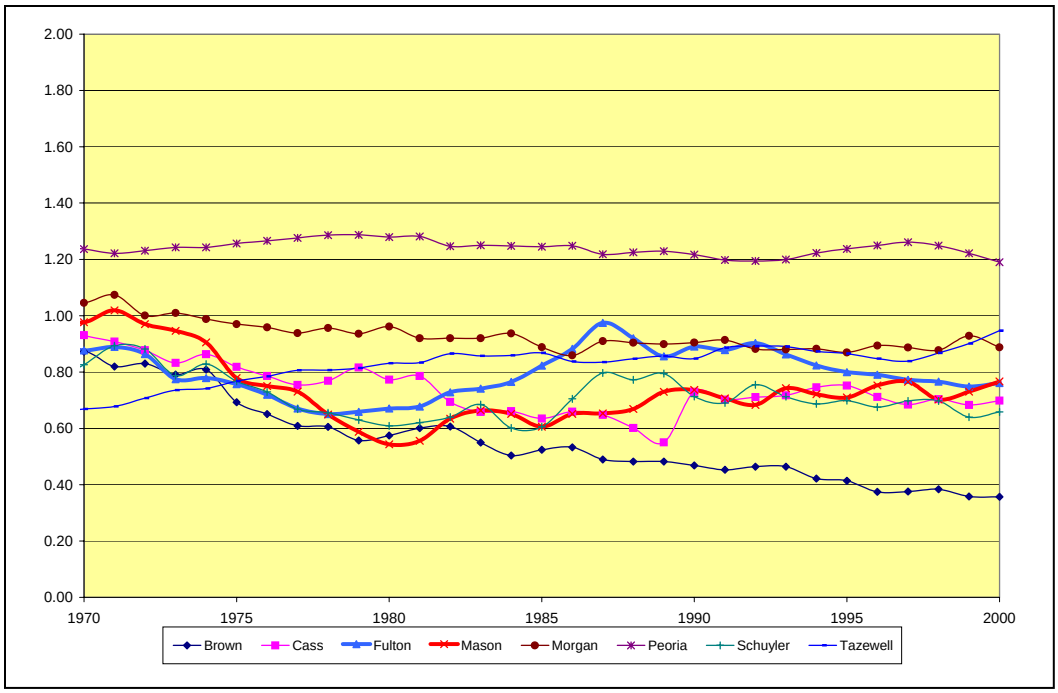

Figure 7. Time series chart of retail employment location quotient (based on La Grange employment and population only).

