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FOR ECONOMIC IMPACT ASSESSMENT

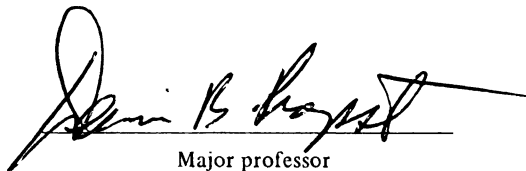
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CLASSIFICATION OF CORPS OF ENGINEERS PROJECTS
FOR ECONOMIC IMPACT ASSESSMENT

By

Dennis Robert Becker

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ABSTRACT

CLASSIFICATION OF CORPS OF ENGINEERS PROJECTS FOR ECONOMIC IMPACT ASSESSMENT

By

Dennis Robert Becker

Formal methods for performing economic impact assessments (EIA) are often time consuming and expensive. This study developed a classification system that shortcuts formal EIA processes by working as a “look-up” table in assigning the data required for input-output modeling. That is, the system provides visitor spending profiles and regional sales multipliers for Corps of Engineers (COE) projects that lack primary data. Socio-economic variables from previous research were used to construct the classification system. ANOVA results showed that the classification system successfully segmented COE projects into homogeneous categories having statistically different class means for many of the variables. Results of the discriminant analysis showed that fifty-five percent of the projects were correctly classified, and that regional population, number of retail establishments, per capita retail sales, percent retail sales, median household income, and distance to the nearest metropolitan area were valid discriminators. Recommendations for reducing the error in the classification system and for using it to perform EIAs are provided.

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Several people have been with me in seeing this project through, and in supporting me through the difficult times. I would like thank Dr. Joseph Fridgen, Park, Recreation & Tourism Resources department chair, for his generous contributions. Above all, I would like to thank my fellow graduate students and peers for their help and assistance, and most importantly to my friends and family for their unending support and encouragement to go the extra mile. This thesis would not be possible without them.

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Chapter 1

INTRODUCTION

The allocation of scarce resources is a critical issue facing many public resource management agencies. Public agencies charged with the care and management of these resources must secure public funding on a competitive basis based on perceived and real benefits and impacts on public welfare. For socially optimal uses of limited public funds, quantification of effects of resource allocations are necessary (Leitch and Leistritz, 1985).

Many public entities, including state and local governments, and federal resource agencies carry out impact studies to quantify the economic effects of proposed actions or policies on a region's economy. The methods used to forecast and understand economic behaviors and impacts created by proposed economic activities are collectively called economic impact assessments (EIA) (Propst and Gavrilis, 1987). Building on theory and knowledge in regional economics, socio-economic assessments, and mathematical economics and econometrics, EIAs typically involve analyses of the intersectoral relationships which exist within a region. Knowledge of the linkages and flows (interdependencies) of economic activity within an economy allows for an increased awareness of possible implications of proposed actions and policies (Propst and Gavrilis, 1987). In the context of public resource management agencies, it is possible with EIAs to

anticipate the economic consequences of a proposed action or policy, such as increasing recreation user fees. It is also possible with EIAs to make annual projections required for effective planning, project business output by economic sector, and show the consequences of alternative development scenarios (Stynes and Propst, 1996).

Increasingly, EIAs are also used as performance indicators in developing agency budgets and formulating policies (Alward and Lofting, 1985; Archer and Fletch, 1996; Johnson, Obermiller and Radtke, 1989). Estimates of economic impacts of visitor spending assist the Corps of Engineers in justifying recreation budgets in Congressional hearings.

Economic impact assessments are utilized on a regular basis by all seven federal land management agencies in the United States (USFS, FWS, NRCS, BLM, NPS, BOR, and COE) (Clarke and McCool, 1996). Agencies such as the US Forest Service (USFS) and the Fish and Wildlife Service (FWS) use EIAs to analyze the economic impacts of designating public lands as wilderness for the purpose of endangered species protection. The Natural Resources and Conservation Service (NRCS) uses EIAs to measure the economic implications of different types of agricultural practices, such as conventional versus alternative soil tillage techniques. The National Park Service (NPS) often uses EIAs to measure the economic impacts of recreation activity, and the implications of those impacts in terms of jobs resulting from visitor spending. Similarly, the Bureau of Reclamation (BOR) utilizes EIAs to measure the economic implications of recreation on lands developed primarily for water conservation (Clarke and McCool, 1996). As illustrated, EIAs have a variety of uses in natural resource planning for federal agencies as well as for state and local agencies for similar purposes.

Traditional methods of quantifying economic impacts of proposed actions or policies on a region's economy require extensive knowledge of EIA concepts, requirements, and limitations. Additionally, methods which rely primarily on primary visitor expenditure data often require large investments of time and money for data collection and aggregation. Often times all that is needed for agency planning purposes is a crude estimate of economic impacts. The development of simpler tools, aimed at aiding in the estimation of economic impacts of changes in consumer demand or supply of resources, would allow resource management agencies to quickly and cost effectively justify or prioritize budgetary allocations. The research in this study focuses on the development of a simplified economic assessment tool for the U.S. Army Corps of Engineers (COE) as it relates to recreation visitor spending while visiting COE areas.

Economic Significance of Corps of Engineers Recreation Areas

Currently the Corps of Engineers operates and manages 462 water resource development projects in the United States for purposes of commercial navigation, flood control, hydroelectric power, and public recreation. A large majority of these projects exist in close proximity to highly populated areas providing significant opportunities for people of all ages and backgrounds to participate in recreation activities, particularly water-based activities. Given that Corps of Engineers visitors account for roughly one third of all recreation visitor days to federally managed recreation areas, Corps of Engineers projects can play a significant role in the economic health and vitality of a

region (Jackson, 1997). While engaging in recreation activities at COE projects, visitors spend money in several sectors of the economy for trip-related goods and services. For instance, a family camping at a COE project may purchase groceries from a local store, eat at a restaurant, or buy souvenirs. The degree to which the local economy is affected by this type of spending behavior is potentially significant in light of the number of visits taken each year to Corps of Engineers areas by campers and other types of recreation visitors. With the aid of economic impact assessments, the Corps of Engineers is capable of measuring the economic implications of visitor spending in terms of jobs, income, and sales generated (Jackson, Stynes and Propst, 1994).

Study Purpose

The purpose of this study is to develop a classification system to obtain the necessary information needed to quickly and cost effectively estimate impacts for Corps of Engineers projects. The proposed classification system is one method that can be used to reduce the cost and time constraints required of traditional economic impact assessment techniques.

Critical to the development of the classification system is the identification of factors which influence Corps of Engineers recreation visitor spending and the regional economic impacts of that spending. Based on differing levels of these factors, economic impact assessments can be estimated at Corps of Engineers projects lacking primary visitor expenditure data. Differing levels of these factors provide the basis for the

classification of a sample of Corps of Engineers projects into relatively homogeneous classes. Within each class there exists at least one COE project for which visitor spending profiles and the economic impacts of that spending have been measured with primary survey-based data. Assuming the dimensions of the classification system are valid and accurately represent socio-economic conditions around COE projects, the values from surveyed projects can be assigned to non-surveyed projects.

The information and tools developed in this study will allow the Corps of Engineers an alternative method of quickly and effectively deriving the required inputs for an economic impact assessment. With these inputs the Corps of Engineers can readily estimate regional economic impacts of proposed recreation management strategies to justify or prioritize budgetary allocations for recreation areas without having to collect primary visitor expenditure data at each site.



Chapter 2

REVIEW OF LITERATURE

Measuring the economic impacts of recreation visitors with traditional economic impact assessment methods is a time consuming and complex process. Sometimes this complex process is necessary to predict visitor spending and to obtain accurate measurements of that spending. However, often times all that is needed for agency planning purposes is an estimate of economic impacts which can be obtained without these complex models (Propst et al., 1985). The classification of recreation areas based on site and regional characteristics is a less expensive approach that bypasses traditional methods of measuring economic impacts. A review of literature is used to identify applications of classification systems in recreation and regional economics. It is also used to identify factors which influence the degree of visitor spending at recreation sites, and the impacts of that spending on the local economy. Input-output modeling in regional economics is also examined to provide a brief background of the economic concepts important to EIAs and their application to the proposed classification system.

Recreation Classification Systems

Classification is an integral part of science, and often the degree of classification is a measure of various disciplines' advancement of knowledge. Chemistry reached its first important stage of development with Mendeleev's periodic table of the elements. Botany reached its when Linnaeus developed a taxonomic, or classification system, that furthered the understanding of plants and their relationships to each other (Gorelik and Skripkin, 1989). Likewise, recreation and tourism has employed classification systems to segment different types of visitors for marketing and management purposes (Bevins and Zwick, 1993; Clark and Stankey, 1978; and Outdoor Recreation Resource Review Commission, 1962).

Recreation management often uses some type of classification as one step in the planning process (Bevins and Zwick, 1993). Armed with classification tools, agency managers and researchers can compare visitor experiences related to opportunities provided, identify patterns of visitor demand, and make short-term forecasts for management and planning purposes. For instance, classifying campgrounds as being rustic or modern can be used to determine the level of maintenance required for each type. Two of the more-well known classification systems used in recreation planning are the Outdoor Recreation Resource Review Commission (ORRRC) and the Recreation Opportunity Spectrum (ROS). These systems are used to illustrate the use of classification as a recreation planning and management tool.

The ORRRC in 1958 decided that an intensive nationwide study should be made of outdoor recreation to provide a systematic approach for meeting growing recreation demand after World War II. The purpose of the study was to identify and forecast outdoor recreation demand in the United States until the year 2000. Additionally, the commission was to identify available resources and the policies needed to ensure those needs were adequately and efficiently met initially and in the future. The commission recommended an inventory system which classified natural resources by type of resource and recreational value ranging from “High-Density Recreation Areas,” (areas intensively developed and managed for mass use) to “Primitive Areas” (undisturbed roadless areas characterized by natural, wild conditions). With the classification system, planners and managers could identify the available resources for a given area, and make decisions how best those resources should be used. The implementation of this system was a major step forward in a coordinated national recreation effort to provide a consistent and effective method of planning for all land-managing agencies and promoted logical adjustment of recreation activities to the available areas (ORRRC, 1962).

The ROS was developed as an outdoor recreation resource supply inventory and classification system for multiple use natural resource planning. Developed by the U.S. Forest Service, it is a framework for integrating recreational opportunities and non-recreational activities. Unlike the ORRRC inventory system which based classification solely on the physical setting of the resources, the ROS classes are defined by a spectrum of recreational opportunities and their associated physical, social, and managerial settings. Classes of the ROS range from “primitive” (provides an opportunity for isolation to feel a part of the natural environment), to “modern urbanized” (provides an

opportunity to experience affiliation with individuals and groups, wildland challenges are unimportant) (Clarke and Stankey, 1978). The central notion of the spectrum is to offer recreation visitors alternative settings in which they can derive a variety of experiences. If full ranges of opportunity settings are provided, changes in demand are more easily accommodated because the kinds of features an activity requires are more likely to be available.

Classification in recreation and tourism, not unlike other disciplines of science, offers a means by which to further understanding of relationships between objects important to planning and management. Building on a priori and statistical approaches to classification in regional economics, a theoretically grounded system can be developed to identify variations in regional economic impacts and visitor spending. Break points in the data can be identified and non-surveyed Corps of Engineers projects can then be assigned to appropriate classes.

Classification in Regional Economics

The primary building blocks of classification systems, including those used in regional economics, are the patterns of relationships, phenomena, or processes which exist between objects (Abler, 1971). Regional economics is concerned with explaining why businesses and industries locate where they do, understanding consumer's purchasing behaviors, understanding and predicting regional development and growth, and identifying the structure and implications of interregional transactions. Economic

impact assessment procedures are analytical tools used by regional economists to predict patterns of regional and interregional relationships (Richardson, 1969). Likewise, classification of socio-economic data such as demographic characteristics, geographic locations, and perceived product benefits is used to segment consumers into homogeneous groups based on market demand (Gunter and Furnham, 1992). Classifying recreation visitors according to their patterns of spending and their regional economic effects, gives researchers or regional economists an analytical tool capable of projecting social and economic impacts created by proposed economic activities or shifts in consumer demand (Bevins and Zwick, 1993).

Prior knowledge of interrelationships between variables should be the fundamental building block for all classification systems, whether statistical in nature, or not. Each classification system, developed from prior knowledge, allows for a systematic discrimination of objects into homogeneous groups providing a means by which to predict performance and behavior (Gorelik and Skripkin, 1989). Prior knowledge of interrelationships between variables, based on general theory, is often used to segment different populations into homogeneous groups. Thus, a priori classification of Corps of Engineers projects can be a useful tool in describing and comparing attributes pertinent to recreation planning and management (Bevins and Zwick, 1993).

Some studies in regional economics rely heavily on statistical classification to identify market segments, and to verify hypothesized relationships developed from a priori investigations of observations (Punj and Stewart, 1983; Bevins and Zwick, 1993). Unlike a priori classification methods, many statistical methods, such as cluster and factor analysis, make no prior assumptions about interrelationships between different

populations. Cluster and factor analysis are purely empirical methods of classification and as such are primarily inductive techniques. Punj and Stewart (1983) suggest that caution should be taken when using inductive techniques as they lack a conceptual (deductive) understanding of the relationships that exist, and individually provide little utility for planning and management. Statistical methods, such as regression and discriminant analysis, on the other hand rely on conceptual hypotheses. Cluster and discriminant analyses are used in regional economics and marketing to identify differences in consumer attitudes and preferences to predict consumer behavior.

Regardless of the method used to classify objects or to verify the classification, statistical verification of hypothesized interrelationships which exist between consumers and the areas where they purchase goods and services further enhances an EIA (Punj and Stewart, 1983). As such, statistical verification of a priori relationships between recreation visitors and regional economies allows researchers and managers to identify the strengths and weaknesses of the a priori set of assumptions.

Factors Influencing Recreation Spending

There is a rich history of economic literature pertaining to relationships between consumer demand for products and services, and industry supply factors relating to price influences and inputs. Notably, classic studies by Samuelson (1963) and Schultz (1938) provided economists with 'operationally meaningful' theorems and hypotheses on market equilibriums, and the demand for goods and services based on price. However, relatively little thought was initially given to spatial aspects within traditional economic theories.

Only within the past forty or so years have location theories, gravity-type spatial interaction models, and regional economics become an important element of mainstream economics extensively used today in policy and management decisions (Richardson, 1969; Fujita, 1990).

Location theory states that businesses tend to locate where they can maximize profits relative to production costs. Thus, the spatial position of industries and consumers is of foremost importance, overshadowing other motivations for location such as personal considerations and satisfactions (Richardson, 1969). Location theory aids in identifying regional interdependencies between specific sectors of the economy, such as the building of a convenience store in relation to a newly opened marina. Inasmuch, location theory allows for an estimation of the potential of new economic activity to attract new spending to a region (Propst and Gavrilis, 1987).

Gravity-type spatial interaction models provide a theoretical base for analyzing the spatial relationships between locations of economic sectors and consumers. It is assumed that recreation visitors traveling to different sites will attempt to minimize trip production costs by identifying goods and services that can be purchased for lesser amounts, while maintaining satisfaction.¹ Differences in travel time and search costs imply differences in total acquisition costs regardless of product prices (English and Bergstrom, 1994). Building on Hotelling's theory of industry agglomeration (Richardson, 1969), recreation-related sectors, such as retail establishments, have a tendency to cluster together. The clustering of economic sectors creates demand

¹The notion of minimizing trip cost while maximizing satisfaction is referred to as the Household Production Theory (English and Bergstrom, 1994).

externalities, including reduction in search costs, and increases the likelihood that visitors will find acceptable prices. Gravity-type spatial interaction models have recognized that the locational distribution of goods and services is a critical determinant in minimizing trip cost while maximizing satisfaction, and that the clustering of economic sectors is an attractive force for economic activity. Building on this notion, retail businesses may concentrate in and around recreation areas to provide goods and services to visitors, consequently increasing a recreation site's attractiveness (English and Bergstrom, 1994).

Various studies have focused on an assortment of regional and recreation site characteristics thought to influence visitor expenditures. Lieber and Allton (1983), and Lieber, Fesenmaier, and Bristow (1989) focused on regional and public recreation site aspects in Illinois. Lieber and Allton (1983) identified seven site and visitation characteristics expected to relate to variations in levels of visitor expenditures. These included: (1) type of recreation area (surveyed in a park or conservation area), (2) significance of resources (subjective agency rating of attractiveness), (3) degree of urbanization (whether a large urban area was within the region), (4) length of stay (day-use or overnight), (5) special events (at time of survey), (6) recreation season, and (7) distance traveled to recreation site (resident or non-resident). Their study revealed that neither the type of recreation area nor the ability of the resource base to attract visitors had much affect on average expenditures per party trip. They found greater non-resident visitor spending at recreation sites in close proximity to urbanized areas than at recreation sites in non-urban areas. They also found that visitor expenditures within the study region increased as the distance traveled by non-residents increased, and increased during special events and hunting seasons. Similarly, Lieber et al. (1989) concluded that the

locational distribution of recreation sites and visitor origin were important factors influencing levels of visitor spending. Surveys of public recreation users showed that total recreation spending per year was higher in areas that possessed a greater number of alternative recreation sites. Typically, spending per trip was lower within these regions. However, overall economic impact to the region was greater. They also concluded that the type of recreation site visited influenced levels of spending. For instance, visitors were likely to spend more while visiting state parks with concessions and convenience stores in the area, than while visiting conservation areas with relatively few services.

Results of the Dawson et al. (1989) study suggested that regional characteristics are an important factor in determining visitor spending. Dawson et al. (1989) suggested that variations in visitor spending are significantly influenced by the degree of economic development within a region, and the amount of tourism and recreation development. Results of visitor expenditure surveys in Great Basin National Park identified retail trade, restaurants and taverns, hotels and motels, amusement services (e.g. golf courses and theaters), and transportation services (e.g. gasoline and car rental) as the primary recreation-related economic sectors where visitors spend money. Analyses of the regional economic impacts from this spending indicated that increased visitation to the region resulted in relatively small increases in local economic activity, illustrated by the small amount of indirect effects. They concluded that in order for the region to increase recreation and tourism revenues, indirect economic impacts of visitor expenditures must be increased. For instance, restaurants should purchase their goods and services, used to meet recreation visitor demand, from the local area to receive an increased impact of visitor spending. Furthermore, it was hypothesized that increasing the supply and

diversity of recreation-related businesses would increase visitor's length of stay and total spending within the region by providing more opportunities to spend money.

Additional variables presumed to be important to the classification of recreation visitors and their expenditure patterns have been investigated in many other studies as well. Taylor et al. (1993) compared recreation visitors to historical sites with other types of recreation visitors. They identified specific demographic and trip-related variables that were thought to influence levels of visitor spending while visiting historic sites. Results of the study indicate that average daily per-person expenditures increased as household income increased. Furthermore, regression coefficients indicated that visitor expenditures decreased as the party size increased, the number of nights within the region increased, and if the group camped while in the area. Additionally, there was a positive relationship between regional visitor expenditures and visiting a historical site. However, historical sites were rarely the destination of visitors.

While researchers have a good idea of the economic sectors influenced by recreation and tourism (Archer and Fletcher, 1996, Dawson et al., 1993; Douglas and Harpman, 1995; and Johnson et al., 1989), there are only a limited number of published studies aimed at predicting recreation visitor spending. Based on the previously reviewed studies, it appears that travel distance, type of recreation activity, length of stay, type of lodging, degree of urbanization, and degree of recreation-related sectors within a region are the most common variables used to predict variations in visitor spending. Additionally, demographic variables (e.g. age, income, and occupation), season, type of recreation site, special events, and locational distribution of recreation sites have been useful in identifying variations of visitor spending. Variables influencing levels of visitor

spending may also contribute to variations in regional impacts of visitor spending. For example, Taylor et al. (1993) demonstrated that significant levels of visitor spending had a significant impact on a region's economy.

Variations in Regional Impacts of Visitor Spending

Economic impacts of visitor spending may be divided into direct, indirect, and induced effects. The sum of these three is termed the total effects. A change in final consumer demand (direct effects) is a measurement of the immediate economic impacts within a defined region resulting from the increase or decrease in consumer activity within the region. For example, an increase in the number of visitors staying overnight in hotels would directly yield increased sales in the hotel sector, as well as changes in wages and salaries, taxes, and supplies and services. To continue the example, indirect effects are the resulting impacts on sectors that supply goods and services to hotels, such as linen supply companies. Induced effects of visitor spending are the changes in economic activity resulting from household spending of income earned by employees and contractors in the hotel and linen supply industries. The sales, income, and jobs that result from household spending of added wage, salary, or proprietors' incomes are the induced effects. Together, indirect and induced effects are referred to as secondary effects (Palmer, Siverts, and Sullivan, 1985).

A common tool for assessing the direct and secondary effects of visitor spending is input-output (I/O) analysis (Leitch and Leistritz, 1985). Input-output analysis traces

the intersectoral flows of visitor spending in a region to identify changes in sales, income, and jobs associated with participation in recreation activities. It may be used to guide investment decision-making by demonstrating the income and employment changes resulting from alternative policy scenarios. Input-output modeling is used to measure the amount of indirect and/or induced activity associated with the direct effects. The numeric representation of this measurement is termed a multiplier. For instance, the numeric representation of the amount of respending of visitor dollars by a restaurant to purchase more food and beverages to meet future demand is a multiplier (Palmer et al., 1985). Generally, economic impact assessments utilize Type I, or Type II or III multipliers to estimate a given impact on a region from a specific economic activity. Type I multipliers are simply the ratio of the direct and indirect impacts on a region from a given economic activity, whereas, Type II and III multipliers are the direct and secondary impacts on a region, including induced effects (Stynes and Propst, 1996).²

There are many kinds of multipliers that reflect secondary effects from different measures of economic activity such as sales, income, or employment. Sales multipliers in recreation (also termed output multipliers) measure the value of all sales required to meet visitor demand. Employee income multipliers measure the wages and salaries necessary to produce this output, and employment is an estimate of the number of jobs required to produce this level of sales (Jackson et al., 1994). Sales multipliers are often used in EIAs because they provide a detailed picture of the sectors most affected by changes in consumer spending (Palmer et al., 1985). The interdependencies those sectors

²Type II multipliers are essentially the same as Type III, other than Type II involves a technical difference in how induced effects are computed.

require with other sectors within the region to produce goods and services indicate the region's ability to "capture" the secondary impacts of visitor spending (Stynes and Propst, 1996).