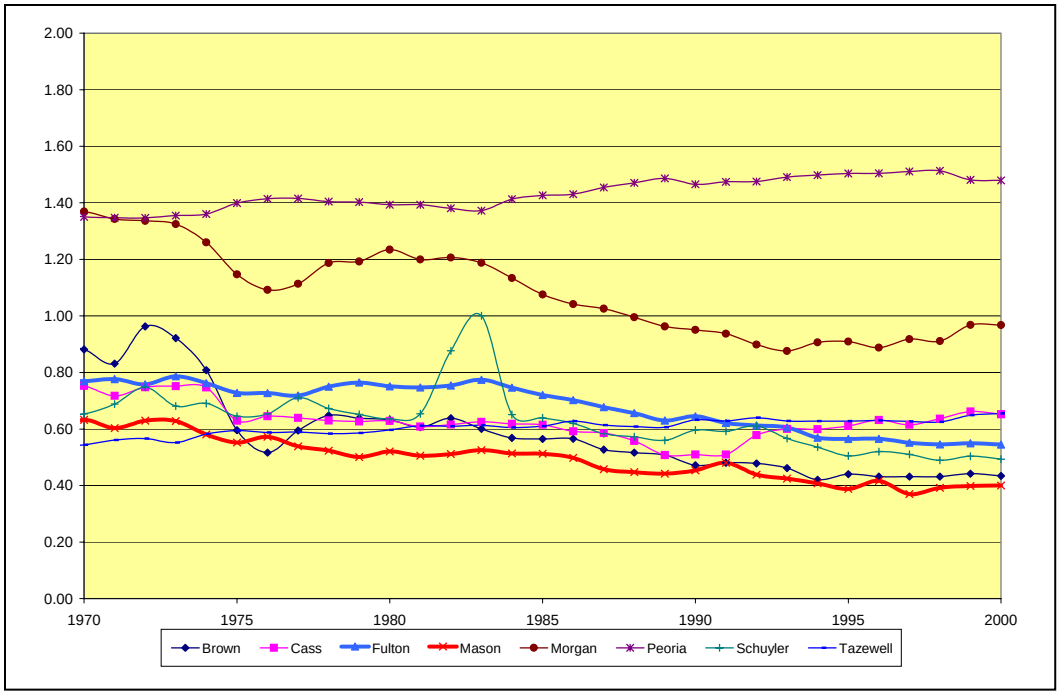

Figure 8. Time series chart of services employment location quotient (based on La Grange Reach employment and population only).

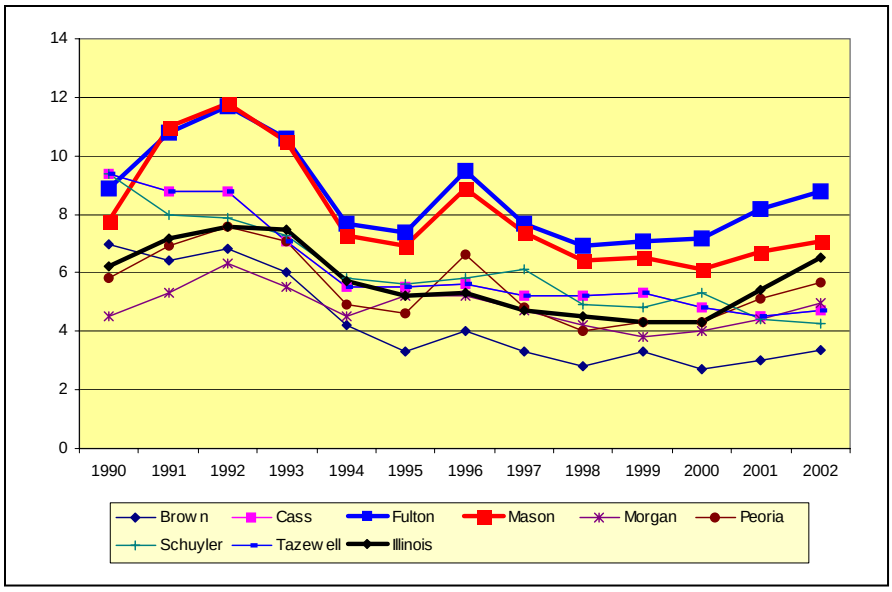

Figure 9. Unemployment rates in Fulton and Mason counties have been consistently and continue to be higher than that of the other La Grange Reach counties.