Variations in sales multipliers from region to region are thought to be a function of several factors including population demand, regional ability to meet consumer demand, and spatial location. Population demand, as defined by Richardson (1969), and Fujita (1990) is the primary factor in determining which goods and services will be produced in a region. Richardson (1969) proposed that supply and demand could be measured in terms of a population potential scale. The scale assumes that population density, regardless of size, exerts an influence on consumers to purchase goods and services from producers within a population center. Influence varies directly with size, and reduces as distance increases. Not unlike central place theory, the population potential model assumes that consumers will travel from complementary regions to population centers to purchase goods and services in direct proportion to the size of a population center. Central place theory is concerned with the hierarchy of interdependence among trade centers, and the supply of goods and services to surrounding populations (complementary regions). In theory, the central place hierarchy results from a direct relationship between the size and functions of central places and the distances consumers are from trade centers (Richardson, 1969; Fujita, 1990).

Richardson's (1969) population demand model also assumes that per capita retail sales increase as population increases, thus supporting the assumption that consumers travel to population centers to purchase goods and services. At the point at which it is no longer economically or otherwise feasible to travel to a particular population center,

consumers will opt to purchase goods and services elsewhere. Additionally, areas with higher populations should exhibit a greater amount of economic diversity within the region due to a greater diversity of goods and services demanded. As the sales of goods and services between economic sectors of a region increases, secondary impacts of visitor spending should increase as well (Dawson et al., 1993), thus increasing regional sales multipliers.

Regional sales multipliers may be influenced by other factors such as changes in visitor spending. Depending on the degree of intersectoral dependencies within a region, visitor spending may have little impact on the regional economy in terms of secondary impacts. However, a significant increase or decrease in the amount of visitor spending within a region has the potential to significantly affect the local economy. If support services for hotels, such as food catering and linen supply services, are available within a region, hotels businesses are not forced to seek these services outside the region. Hence, the local area captures a greater percentage of the economic impacts of visitors seeking overnight accommodations at hotels within the region. Additionally, Type III regional sales multipliers are affected to a large degree by the induced household spending of income earned from recreation related businesses. The respending of employee household income within a local area is dependent on the number of places to purchase household items and personal goods. If these places do not exist within the region, induced effects of visitor spending may be lost. Therefore, even with high levels of visitor spending within a region, economic impacts may be potentially small.

Past studies reviewed in this section have shown that visitor spending increases as the number of places to purchase recreation-related goods and services increases. Lieber

and Allton (1983) found that annual resident and non-resident visitor spending increased as areas became more urbanized. However, they also found that average per party trip spending actually decreased for resident visitors in the same urbanized areas, indicating that residents took trips more frequently and of shorter duration.

The process of tying together factors which influence visitor spending and the factors which influence regional sales multipliers is a complicated process. A discussion of the concepts used in I/O modeling and economic impact analysis is needed to understand the importance of the intersectoral relationships that exist between recreation-related businesses, and how they are impacted by visitor spending.

Concepts and Tools of Input-Output Modeling in Recreation

Economic base theory states that a region's economy can be divided into basic and non-basic sectors. Basic sectors are involved in the export of products, and non-basic in the supply of local goods and services. All non-basic economic activities, especially a region's trade and service activities, are induced by the expansion or decline of basic export industries (Richardson, 1969). Tourism is an export industry, therefore an assessment of regional impacts produced from a change in economic activity of recreation and tourism is feasible.

To quantify the economic impacts recreation visitors have on an area, I/O models estimate the secondary effects of visitor spending within a defined region. These secondary effects are calculated for the different types of recreation visitors (visitor

segments) by tracing the flow of dollars between the economic sectors required to produce those goods and services visitors purchase (Stynes and Propst, 1996). Since most of the categories in which visitor spending accrues do not exist as economic sectors, visitor expenditures for each visitor segment must be margined to their respective sectors. A bridge table that transforms visitor spending to a final demand vector handles the process of margining. The final demand vector can then be applied to the regional I/O model. Total economic impacts are estimated by multiplying the final demand vector by a set of multipliers (Stynes and Propst, 1992).

Primary visitor expenditure data are often used to determine average visitor spending by different visitor segments, and to determine where goods and services were purchased (Bergstrom, Cordell, Ashley and Watson, 1990; Douglas and Harpman, 1995; Johnson et al., 1989; and Propst et al., 1992). Due to the time and labor expenses of data collection, alternative methods of I/O analysis may be desired. Depending on the EIA's application, non-survey or partial survey techniques for estimating visitor spending and regional impacts may be the preferred alternatives. Both techniques utilize secondary data in the transaction matrix in the I/O model (Hewings, 1985). The transaction matrix refers to the intersectoral relationships between businesses as to how much they purchase from each other to provide goods and services to consumers (Palmer et al., 1985). The non-survey-based technique uses existing input-output tables, generally of national data, and modifies them for regional uses. The partial survey technique is similar to the non-survey technique in that it utilizes national tables and modifies them for regional purposes. However, the partial survey method also uses local data and updates regional

tables periodically. Therefore, many researchers regarded it as the best alternative to costly primary survey-based data (Hewings, 1985).

One of the more common I/O models used in recreation planning and management is IMPLAN. The U.S. Forest Service developed IMPLAN in 1979 as a computer-based system capable of developing non-survey and partial survey models. It provides a static view of economic activity down to the county level, including detailed information on final demand and payments for recreation related sectors. The analytical capabilities of the IMPLAN system can be separated into two broad categories: (1) the estimation of impacts originating from changes in final demands, and (2) the evaluation of constraints upon sectoral gross outputs. Economic impacts are expressed by the changes in regional income and earnings, employment, gross output and various other parameters (Alward and Lofting, 1985).

A limitation of using IMPLAN for assessing the economic impact of a change in final recreation demand in a region is that it lacks clearly defined recreation sectors. Identification of those sectors impacted by visitor spending that are unique to recreation are identified in many research studies such as those done by Archer and Fletcher (1996), Dawson et al. (1993), Douglas and Harpman (1995), Johnson et al. (1989), and Stynes and Propst (1996). Through the use of the Mico-Implan Recreation Economic Impact Estimation System (MI-REC), IMPLAN can be used for recreation applications by attributing visitor expenditures for thirty three specific goods and services to recreation related Standard Industrial Classification (SIC) sectors (Stynes and Propst, 1996). The MI-REC model identifies these sectors within IMPLAN and automatically margins and bridges visitor spending for the regional I/O model. Additionally, MI-REC imports the

impact reports produced in IMPLAN and generates an assortment of summary reports important to an economic impact assessment (Stynes and Propst, 1996).

With knowledge of how economic impact analyses are done, methods and tools can be developed to tailor regional I/O models to particular applications. This study is concerned with developing a “look-up” classification scheme that short cuts the traditional I/O approach altogether. This scheme does not require primary visitor expenditure data nor I/O modeling software to assess the economic impacts of visitor spending.

Statement of the Problem

Economic impact assessments have a variety of uses in recreation and tourism, including quantitative evaluations of Corps of Engineers recreation programs and facilities. Since they estimate economic impacts of changes in recreation demand or shifts in agency policy and management strategies, the Corps of Engineers use EIAs to justify or prioritize budgetary allocations. With prior knowledge of what differing types of recreation visitors spend on different goods and services and what the regional implications of that spending are, the Corps of Engineers can forecast economic effects of proposed actions or policies. As previously stated, much of the data needed to make estimates of visitor spending and its impacts on a region are obtain with survey-driven expenditure studies. Given the expensive nature of collecting primary data, this study proposes a classification system that can use existing spending data to estimate economic

impacts of Corps of Engineers agency policies and management strategies. Visitor spending profiles and regional multipliers currently exist for a sample of COE projects where primary survey-based data were previously collected (Propst et al., 1992). The classification system can be used to assign these spending profiles and sales multipliers to COE projects that lack primary expenditure data. Thus, the classification system would greatly reduce time and costs associated with traditional I/O methods. However, to assign these values to non-surveyed projects the factors that influence visitor spending and its regional impacts must be identified. Once these relevant factors have been identified, Corps of Engineers projects can be classified into categories based on differing levels of these factors. The classification system developed in this study utilizes readily available secondary data identified in the literature and examines their effectiveness in explaining variations in visitor spending and regional impacts of the differing classes.

Study Objectives

The classification system should be capable of assigning non-surveyed Corps of Engineers projects to classes for the purpose of accurately identifying visitor expenditure data and the subsequent economic impacts of that spending. To develop a classification system and utilize it as a “look-up” table, the following objectives must be met.

1. Identify Corps of Engineers project and regional socio-economic variables, from past research studies, that influence levels of visitor spending.

2. Identify Corps of Engineers project and regional socio-economic variables, from past research studies, that provide indicators of levels of regional direct and secondary effects of visitor spending to Corps of Engineers projects.
3. Develop a classification system based on those project and regional socio-economic variables identified in the literature as being relevant to the first two objectives.
4. Determine the effectiveness and validity of the classification system using statistical procedures.

Chapter 3

METHODS

A classification system capable of assigning spending profiles and regional multipliers, for recreation areas where primary expenditure data does not exist, must rely on secondary data sources. With secondary data sources, associated cost requirements typical of input-output models using primary data can be reduced. Previously identified factors thought to influence visitor spending and regional economic impacts are incorporated into an initial classification matrix to segment a sample of Corps of Engineers projects into homogeneous classes. This section will focus on the methods used to classify Corps of Engineers projects and the methods used to test the validity of the proposed system.

Operational Definitions

To standardize results with past research, the following terms as defined in Propst et al. (1992) study of visitor expenditures at Corps of Engineers projects were used in this study as operational definitions.

Region – An area of interest defined to identify what spending and economic activity to include in an economic impact assessment. Measures of economic impacts should include only businesses within the defined area. The economic region used in this study is comprised of those counties that are within 30 road miles of Corps of Engineers project boundaries.

Visits – A visit is defined as the entry of one person onto a COE project to engage in one or more recreation activities.

Non-Resident Visitors – Recreation visitors to Corps of Engineers projects who reside outside the economic region used in the economic impact assessment.

Resident Visitors – Recreation visitors to Corps of Engineers projects who reside within the economic region used in the economic impact assessment.

Visitor segments – Homogeneous groups of recreation visitors in terms of similar spending patterns and preferences for certain goods and services. Each segment, such as day-use boaters, or non-resident campers are characterized by homogeneous spending profiles for recreation related goods and services.

Recreation-related businesses – Those retail and service sector businesses and industries within a defined region directly affected by Corps of Engineers visitor spending. Those businesses include, but are not limited to hotels and lodging, restaurants, miscellaneous retail stores, grocery stores, gasoline and automotive services, and recreation and amusement establishments.

Input-Output Models – An input-output model is a representation of the flows of economic activity within a region. The model captures what each business or

sector must purchase from every other sector in order to produce a dollar's worth of goods or services.

Sales Multiplier – Multipliers capture the size of the secondary effects, usually as a ratio of total effects to direct effects. The sales multipliers used in this study measure the value of all sales, including indirect and induced (Type III), required to meet the demand created by visitors to Corps of Engineers projects.

Spending profiles - Average visitor spending for various goods and services purchased by members of different recreation visitor segments to Corps of Engineers projects.

Spending profiles for COE visitors are a representation of only those expenditures on recreation related goods and services within the defined economic region.

Sample Population

The units of analysis for this study are Corps of Engineers projects. A sample of 108 Corps of Engineers projects was drawn from the total population of 462 projects. Locations of those projects are display in Figure 1. The subset of 108 COE projects consisted primarily of those projects having a high degree of recreation visitation in 1994. The sample set of projects accounted for more than 65 percent of all COE visitation, but less than one-third of the projects. The following sources provided the 108 COE projects: the National Resource Management System (NRMS) developed and maintained by the Corps of Engineers (U.S. Army Corps of Engineers, 1994), Propst et al. (1992), and Ward, Roach, Loomis, Ready and Henderson (1996). The top one hundred COE projects,

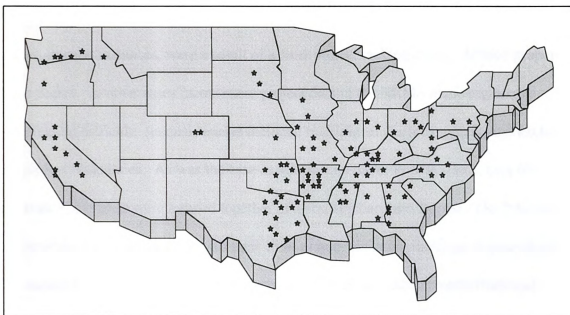


Figure 1. Location of Corps of Engineers Projects Used to Develop the Classification System (N = 108).

ranked by annual visitation in 1994 (U.S.C.O.E., 1994), were included in the study with the assumption that these projects would account for a greater variety of visitor spending than projects with a limited number of visitors. Thus, there would be sufficient variation in spending and sales multipliers to develop a useful classification system into which any of the remaining COE projects would fit. Other COE projects in the sample set include those used by Propst et al. (1992) in a previous economic impact assessment study of twelve projects. Primary visitor segment expenditure data from the 12 lakes study were used as the basis for variations in spending explored in this study. Lastly, an additional twenty-two COE projects were added to the classification system due to their previously defined economic regions of 30 miles (Ward et al., 1996). After excluding overlapping projects and the exclusion of an additional nine others, due to undefined service areas, the

final sample set of COE projects was reduced to 108 (Appendix A). Undefined service areas, in most instances, were a result of a river project lacking clearly defined property boundaries. In other cases inconsistent project data in the NRMS made regional delineation difficult. Inconsistencies included multiple names for projects, and exclusion of project boundaries. As was the case in Mississippi River Pool systems, data for several of the areas were lumped together in a non-standardized format. The following is a list of the excluded projects with their 1994 project visitation rankings in parentheses: Mississippi River Pools 11-22 (2), Riverlands - Upper (6), Lake Okeechobee and Waterway (10), Cape Cod Canal (11), Mississippi River Headwaters Lakes Project (23), Black Warrior and Tombigbee Lakes (26), John Paul Hammerschmidt Lake (76), Duluth - Superior Harbor (95), and Mississippi River Pool No. 3 (97) (U.S. Army COE, 1994).

Delineation of Economic Impact Regions

Defining the regions surrounding Corps of Engineers projects was a vital step in developing the classification system. The decision to include or exclude counties in regional economic impact assessments may alter the extent of intersectoral economic relationships, consequently modifying regional multipliers. A change in multiplier size, in turn, may alter the class to which a given project is assigned. For instance the decision to include a county with a Metropolitan Statistical Area (MSA) into an I/O model may reclassify a particular project into a category with differing regional characteristics and

spending patterns. Not including a county with a MSA may result in a project being classified into a category with lower spending patterns and regional impacts.

For the purposes of the classification system, the defined regions surrounding COE projects were comprised of those counties which had a majority of their land mass and economic activity within thirty road miles of a project's shoreline. Therefore, some areas that fell within thirty miles were not included in the impact region due to a lack of economic activity and/or their relative geographic position to COE projects.

Additionally, counties were used to delineate economic impact regions because most socio-economic data relevant to regional economics is aggregated at the county level and up. For example, IMPLAN utilizes only county level data from US Census Bureau sources to estimate I/O models (Alward and Lofting, 1985). Counties within each of the defined economic regions for each of the COE projects are summarized in Appendix A.

Thirty miles was chosen to define economic regions for two primary reasons. First, thirty miles is roughly the average distance across most counties in the east and midwest where a majority of the projects are located. Secondly, the researchers in the 12 lakes study felt that thirty miles was a reasonable distance within which visitors could recall whether or not they purchased goods or services (Propst et al., 1992). Other studies of COE projects such as Ward et al. (1996) used thirty miles as functional economic boundaries. However, they included only those counties that fell within thirty miles of a project's dam. A significant number of recreation areas exist on the upper ends of reservoirs, opposite COE dams. Therefore to fully account for visitor expenditures within thirty miles of recreation sites, this study utilized an operational definition of visitor spending within thirty road miles of a project's shoreline.

The first step in identifying counties to include in economic impact regions was to use a computer-based mapping system with a geographic information system called ArcView (ESRI, 1996). With the aid of ArcView, counties partially or wholly within thirty miles of COE project shorelines were electronically downloaded into spreadsheet format. The criteria used to determine inclusion or exclusion of counties were:

Include counties if:

1. They are entirely within the thirty-mile area surrounding the project.
2. They have greater than one half of their landmass within the thirty-mile area.
3. They have half their landmass within the thirty-mile area and half outside the area, ONLY IF they are easily accessible¹, OR an MSA falls within the service area and can easily access the project.
4. They have less than half their landmass within the thirty-mile area ONLY when a majority of the population of their MSA(s) is within the thirty-mile area, AND easy access is possible.

Exclude counties if:

1. They are entirely outside the thirty-mile area surrounding the project.
2. They have less than half of their landmass within the thirty-mile area.
3. Transportation to a project is difficult, regardless of the amount of landmass within the thirty-mile area.

¹Project inaccessibility is defined as the difficulty or inability to travel to the project site in thirty miles or less. Difficulty or inability to travel may be a result of a lack of transportation systems (e.g., interstate highways and roads), or presence of natural barriers (e.g., lakes and mountains).

Secondary Data Sources

The data used in this study are a representation of those factors identified in the literature as having an influence on visitor spending and the regional impacts of that spending. Selection criteria for the data were that they come from secondary data sources that were readily available and that the data be easily obtainable. Secondary data sources

included the U.S. Census Bureau, the NRMS (U.S.C.O.E., 1994), and spending profiles from Propst et al. (1992). U.S. Census Bureau data were electronically downloaded from government library sources from the following databases: USA Counties 1994 (U.S. Bureau of the Census, 1996), 1992 Economic Census (U.S. Bureau of the Census, 1996), and County Business Patterns 1993 (U.S. Bureau of the Census, 1996).

The variables thought to account for variations in visitor spending and regional multipliers were summed for counties in each region for each of the 108 Corps of Engineers projects. Variables and their data sources are listed in Table 1.

Table 1. Independent Variables¹

Independent Variables	Secondary Data Source
Type III Sales Multipliers ²	IMPLAN
Regional Population	USA Counties 1994 ³
Median Household Income (\$)	USA Counties 1994
Number of Retail Establishments	1992 Economic Census ³
Annual Retail Sales (\$)	1992 Economic Census
Percent Retail Sales ⁴	County Business Patterns, 1993 ³
Per Capita Retail Sales (\$) ⁵	
Annual COE Project Visitation	1994 NRMS ⁶
Distance to nearest MSA (miles) ⁷	1994 NRMS
Percentage of Visits Attributed to Boating	1994 NRMS
Percentage of Visits Attributed to Camping	1994 NRMS

¹Complete database of independent variables and their units of measurement are found in Appendix B

²Regional sales multipliers were calculated with input-output model software, IMPLAN. I/O models were estimated for each region in the study sample using 1992 Census Bureau data.

³Government library data sources obtained from the U.S. Bureau of the Census (1996).

⁴Ratio of total non-agricultural sales in a region attributed to retail trade

⁵Computed from annual retail sales per 1000 residents residing in the region

⁶Corps of Engineers project data derived from the 1994 Natural Resource Management System (NRMS) maintained by the Corps of Engineers.

⁷Road miles to nearest Metropolitan Statistical Area (MSA) from Corps of Engineer projects

Classification Variables

Variables were identified in the literature as being relevant to variations in visitor spending and regional sales multipliers. The variables found to influence levels of visitor spending include location factors (Richardson, 1969), gravity-type spatial interaction factors (English and Bergstrom, 1994), and economic industry agglomeration factors (Fujita, 1990). Following the assumptions of the gravity-type spatial interaction models presented by English and Bergstrom (1994), and Richardson (1969), a region's retail attractiveness increases as retail establishments agglomerate, which in turn causes an increase in per capita retail sales. Additionally, average total visitor spending per recreation trip for retail items may increase as a region's retail attractiveness increases. Thus, the number of retail establishments and their levels of sales were used as indicators of "retail attractiveness."

Variables thought to influence variations in regional sales multipliers were also derived from the literature based on theories in regional economics as they pertain to population demand models, location factors, and regional trade centers (Richardson, 1969; Fujita, 1990). These theories share in common the postulates that as a regional trade center increases in population, a greater number of consumers are drawn to that area to purchase goods and services. As the number of consumers increases, the demand for a greater diversity of goods and services increases. Thus, as population increases the diversity of economic sectors within a region does as well (Richardson, 1969). An increase in population and the number of economic sectors within a region to meet population demand should lead to greater output and sectoral interdependencies. Hence,

there should be higher regional sales multipliers in regions with higher populations and greater economic diversity.

The literature suggests other variables are also factors influencing levels of trip spending and regional impacts. Included are recreation site characteristics such as annual visitation, type of activity participated in (e.g. boating and camping), and distance to nearest economic service areas (distance to nearest MSA). Research such as that done by Bergstrom et al. (1990), and Dawson et al. (1993) shows that total recreation visitation in a region is capable of producing a significant enough amount of economic activity to influence levels of visitor spending and sales multipliers. Other studies suggest that the type of activity participated in is a significant factor in what visitor spending preferences are while visiting an area (Douglas and Harpman, 1994; Lieber and Allton, 1983; and Taylor et al., 1993). Richardson (1969) suggests that distance to economic service centers is a critical factor influencing visitor spending. A metropolitan statistical area is an example of an economic service center. An MSA is a core area (defined in counties) containing a large population nucleus (greater than 50,000 population) with adjacent communities having a high degree of economic and social integration (National Institute of Standards and Technology, 1995). Additionally, demographic data, such as household income and age influence levels of visitor spending. As income increases, expenditures on recreation related goods and services would increase non-proportionately (Gunter and Furnham, 1992).