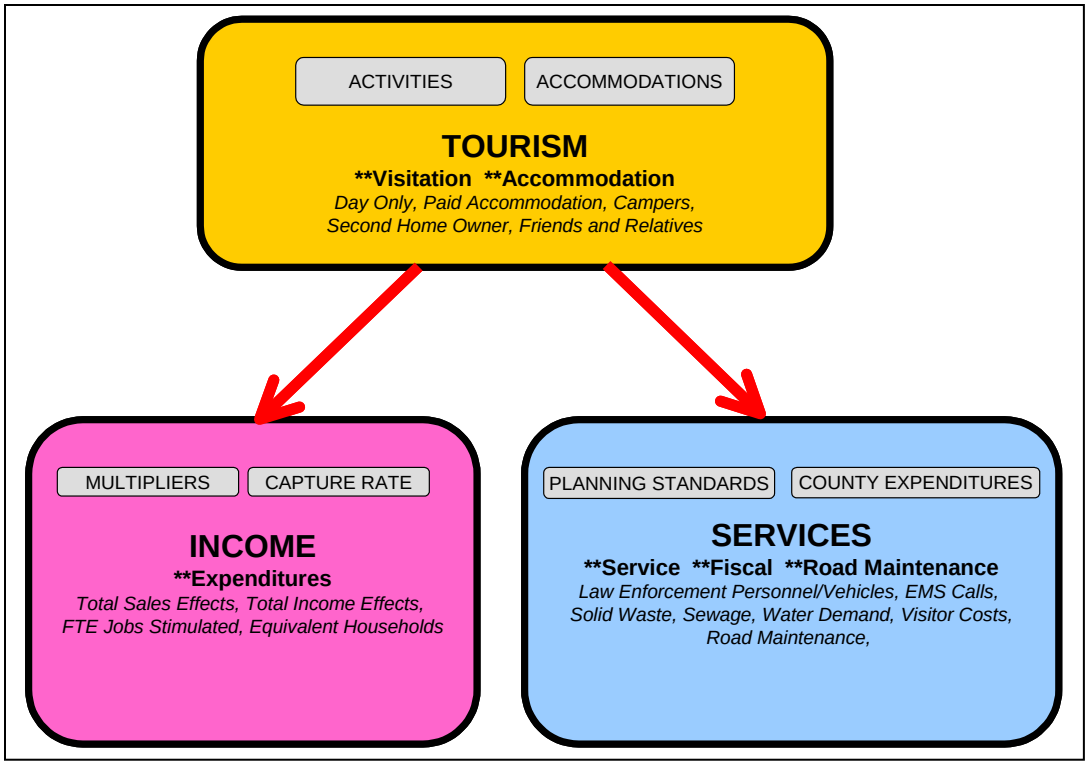

Figure 10. EmiquonViz model logic. The colour boxes represent conceptual submodels. The red arrows show the data and calculation flows. The grey boxes are examples of key variables affecting calculations in the submodels. The italicized terms represent sample outputs and indicators. Automated themes associated with each submodel are designated with "**".

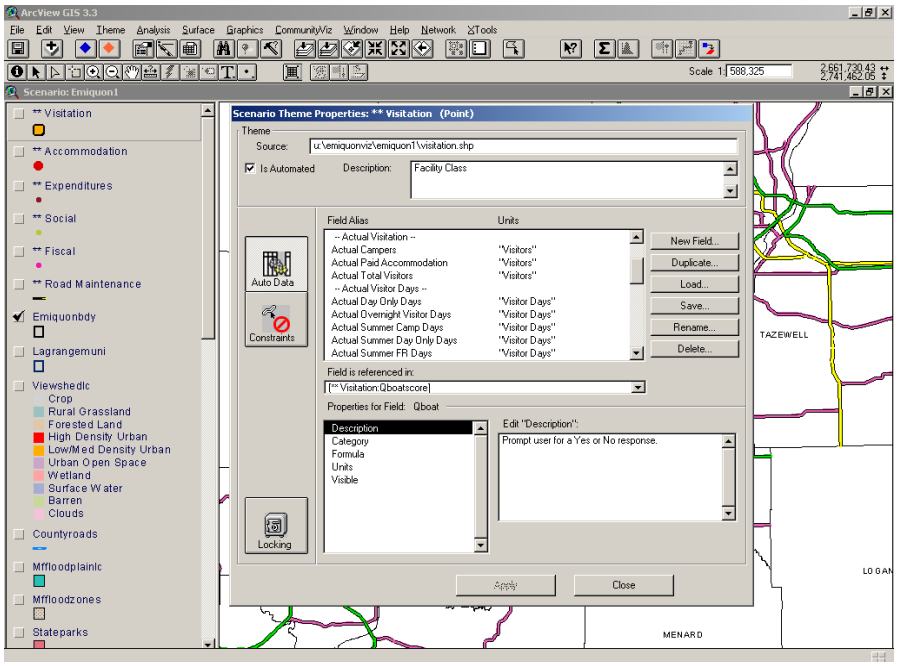

Figure 11. Table of contents in Scenario View. Automated themes (distinguished by "**") can be customized with formulae, as shown in the active Scenario Theme Properties dialogue box.