Twelve Lakes Study

The 12 lakes study conducted by Propst et al. (1992) was used in the present research study to identify variations in recreation visitor spending in Corps of Engineers project regions. The goal of the study was to predict visitor expenditures associated with the recreational use of a sample of twelve COE projects. The intent was to develop nationally representative spending profiles for recreation visitors that portrayed spending behavior in three ways: (1) total amount spent on a recreation trip, (2) distribution of that spending among economic sectors, and (3) geographic location of spending in relation to a given COE project.

Site selection criteria of the twelve sample lakes required projects to represent a full range of spending behavior by COE visitors. Priority was given to projects that:

1. Received recreation use from a broad range of visitor segments.
2. Differed in adjacent county population sizes (assuming that variation in population size is an index of opportunities for local spending).
3. Were located in different geographic regions of the continental United States.
4. Varied according to lake size and degree of recreation development.

Consistent with the literature review presented in this thesis, the authors argued that types of activities visitors engage in, distance traveled to a destination, and length of stay affect the total amount spent and the distribution of spending among economic sectors. Thus, twelve user segments representing visitor origin, type of overnight accommodations (if applicable), and activity participation were defined. Spending profiles were developed for each of the visitor segments at each of the twelve projects based on reported expenditures for different goods and services by different visitor

segments. The following visitor segments, defined by the 12 lakes study, were used to obtain homogeneous segments of visitors with similar patterns of recreation-related expenditures.

D/R/B: day user, resident, boater
 D/R/NB: day user, resident, nonboater
 D/NR/B: day user, nonresident, boater
 D/NR/NB: day user, nonresident, nonboater

O/R/C/B: overnight user, resident, camper, boater
 O/R/C/NB: overnight user, resident, camper, nonboater
 O/NR/C/B: overnight user, nonresident, camper, boater
 O/NR/C/NB: overnight user, nonresident, camper, nonboater

O/R/NC/B: overnight user, resident, noncamper, boater
 O/R/NC/NB: overnight user, resident, noncamper, nonboater
 O/NR/NC/B: overnight user, nonresident, noncamper, boater
 O/NR/NC/NB: overnight user, nonresident, noncamper, nonboater

The survey of the twelve sample lakes yielded 3,144 on-site interviews. Of the COE visitors interviewed on-site, 2,190 completed mailback questionnaires of recreation trip expenditures. It was found from the expenditure surveys that average spending for overnight visitors was more than 7.5 times greater than day-users. Additionally, it was also found that visitors who engaged in boating activities typically spent more for recreation related goods and services per party trip than visitor who did not boat. It is assumed that projects with similar project and regional characteristics will attract similar visitor segments with similar spending profiles. Therefore, it should be valid to assign the spending profiles and regional multipliers developed in the 12 lakes study to other projects with similar site and regional characteristics.

The Classification System

The third study objective was to develop a classification system capable of assigning non-surveyed Corps of Engineers projects to classes for the purpose of identifying site specific visitor expenditure data and regional impacts of visitor spending. The benefit segmentation approach used in marketing research (Gunter and Furnham, 1992) was the basis of the a priori classification system. The benefit segmentation approach typically uses some type of classification technique to partition objects into homogeneous classes. The classes are then described in terms of class means, standard deviations, and standard errors of the variables used in developing the a priori classes. The classes are then described in terms of additional variables not included in forming the initial classes. The variables listed in Table 1 were used to describe the classification classes summarized in Appendices C and D. The classes of variables in Table 1 were also used to meet study objective four. Objective four was to determine the effectiveness and validity of the classification system based on the independent variables identified in the literature.

The sample of COE projects were initially classified into homogeneous classes based on three of the independent variables: regional sales multipliers, number of retail establishments within a region, and regional population. These three variables were used in the classification scheme because of the magnitude of their importance relayed in the literature. Additionally, both the numbers of retail establishments and regional population appear to significantly influence visitor spending and regional impacts of that spending (Richardson, 1969; Fujita, 1990). Likewise, Type III regional sales multipliers

were included in the classification scheme to identify levels of regional economic impacts across different regions. Type III multipliers were used because they represent both the direct and secondary effects of visitor spending. MI-REC was used with IMPLAN to estimate Type III sales multipliers used in this study. The multipliers are aggregate estimates of the amount of sales (output) generated in each sector present within each of the defined regions surrounding the sample of 108 COE projects. Sales multipliers used in this study were calculated as follows:

$$\text{Type III sales multiplier} = \frac{\text{Direct Sales} + \text{Indirect Sales} + \text{Induced Sales}}{\text{Direct Sales}}$$

The classification system for the sample of 108 COE projects consisted of a 3 X 4-classification matrix scheme with twelve categories, depicted in figure 2. Categories ranged from regions having high numbers of retail establishments, high populations and high sales multipliers, to regions with a low number of retail establishments, low population, and low or medium levels of sales multipliers. Three of the twelve classes were excluded from the classification scheme resulting in nine classes. The three excluded classes included high, medium, and low sales multipliers classes within the

	High Number of Retail Est./ High Population	High Number of Retail Est./ Low Population	Low Number of Retail Est./ High Population	Low Number of Retail Est./ Low Population
High Multipliers				
Medium Multipliers				
Low Multipliers				

Figure 2. Diagram of Initial Classification Scheme

“Low Retail Establishments/High Population” category. All regions having high populations also had a high number of retail establishments. The classification dimensions were established by identifying natural breaks in the initial classification variables depicted in Table 2. Natural breaks were identified by personal judgment based on variable means and distribution among classes (Appendix B). Ranges of retail establishments and regional populations were large with a significant variation in ranges above the break points. Due to a limited number of regions with high values of establishments and populations, break points were established at lower levels to more closely reflect medians. Corps of Engineers projects classified in this manner created classes of projects with similar site and regional socio-economic characteristics.

Table 2. Initial Classification Dimension Breakpoints

	High	Medium ¹	Low
Number of Retail Establishments	1,350 +	N/A	0 - 1,349
Regional Population	500,000 +	N/A	0 - 499,999
Type III Sales Multipliers	2.3 +	2.0 - 2.29	0 - 1.99

¹The number of retail establishments and total regional population was split into categories having high and low levels with no designation of medium levels in the classification system due to the difficulty in establishing natural break points.

Tests for Validity of the Classification System

Objective four was to determine the effectiveness and validity of the classification system using statistical procedures. A Pearson product moment correlation table was

computed to determine the magnitude of relationships between the independent variables chosen to represent those factors identified in the literature review. The correlation table was used to determine if the identified variables were consistent with past theories in regional economics, and to aid in the interpretation of the analyses of variances and the discriminant analyses used to test the validity of the classification system.

Analysis of variance, or ANOVA, was used in this study to determine if class means for each of the independent variables across the nine classes were statistically different. The existence of statistical differences provides evidence that the classification system has some validity in segmenting COE projects into homogeneous classes by factors thought to influence spending and regional impacts of that spending. Analysis of variance was also used to select independent variables to include in the discriminant analysis.

Independent variables found to have statistically significant differences between class means were included in the discriminant analysis to determine if they were good discriminating variables between the different classes. If characteristics which distinguish between the differing levels of visitor spending and regional impacts of that spending are found for the sample of 108 Corps of Engineers projects, the remainder of the 462 projects should also appropriately be classified by these characteristics. Thus, discriminant analysis was used to seek a set of satisfactory discriminating variables.

Chapter 4

RESULTS AND DISCUSSION

The major goal of this study was to classify Corps of Engineers projects into homogeneous groups based on differing levels of factors thought to influence levels of visitor spending and the regional impacts of that spending. The intent of the classification system is to have the capability of assigning spending profiles and sales multipliers to COE projects without having to collect primary visitor expenditure data.

The results are presented as they relate to the four study objectives. The first objective was to identify COE project and regional socio-economic variables from past research that influence levels of visitors spending. The second objective was to identify COE project and regional socio-economic variables from past research that provide indicators of regional direct and secondary effects of visitor spending to recreation areas. The third study objective was to develop a classification system based on differing levels of the factors identified in objectives one and two. The fourth objective was to determine the validity of the classification system using statistical procedures. The first and second study objectives of identifying socio-economic factors that influence levels of visitor spending and economic impacts were accomplished with the literature review. Therefore, a majority of the discussion of results will focus on the last two objectives.

Determinants of Spending and Economic Impacts: Objectives One and Two

To review, factors that influence levels of visitor spending include gravity-type spatial interaction factors (English and Bergstrom, 1994), economic industry agglomeration (Fujita, 1990), location factors (Richardson, 1969), and retail attractiveness factors (Richardson, 1969). Independent variables chosen to represent these factors were: regional population, number of retail establishments, per capita retail sales, type of activity engaged in, distance to MSA, and median household income.

Factors that were identified in the literature that influence regional economic impacts of visitor spending are based on theories in regional economics. Those factors include population demand factors, regional trade center factors (Richardson, 1969; Fujita, 1990), and location factors (Richardson, 1969). Independent variables chosen to represent these factors were: Type III regional sales multipliers, regional population, annual COE project visitation, number of retail establishments, per capita retail sales, distance to the nearest MSA, and percent retail sales. Variables that were readily obtained from current and reliable secondary data sources were used in this study to represent the identified factors (Table 1). The independent variables chosen were used in the classification system to segment Corps of Engineers projects into homogeneous classes, and to test the validity of the system.

Observed correlations between the independent variables in Table 1 were used to determine which relationships were consistent with theories in regional economics, and to aid in the interpretation of statistical tests of the classification system's validity. Many of

the variables thought to influence visitor spending and regional economic impacts are significantly correlated (Table 3). For instance, regional population is nearly directly proportional to the number of retail establishments ($r = .997$, $\rho < .001$). Fujita's (1990) population demand models and retail agglomeration theories state that business establishments increase as population density increases. Consistent with theory, the number of retail establishments surrounding COE projects increase at a similar rate to regional population.

Further support of the population demand model is the high correlations between population and per capita retail sales, and per capita retail sales and distance to the nearest MSA. As theorized by the population demand model, consumers have an increased propensity to purchase goods and services from within population centers in proportion to the size of the population center and distance traveled. Thus, as regional populations increased around COE projects, per capita retail sales increased. Additionally, as regional per capital retail sales increased, travel distance to the nearest MSA decreased.