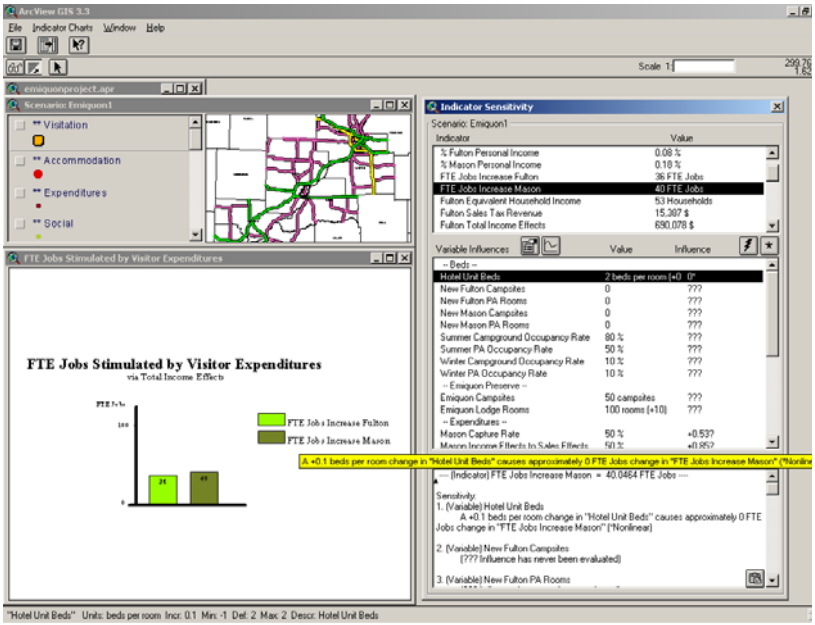

Figure 12. Indicators summarize important fields in automated and non-automated themes and are shown in charts. The active Indicator Sensitivity dialogue box allows the user to test all the user-adjustable variables associated with each indicator.

Table 1. Destination of Workers that Reside in Fulton and Mason Counties. Original data were obtained from US Census Bureau's 2000 Journey-To-Work dataset.

Place-of-Residence, County	Place of Work, County	Percent of employed residents in Place-of-Work County
Fulton County (15,756 employed residents)	Fulton	58
	Peoria	18
	Tazewell	6.7
	Mason	2.4
Mason County (6940 employed residents)	Mason	49
	Tazewell	14
	Sangamon	10
	Peoria	7.5
	Fulton	3

Table 2. Source of Workers for Fulton and Mason Counties. Original data were obtained from US Census Bureau's 2000 Journey-To-Work dataset.

Place-of-Work, County	Place of Residence, County	Percent of workers from Place-of-Residence County
Fulton County (10,647 workers)	Fulton	86
	Peoria	3.4
	Mason	1.9
Mason County (4542 workers)	Mason	76
	Fulton	8
	Tazewell	7.4
	Peoria	0.6

Table 3. Industry Specializations for Fulton and Mason Counties. Original data obtained from US Census Bureau's 1999 County Business Patterns database and BEA's Regional Economic Information System (REIS) database.

Industry	NAICS	EST	EMP2	LQP	Extra Jobs
Fulton County					
Farm employment	10----	--	1555	3.46	1105
Local government	94----	--	2131	1.20	353
Nursing & residential care facilities	623///	11	692	1.90	328
Food & beverage stores	445///	16	549	1.28	121
Primary metal mfg	331///	1	174.5	2.06	90
Utilities	221///	5	166	1.75	71
Gasoline stations	447///	22	187	1.42	55
Hospitals	622///	1	749.5	1.06	40
Nonstore retailers	454///	10	109	1.42	32
Educational services	611///	3	374.5	1.09	30
Ambulatory health care services	621///	34	639	1.01	6
Mason County					
Farm employment	10----	--	781	4.00	586
Local government	94----	--	990	1.28	218
Primary metal mfg	331///	2	174.5	4.74	138
Nursing & residential care facilities	623///	5	273	1.73	115
Transit & ground passenger transportation	485///	2	69	3.03	46
Gasoline stations	447///	11	103	1.80	46
Bldg material & garden equip & supp dealers	444///	7	115	1.58	42
Utilities	221///	1	74.5	1.81	33
Food & beverage stores	445///	9	217	1.17	31
Waste management & remediation services	562///	2	36.5	2.06	19
Agriculture & forestry support activities	115///	4	14.5	2.39	8
Wood product mfg	321///	4	43	1.17	6

EST: Number of establishments
EMP2: Revised estimates of employment

$$\text{LQP (Population-based Location Quotient)} = \frac{\text{County Industry Employment / County Population}}{\text{Nation Industry Employment / Nation Population}}$$

$$\text{Extra Jobs (Population-based)} = \left(\frac{\text{County Industry Emp}}{\text{County Population}} - \frac{\text{Nation Industry Emp)}}{\text{Nation Population}}\right) \text{X County Pop}$$

Table 4. Non-specialized industries in Fulton and Mason counties. Original data were obtained from US Census Bureau's County Business Patterns database and BEA's Regional Economic Information System (REIS) database.

Industry	NAICS	EST	EMP2	LQP	Extra Jobs
Fulton County					
State government	93----		292	0.42	-397
Corp, subsidiary & regional managing offices	551114	1	2	0.01	-368
Federal civilian	91----		121	0.31	-274
Full-service restaurants	722110	30	309	0.58	-228
Military	92----		86	0.29	-208
Hotels (exc casino hotels) & motels	721110	3	31	0.16	-163
Auxiliaries (exc corporate, subsidiary & regional mgt)	95----	1	14.5	0.11	-122
Janitorial services	561720	4	10	0.08	-118
Offices of lawyers	541110	12	44	0.31	-100
Mason County					
State government	93----		142	0.47	-157
Full-service restaurants	722110	16	109	0.47	-124
General medical & surgical hospitals	622110	1	174.5	0.62	-109
Federal civilian	91----		69	0.40	-103
Military	92----		37	0.29	-91
Offices of physicians (exc mental health)	621111	3	14.5	0.14	-87
Hotels (exc casino hotels) & motels	721110	3	14.5	0.17	-70
Janitorial services	561720	2	4	0.07	-52
Wired telecommunications carriers	513310	2	4	0.08	-46
Limited-service restaurants	722211	8	141	0.78	-39

Table 5. Top employment sectors in Fulton County, 2000 (REIS)

Sector	Employment	Share of Total (%)
Total full-time and part-time employment	14,254	100
Services	3,828	27
Retail trade	3,002	21
State and local government	2,402	17
Farm employment	1,538	11
Farm proprietors' employment	1,343	9
Finance, insurance, and real estate	932	7

Table 6. Top employment sectors in Mason County, 2000 (REIS)

Sector	Employment	Share of Total (%)
Total full-time and part-time employment	6,694	100
Retail trade	1,268	19
Services	1,178	18
State and local government	1,200	18
Farm employment	782	12
Manufacturing	585	9
Farm proprietors' employment	507	8
Finance, insurance, and real estate	404	6

Table 7. State park & lodge and state conservation area acreage and attendance. Data obtained from Illinois Department of Natural Resources' annual *Land and Water Report*.

Name	County	Acreage (Land+Water+Leased)	Attendance 2000
Cave-In-Rock State Park	Hardin	192	524,782
Eagle Creek State Park	Shelby	1462	339,251
Giant City State Park	Jackson, Union	4052	1,208,662
Illinois Beach State Park	Lake	2982	2,859,068
Pere Marquette State Park	Jersey	8129	1,271,340
Starved Rock State Park	LaSalle	2817	161,016
Wayne Fitzgerrell State Park	Franklin, Jefferson	3242	1,412,616
White Pines Forest State Park	Ogle	385	362,278
Anderson Lake SCA	Fulton, Schuyler	2,248	138,546
Rice Lake SCA	Fulton	5,660	113,401
Sanganois SCA	Mason, Cass, Schuyler	9,319	74,830
Spring Lake SCA	Tazewell	2,032	249,802