Regional population was negatively correlated with percent retail sales ($\rho < .001$). This finding is also consistent with the literature. Following Warntz's population demand model (Richardson, 1969), large regional populations have a greater diversity of economic sectors by which to meet increased consumer demands (e.g. wholesale, transportation, and manufacturing). Thus, the percentage of total sales attributed to retail trade within highly populated regions will decrease. As further support, Type III sales multipliers increased as the percentage of total sales attributed to retail trade decreased ($\rho < .01$). This finding implies that regions with low percentages of retail sales contained

Table 3. Pearson Product Moment Correlations for Independent Variables

	Sales Multiplier	Regional Population	Retail Est.	Per Capita Retail Sales (\$)	Annual COE Visitation	Percent Camping	Percent Boating	Distance to MSA (miles)	Percent Retail Sales	Median Household Income (\$)
Sales Multiplier	1.000									
Regional Population	0.135	1.000								
Retail Establishments	0.135	0.997 ³	1.000							
Per Capita Retail Sales	0.386 ³	0.261 ³	0.308 ²	1.000						
Annual COE Visitation	0.060	-0.008	0.006	0.023	1.000					
Percent Camping	-0.042	-0.230 ¹	-0.239 ¹	-0.232 ¹	0.217 ¹	1.000				
Percent Boating	-0.036	-0.313 ²	-0.312 ²	-0.204 ¹	-0.096	0.012	1.000			
Distance to MSA	-0.170	-0.287 ²	-0.308 ²	-0.350 ³	-0.071	0.260 ²	0.026	1.000		
Percent Retail Sales	-0.257 ²	-0.555 ³	-0.572 ³	-0.471 ³	0.145	0.255 ²	0.166	0.265 ²	1.000	
Median Income	0.076	-0.205 ¹	-0.202 ¹	-0.027	0.078	0.198 ¹	0.039	-0.031	0.023	1.000

¹p < .05²p < .01³p < .001

more of the economic sectors needed to produce the goods and services purchased by retail establishments than regions with high percentages of retail sales. However, regional population was weakly correlated with Type III sales multipliers. Although regions having high degrees of economic diversity also had high sales multipliers, some sparsely populated regions also had high sales multipliers. Likely this is a function of isolated areas with low populations meeting consumer demand within the region. Thus, an adequate number of secondary sectors (e.g. retail, wholesale, transportation, and manufacturing) which are dependent upon each to produce goods and services were present in these regions to minimize economic leakages and increase sales multipliers.

Additionally, per capita retail sales and the number of retail establishments were found to be positively correlated ($\rho < .01$). This result supports English and Bergstrom's (1994) gravity-type spatial interaction models that assume that consumers are attracted to areas with clusters of economic sectors (i.e. retail establishments) where they can minimize trip production costs and maximize satisfaction.

Several variables were not correlated with Type III sales multipliers. They include all of the following: distance to the nearest MSA, regional population, number of retail establishments, and number of COE visitors. Warntz's population demand model (Richardson, 1969) assumes that economic activity will increase as the distance to a population density (MSA) decreases. Although the relationships between the two independent variables are in the theorized direction, they were not significant. Other variables found not to have significant correlations include COE project visitation and regional population. From Propst et al. (1992) study of twelve COE projects, it was

determined that a majority of visitors reside within the economic regions of the projects. Hence, highly populated regions would likely have a greater number of visitors. However, this relationship does not hold true. The data in Appendices B and E indicate that regions with small reservoirs or limited recreational facilities often have smaller visitation numbers regardless of the population size within the region. Thus, reservoir size and degree of recreation facility development appear to be variables that mediate the relationships between population size and visitation.

The variables chosen to represent factors which are thought to influence levels of visitor spending and regional economic effects appear to be consistent with past research and theory. Therefore, it is assumed that the independent variables listed in Table 1 are appropriate indicators of the identified factors and are capable of segmenting Corps of Engineers projects into homogeneous classes.

The Classification System

The third objective of the study was to develop a classification system based on differing levels of factors thought to influence visitor spending and regional economic effects. The classification system should be capable of assigning non-surveyed Corps of Engineers projects to homogeneous classes for the purpose of economic impact assessment. Once the classification system has been established, predetermined spending profiles and sales multipliers are available for each class. Thus, the classification system works as a "look-up" table by assigning spending profiles and sales multipliers to non-

surveyed projects assigned to particular classes with similar economic characteristics. If valid, using the classification system as a “look-up” table significantly reduces the time and expense involved in many economic impact analyses. A step-by-step process of assigning profiles and multipliers to non-surveyed COE projects is outlined in Chapter 5.

Following the benefit segmentation approach used in marketing research (Gunter and Furnham, 1992), regional sales multipliers, number of retail establishments, and regional population was used to segment COE projects into initial classes. As previously mentioned, these three variables were used in the initial classification scheme because of the magnitude of their importance relayed in the literature and because of readily available, annual databases. Descriptive statistics of the independent variables listed in Table 1, including the three classification variables, are summarized in Appendix C by each of the classification categories derived from the scheme.

The sample set of 108 Corps of Engineers projects was classified into the nine categories summarized in Table 4. In general, COE projects are reasonably distributed across the classification categories. The high sales multiplier category contains 27 percent (29 of 108) of the projects. The medium multiplier category contains 47 percent (51) of the projects, and the low multiplier category has 26 percent (28). Additionally, the “High Retail Establishments/ High Population” category contains 29 percent (31) of the sample of COE projects across all multiplier levels, while 23 percent (25) of the 108 COE projects are classified into categories with high numbers of retail establishments but low populations. The remaining 48 percent (52) of the projects are classified into categories with low retail establishments and low populations.

Table 4. Initial Classification of Corps of Engineers Projects

	High Retail Establishments (1,350 +) /High Population (500,000 +)	High Retail Establishments (1,350 +) /Low Pop. (under 500,000)	Low Retail Establishments (under 1,350) /Low Population (under 500,000)
High Sales Multiplier (2.3 +)	I <i>J. Percy Priest, TN</i> ¹ Saylorville, IA Canyon Lake, TX Sepulveda Dam, CA Cheatham, TN Shenango, PN David D. Terry, AR Smithville Lake, MO Hansen Dam, CA Whittier Narrows, CA Pine Flat, CA W. H. Harsha, KY (N = 12)	II <i>Willamette, OR</i> ¹ Barkley, KY Beaver, AR Bluestone, WV Stockton Lake, MO Table Rock, AR Whitney, TX (N = 7)	III <i>Oahe, SD</i> ¹ Norfork, AR <i>Ouachita, AR</i> ¹ Pomme de Terre, MO Bull Shoals, AR Rathbun Lake, IA Englebright, CA Waco Lake, TX Lake Sharpe, SD New Hogan, CA (N = 10)
Medium Sales Multiplier (2.0 - 2.29)	IV Addicks, TX Grapevine Lake, TX Alum Creek, OH Hartwell Lake, GA Blue Marsh, PN J Strom Thurmond, SC Bonneville, OR Joe Pool Lake, TX Chatfield, CO Keystone Lake, OK Cherry Creek, CO Lewisville Lake, TX Deer Creek, OH Oologah Lake, OK (N = 14)	V <i>McNary, OR</i> ¹ Murray, AR <i>Raystown, PN</i> ¹ Success, CA <i>Shelbyville, KY</i> ¹ Cecil M. Harden, IN Center Hill, TN John H. Kerr, NC Kaweah, CA Lake O' The Pines, TX Nolin River, KY Senecaville, OH Texoma Lake, TX West Point, AL (N = 14)	VI <i>Cumberland, KY</i> ¹ Harry S. Truman, MO <i>Mendocino, CA</i> ¹ Laurel River, KY <i>Milford, KS</i> ¹ Lower Granite, WA Barren River, KY Mark Twain, MO Belton Lake, TX Millwood, AR Black Butte, CA Sam Rayburn, TX Cordell Hull, TN Somerville, TX Dardanelle, AR Summersville, WV Degray, AR Tenkiller, OK Eufaula Lake, OK Wappapello, MO Fort Gibson, OK Wright Patman, TX Greers Ferry, AR (N = 23)
Low Sales Multiplier (under 2.0)	VII <i>Sidney Lanier, GA</i> ¹ Allatoona Lake, GA B Everett Jordan, NC Falls Lake, NC Lavon Lake, TX (N = 5)	VIII Monroe, IN Rend Lake, IL W. Kerr Scott, NC Woodruff, AL (N = 4)	IX <i>Dworshak, ID</i> ¹ Lake Celilo, WA Arkabuta, MS Lake Seminole, FL Blue Mountain, AR Lake Umatilla, OR Canton, OK Lewis and Clark, SD Carlyle, IL Nimrod, AR Dale Hollow, TN Philpott Lake, VA Dannelly, AL Rough River, KY Eastman, CA Sardis Lake, MS Grenada Lake, MS Walter F. George, AL Hensley, CA (N = 19)

¹Corps of Engineers Projects in Propst et al. (1992) 12 Lakes Study

Recreation spending data were then provided for each of the nine categories. To do so, average per person trip spending developed in the 12 lakes study (Propst et al., 1992) were aggregated for day-user, camping, non-camping, and hotel spending categories (Tables 5 and 6). The hotel spending category included only those visitors who stayed in hotels or with family or friends while visiting COE projects. Spending categories of day-users, campers, and hotels represent only visitors in those segments. However, the non-camping visitor segment is an aggregation of both day-users and hotel spending segments. Spending categories of residents and non-residents were aggregated to obtain visitor expenditure profiles based on larger sample sizes, since many of the original spending segments in Propst et al. (1992) had relatively few survey respondents.

Table 5. Average Per Person Trip Spending Within 30 Miles for Day-Users and Campers¹

Classification Class	Corps of Engineers Project	Average Trip Spending Per Day-User \$ ²	Average Trip Spending Per Camper \$ ²	Percent Campers (%) ³
Class I	J. Percy Priest	17.71 (118)	64.84 (15)	20
Class II	Willamette	10.93 (201)	66.77 (52)	34
Class III	Oahe	13.09 (53)	62.15 (38)	13
	Ouachita	10.35 (30)	69.13 (65)	18
Class IV	None	-	-	-
Class V	McNary	14.92 (56)	65.54 (27)	2
	Raystown	21.09 (88)	72.30 (150)	9
	Shelbyville	10.55 (99)	63.77 (32)	14
Class VI	Cumberland	22.45 (26)	77.81 (66)	49
	Mendocino	24.44 (25)	102.90 (35)	17
	Milford	16.48 (47)	54.50 (178)	13
Class VII	Sidney Lanier	19.06 (65)	54.81 (62)	8
Class VIII	None	-	-	-
Class IX	Dworshak	10.75 (49)	40.79 (89)	11

¹Average per person trip spending derived from Propst et al. (1992) study of 12 Corps of Engineers projects.

²The number of survey responses are reported in parentheses (N). Average per person trip spending includes both resident and non-resident visitors.

³Natural Resource Management System (Corps of Engineers, 1994)

Table 6. Average Per Person Trip Spending Within 30 Miles for Non-Campers¹ and Hotel Visitors^{2,3}

Classification Class	Corps of Engineers Project	Average Trip Spending Per Non-Camper (\$) ⁴	Average Trip Spending Per Hotel Visitor (\$) ⁴	Percent Non-Campers (%) ⁵
Class I	J. Percy Priest	24.92 (127)	119.56 (9)	80
Class II	Willamette	11.44 (202)	114.00 (1)	66
Class III	Oahe	49.54 (86)	108.07 (33)	87
	Ouachita	81.70 (98)	113.18 (68)	82
Class IV	None	-	-	-
Class V	McNary	20.76 (61)	86.16 (5)	98
	Raystown	45.10 (126)	100.71 (38)	91
	Shelbyville	29.85 (125)	103.36 (26)	86
Class VI	Cumberland	128.84 (113)	160.64 (87)	51
	Mendocino	23.91 (29)	20.62 (4)	83
	Milford	20.90 (64)	33.14 (17)	87
Class VII	Sidney Lanier	55.21 (110)	107.42 (45)	92
Class VIII	None	-	-	-
Class IX	Dworshak	16.23 (60)	40.64 (11)	89

¹Non-Campers include both day-users and hotel visitors.

²Hotel visitors include visitors who stayed in hotels or with family or friends while visiting Corps of Engineers (COE) projects.

³Average per person trip spending derived from Propst et al. (1992) study of 12 COE projects.

⁴The number of survey responses are reported in parentheses (N). Average per person trip spending includes both resident and non-resident visitors.

⁵Derived from the percentage of campers reported in the Natural Resource Management System (Corps of Engineers, 1994).

In general, visitor spending across the classification categories are what one would expect. Average per person trip spending was significantly higher for campers than day-users (Table 5). Average spending for non-campers generally was lower than for hotel visitors. Additionally, hotel visitors typically spent the greatest amounts on recreation related items within 30 miles of COE projects (Table 6). However, campers at Lakes Mendocino, Milford, and Dworshak reported spending more for related goods and services than hotel visitors. Caution should be taken when comparing hotel visitors at these projects, as the number of survey respondents was small (ranging from 4 to 17

respondents). Similarly, the number of respondents at many of the COE projects in the Propst et al. (1992) study was small for hotel visitors.

Regions with high numbers of retail establishments and high populations generally received higher levels of visitor spending within the local area (30 miles). However, campers reported higher spending while visiting both Cumberland Lake and Lake Mendocino which are located in sparsely populated areas with low numbers of retail establishments (Class VI). Additionally, non-campers (Table 6) at the J. Percy Priest and Willamette projects (Classes I and II respectively) reported fewer expenditures for recreation related goods and services than many of the other non-camping segments in categories with low numbers of retail establishments and low populations.

A good distribution of the COE projects in the twelve lakes study across the nine classification categories is important for the purpose of assigning spending profiles and sales multipliers to as many non-surveyed projects as possible. Of the nine categories, seven are represented by one or more projects from the Propst et al. (1992) study. Classes IV and VIII were not represented by a project in the study. Hence, 90 of the 108 (83%) projects in the classification system are represented by primary visitor spending data from the Propst et al. (1992) study.

Categories with two or more COE projects from the Propst et al. (1992) study included Classes III, V, and VI. Generally, visitors within these categories reported similar spending patterns in each of the visitor segments (day-users, campers, non-campers, and hotel visitors). For instance, visitors to Lakes Oahe and Ouachita (Class III) reported similar trip expenditures for both the day-user and camper visitor segments. However, this pattern was not consistent as Lakes Oahe and Ouachita (Class III) had

differing spending for the non-camping visitor segment. Similarly, non-campers at Raystown (Class V) and Cumberland Lake (Class VI) reported differing spending behavior than the other projects in their respective classes. In fact, Cumberland Lake non-campers and hotel visitors reported significantly higher expenditures than any of the remaining eleven projects in the study. Further investigation reveals that Cumberland Lake has a unique visitation pattern of houseboaters (classified by the COE as hotel visitors) who spent a significantly higher amount on recreation related goods and services (Appendix E, and Propst et al., 1992). Therefore, Cumberland Lake may be a poor representation of non-camper and hotel visitor spending profiles for Class VI.

Caution should also be taken when using spending profiles from Lake Sidney Lanier (Class VII) because of its close proximity to Metropolitan Atlanta. Due to the selection criteria for choosing counties to include in the I/O model (Chapter 3), Fulton county (which includes Metropolitan Atlanta) was excluded from the analysis. If Fulton county was included in the I/O model that produced the Type III sales multipliers, the Lake Sidney Lanier region would likely have been classified into Class I. Hence, Lake Sidney Lanier spending profiles may not be representative of visitors to Class VII projects.

For the purpose of assigning visitor spending profiles and regional sale multipliers to non-surveyed COE projects, analysis of variance was used to determine whether the classification categories were statistically different from one another. Additionally, correlations between independent variables and discriminant analysis were used to test the classification system's ability to segment projects into homogeneous classes.

Analysis of Variance

Analysis of variance (ANOVA) was used in this study to determine if class means for each of the independent variables were statistically different across the nine classes. The existence of statistical differences provides evidence that the classification system has some validity in segmenting COE projects into homogeneous classes by factors thought to influence spending and multipliers. Those variables found to have statistical differences in means between classes were used in the discriminant analysis to measure the amount of variance explained by the classification variables.

Analysis of variance is a statistical technique used in testing the null hypothesis that the class means are equal in the population. It compares the sample variance estimated from the class means to that estimated within the classes. If the observed differences in class means are not statistically significant, they are assumed to be a function of natural variability among sample means from the same population (Norusis, 1992). Analysis of variance procedures require the following assumptions: each of the classes is an independent random sample from a normal population, and the variances of the classes are equal (Norusis, 1992). To test the null hypothesis that class variances are equal, a Levene test was used. The Levene test computes the absolute difference between the independent variable's value and the class means, and performs a one-way analysis of variance on those differences (often referred to as Homogeneity-of-variance) (Norusis, 1992). Small significance levels of the Levene statistic ($< .05$) indicate that the null hypothesis of equality of class variances should be rejected. Likewise, a large significance level confirms that the variances are relatively equal. Results of the Levene

test for homogeneity of class variances are summarized in Table 7. The ANOVA indicates that roughly half of the independent variables have equal variances across the nine classes. However, each of the variables used in the initial classification scheme (Type III sales multipliers, number of retail establishments, and regional population) do not have equal class variances. The effect of violating the variance assumption is not clear. Some authors argue that ANOVA is robust and the assumptions need not be strictly adhered to (Klecka, 1975; and Lewis-Beck, 1982).

Table 7. Levene Test for Homogeneity of Class Variance

A priori Variable	Levene Statistic	Between Classes df	Within Classes df	Significance ¹
Type III Sales Multipliers	2.129	8	99	0.040
Regional Population	26.342	8	99	<0.001
Retail Establishments	24.984	8	99	<0.001
Per Capita Retail Sales	1.566	8	99	0.145
Annual COE Visitation	2.089	8	99	0.044
Percent Camping	1.030	8	99	0.419
Percent Boating	0.300	8	99	0.964
Distance to MSA	1.868	8	99	0.073
Percent Retail Sales	1.139	8	99	0.344
Median Household Income	1.554	8	99	0.149

¹Significance less than 0.05 indicates rejection of null hypothesis of equality of class variances.

To test the null hypothesis that the class means for the nine classes are equal, the between-classes mean square is divided by the within-classes mean square. This ratio of the variance among class means divided by the number of observations within each class is the F statistic. Small observed significance levels of the F statistic (<0.05) indicate that the null hypothesis of equality of class means can be rejected. Hence, observations are

from statistically different populations. Results of the F statistic for each of the independent variables between each of the classification categories are summarized in Table 8. All the independent variables, with the exception of percentage of the COE visitors who camped and total COE project visitation, had statistically different means across the nine classes. Similar results were obtained from a Kruskal-Wallis nonparametric analysis of variance, with identical variables identified as having significantly different variances between classes. Therefore, results of the ANOVA are assumed valid.

The existence of statistical differences provides evidence that the classification system has some validity in segmenting COE projects into homogeneous classes by factors thought to influence spending and multipliers. However, a significant F value is reported if only two class means are unequal. In order to determine exactly which class means were statistically different from others, a multiple comparison post hoc procedure was used. The Dunnett T3 post hoc procedure was chosen because it assumes that class variances are not equal (SPSS, 1997). Results of Dunnett T3 method are summarized in Appendix D.

The Dunnett T3 multiple comparisons indicate that some of the independent variables were not statistically different across the nine classification categories. Total COE project visitation, percent campers, and percent boaters did not have significant differences in means for any of the classes. However, the percentage of boaters previously had a statistical significant ANOVA of 0.029 (Table 8). Therefore, these variables were not good discriminators between the initial classification categories. Distance to the nearest MSA and percent retail sales had significantly different means

Table 8. ANOVA Test for Differences in Class Means

A priori Variable	Sum of Squares	df	Mean	Mean Square	F	Significance
Type III Regional Sales Multipliers						
Between Groups	5.059	8	2.13	0.632	54.347	<0.001
Within Groups	1.152	99		0.012		
Regional Population						
Between Groups	1.1E+14	8	7.6E+05	1.3E+13	6.325	<0.001
Within Groups	2.1E+14	99		2.1E+12		
Number of Retail Establishments						
Between Groups	2.9E+09	8	4.2E+03	3.6E+08	7.354	<0.001
Within Groups	4.9E+09	99		4.9E+07		
Per Capita Retail Sales						
Between Groups	1.5E+08	8	6.7E+03	1.9E+07	16.499	<0.001
Within Groups	1.1E+08	99		1.1E+06		
Annual COE Project Visitation						
Between Groups	5.6E+13	8	2.3E+06	6.9E+12	1.497	0.168
Within Groups	4.6E+14	99		6.7E+12		
Percent Campers						
Between Groups	0.082	8	.11	0.010	0.864	0.549
Within Groups	1.171	99		0.012		
Percent Boaters						
Between Groups	0.283	8	.22	0.035	2.258	0.029
Within Groups	1.549	99		0.016		
Distance to Nearest MSA						
Between Groups	3.5E+04	8	29	4.3E+03	5.194	<0.001
Within Groups	8.3E+04	99		3.3E+03		
Percent Retail Sales						
Between Groups	392.954	8	28.1	49.119	8.047	<0.001
Within Groups	604.306	99		6.104		
Median Household Income						
Between Groups	1.8E+09	8	2.4E+04	2.2E+08	16.432	<0.001
Within Groups	1.3E+09	99		1.3E+07		

between some classes. However, a majority of the class means for these variables were not different. Thus, these variables too were not the best discriminators between the initial classes.

Variables that stood out as consistently having significant differences in means across many of the classes included: Type III sales multipliers, regional population, number of retail establishments, per capita retail sales, and median household income. The only class mean for Type III sales multipliers that was not consistently different from other class means at the 0.001 level was Class VIII. Regional population, number of retail establishments, per capita retail sales, and median household income exhibited statistical differences for many of the initial classes at the 0.05 significance level. Therefore, it is assumed that these variables, including Type III sales multipliers, were good discriminators between the initial classes of COE projects. These variables also provide evidence that the classification system has some validity in segmenting COE projects into homogeneous classes by factors thought to influence spending and regional impacts of that spending. To statistically determine the effectiveness of all the independent variables in classifying COE projects into homogeneous classes, those variables identified by ANOVA as having significant between class differences in class means (Type III sales multipliers, regional population, number of retail establishments, per capita retail sales, median household income, distance to the nearest MSA, percent retail sales, and percent boaters) were used in discriminant analysis.

Discriminant Analysis

Several factors were identified in the literature as influencing visitor spending and ensuing economic impacts. The independent variables listed in Table 1 represent many of those factors. Independent variables found to have statistically significant differences between class means were included in a discriminant analysis to determine if they are good discriminating variables between the nine classes. “Once a set of variables is found which provides satisfactory discrimination for cases with known group membership, a set of classification functions can be derived which will permit the classification of new cases with known memberships” (Klecka, 1975, p. 436). Thus, if characteristics which distinguish between differing levels of visitor spending and regional sales multipliers are found for the sample of 108 Corps of Engineers projects, the remainder of the 462 projects could be classified using these characteristics.

Discriminant analysis attempts to delineate between the classes by forming one or more linear combinations of the discriminating variables. The mathematical representation of these linear combinations of discriminating variables are called discriminant functions (Morrison, 1969). The linear discriminant equation

$$Z_i = b_0 + b_1X_{1i} + b_2X_{2i} + \dots + b_nX_{ni}$$

is similar to the multiple linear regression equation. The X_i 's represent the values of the independent variable for the i th observation, the b 's are coefficients estimated from the data, and Z_i is the discriminant score for the i th observation (Morrison, 1969). For

sample populations to be significantly different, their discriminant scores must be different. Therefore, independent variables are chosen so that the values of the discriminant function differ as much as possible between groups, or that the discriminant scores maximize the ratio of between-classes sum of squares divided by the within-classes sum of squares. The first function, in the case of two or more functions, has the largest ratio of between-classes to within-classes sums of squares. All subsequent functions are uncorrelated and have smaller sums of squares ratios than previous functions (Norusis, 1986). Thus, the discriminant functions determine which class an observation has membership in based on maximum discriminant scores. Additionally, the larger the value of b_j (discriminant coefficient for the j th variable), the more important variable X_j is in discriminating between classes (Morrison, 1969).

For the linear discriminant function to be “optimal,” that is, to provide a classification rule that minimizes the probability of misclassification, certain assumptions about the data should be met. Those assumptions are that each class should be from a sample with a multivariate normal population, and the population covariance matrices between classes should be equal (Norusis, 1986). However, given the robust nature of discriminant analysis, many researchers feel that these assumptions need not be strongly adhered to (Klecka, 1975). Although, Lewis-Beck (1982) cited other researchers that felt that the violations of the assumptions may render the results almost useless and invalid.

Examination of the variables listed in Table 1 reveals that only the Type III sales multiplier, per capita retail sales, and percent boating have normal distributions.³ Many of the variables with non-normal distributions are heavily skewed in the positive direction. Possibly this is a function of a majority of the sample COE projects being drawn from the top one hundred projects ranked in visitation. If total regional population in any way affects visitation, population factors may be skewing the data. Although results of the correlation matrix (Table 3) show that visitation and regional population are not highly correlated, many of the projects which had comparatively high visitation were located in urban regions (Appendices B and E). Therefore, comparing these projects to the remaining projects with relatively low visitation rates may influence the distribution of the data. Additionally, since the test of equal covariance is sensitive to the normality assumption (Norusis, 1986), equal covariance will likely be violated.

Equally critical to the validity of the discriminant function is the absence of specification errors and measurements errors in the model. Absence of specification error means that variables have not been improperly included or excluded from the analysis (Lewis-Beck, 1982). Given the nature of the study, variables that were readily obtained from current secondary data sources were included in the analysis. Although, the variables used in this study are thought to represent factors identified in the literature, not all of the identified factors are represented by an independent variable. Variables not included in the analyses that are thought to influence levels of visitor spending and

³A Lilliefors test of normality was used to determine levels of significance of each of the independent variables, with a Kurtosis test to examine variable skewness. To adhere to the normality assumption, variables with nonnormal distributions were transformed by their natural log, z scores and squares. However, each attempt to obtain a normal distribution to adhere to the normality assumption was unsuccessful.

regional impacts include travel distance, length of stay, party size, and type of lodging. Variables such as length of stay and type of lodging often are obtained from visitor expenditure surveys. However, these surveys were not available for each project in the sample set. Likewise, travel distance and visitor origin was not available from secondary data sources.

Absence of measurement error is a critical assumption of any analysis. If the data do not reflect what is intended to be measured, any generalizations are likely inappropriate (Lewis-Beck, 1982). Many of the variables used in the classification system were obtained from government census sources where measurement error was assumed minimal. The levels of measurement error for visitation variables obtained from the NRMS are suspect. The Corps of Engineers estimates total visitation by multiplying the number of vehicles entering project areas by a predetermined number of passengers (NRMS, 1994). Therefore, total visitation is only a crude estimate of true visits. Additionally, length of stay bias is introduced in this measurement, as a visitor staying for ten days is considered equal to a visitor staying only for a few minutes. However, estimates of project visitation were not included in the discriminant analysis due to their statistically insignificant differences between class means.

Separate discriminant analyses were performed to test the initial classification's ability to segment COE projects, to obtain a parsimonious set of discriminating variables, and to predict sales multipliers. Initially a discriminant function was obtained for the variables included in the classification scheme (Type III regional sales multipliers, number of retail establishments and regional population). The purpose of the first discriminant analysis was to determine the adequacy of independent variable break points

(Table 2) in segmenting COE projects into homogeneous classes. One might suspect that the percent of projects correctly classified would be artificially inflated, as the data used for estimation were also used for validation (Aaker et al., 1995). Therefore, additional variables not included in the initial classification scheme were included in a second and third discriminant analyses to obtain a parsimonious set of discriminating variables, and to predict sales multipliers. Based on the ANOVA, variables found to have significant differences in means between the nine classes (Type III sales multipliers, regional population, number of retail establishments, per capita retail sales, median household income, distance to the nearest MSA, percent retail sales, and percent boaters) were included in the second and third analyses.

The first discriminant analysis (3-variable model) correctly classified 70.4 percent of the projects (32 of the 108 projects were misclassified). Investigations of those misclassified projects revealed that nearly half (14) of the 32 projects were misclassified to the “Medium Multiplier/High Retail Establishments/Low Population” category (Class V). All fourteen projects in this class were predicted to belong to the “Medium Multiplier/Low Retail Establishments /Low Population” category (Class VI). Thus, the break point between high and low retail establishments is likely the reason for misclassification. Similarly, 6 of the 12 projects in Class I were predicted to belong to Class II, III, or IV. The initial variables (sales multipliers, number of retail establishments, and regional population) for each of the misclassified COE projects had values close to break points listed in Table 2 (Appendix B).

Again, one might suspect that the percent of projects correctly classified would be artificially inflated, as the data used for estimation were also used for validation (Aaker et

al., 1995). The purpose of the first discriminant analysis was to determine the adequacy of independent variable break points (Table 2) in segmenting COE projects into homogeneous classes. However, the three variable model is inappropriate for the goal of obtaining a parsimonious list of discriminating variables which are capable of segmenting COE projects into homogeneous classes.

Therefore, a second discriminant analysis was performed with the following variables: regional population, the number of retail establishments, per capita retail sales, distance to the nearest MSA, percent retail sales, percent boaters and median household income. The Type III regional sales multiplier was excluded from the second analysis since, along with visitor spending profiles, sales multipliers are to be assigned (predicted) for non-surveyed projects. Logically it would be inappropriate to include Type III sales multipliers into the discriminant function since the function's task was to predict the multipliers. Results of the discriminant function using the above variables are summarized in Table 9. Seven separate functions were calculated for each linear combination of independent variables and used in the analysis.⁴ Functions one and two accounted for 85.3 percent of the variance, with function one having an eigenvalue greater than 1.0. Functions three through seven did not significantly contribute to the analysis (Norusis, 1986). The Wilks' Lambda for the seven functions was 0.085 at the <0.001 significance level. The small lambda indicates that class means are statistically different, and the within-class variability is small compared to the total variability (Norusis, 1986).

⁴Eight functions were obtained by default due to seven independent variables in the analysis.

Table 9. Results of the Discriminant Functions Obtained from the Independent Variables in the Second Discriminant Analysis.¹

Function ²	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	3.269	73.6	73.6	0.875
2	0.520	11.7	85.3	0.585
3	0.299	6.7	92.0	0.480
4	0.151	3.4	95.4	0.362
5	0.110	2.5	97.9	0.315
6	0.086	1.9	99.8	0.282
7	0.008	0.2	100.0	0.091

¹Variables included in the discriminant functions were number of retail establishments, regional population, per capita retail sales, percent retail sales, distance to nearest Metropolitan Statistical Area, percent boaters, and median household income.

²Wilks' Lambda of the seven discriminant functions was 0.085 at the <0.001 significance level.

Independent variables with the highest correlations to the standardized discriminant functions are thought to contribute more to the overall discriminant function and are the best discriminating variables in the analysis. Median household income and per capita retail sales had the largest correlations with the first standardized discriminant function for the second discriminant analysis (.609 and .588 respectively). In the second function per capita retail sales (.505) and the distance to the nearest MSA (-.263) had the largest correlations (Table 10). However, caution should be taken when interpreting correlations in the structure matrix, as strong intercorrelations between the independent variables influence their magnitudes and signs. From the results of the correlation matrix (Table 3) it was shown that the number of retail establishments and regional population were highly correlated (0.997, with $p < 0.001$). Thus, their contribution to the discriminant functions were shared and it was not possible to assess the degree of importance of the individual correlations to the functions (Norusis, 1986).

Table 10. Structure Matrix of Correlations Between Variables and Standardized Discriminant Functions in the Second Discriminant Analysis.

Independent Variable	Function ¹	
	1	2
Number of Retail Establishments	0.352 ²	0.199
Regional Population	0.306	0.226
Per Capita Retail Sales	0.588	0.505
Percent Retail Sales	-0.397	-0.256
Distance to Nearest MSA	-0.306	-0.263
Percent Boaters	-0.138	-0.101
Median Household Income	0.609	0.030

¹Functions three through seven have been excluded from the analysis since they do not significantly contribute to the total variance. Functions one and two accounted for 85.3 percent of the variance.

²Within-classes correlations between discriminating variables and standardized discriminant functions.

Class membership of the sample of COE projects was predicted by statistical classification using the functions obtained in the second discriminant analysis.

Comparison of the discriminant classification system to the a priori system resulted in 54.6 percent of projects (59) being classified into the correct class. Observation of the 49 misclassified projects reveals that 8 projects were misclassified in Class V, 7 were misclassified in Classes I and VI, 6 in Classes III and IX, 5 in Classes II and IV, 4 in Class VIII, and 1 in Class VII (Table 11).

Misclassified COE projects generally fell into adjacent classes (i.e. predicted Class I projects falling into Classes II, IV or V, but none of the others). These projects often had values of Type III sales multipliers, number of retail establishments, and regional populations similar to the breakpoints (Table 2). However, six COE projects were predicted by the discriminant function to belong to classes that did not directly adjoin the initial classification category (Table 12). For instance, Pine Flat project (Class

Table 11. Predicted Class Memberships of the Initial and the Second Discriminant Classification Systems.¹

Initial Class Membership	Predicted Class Membership by the Discriminant Function									Total
	I	II	III	IV	V	VI	VII	VIII	IX	
I	5 ²	1	1	3	2	-	-	-	-	12 ³
II	-	2	1	-	3	1	-	-	-	7
III	-	1	4	-	1	1	-	1	2	10
IV	1	-	-	9	1	-	3	-	-	14
V	-	2	-	-	6	3	-	-	3	14
VI	-	-	2	-	3	16	-	-	2	23
VII	-	-	-	1	-	-	4	-	-	5
VIII	-	-	1	-	1	2	-	-	-	4
IX	-	-	1	-	-	5	-	-	13	19
Total	6	6	10	13	17	28	7	1	20	108

¹54.6% of Corps of Engineers projects correctly classified.

²Number of Corps of Engineers projects predicted by the discriminant function to have membership in a class.

³Number of Corps of Engineers projects predicted by the a priori classification system to have membership in a class.

I), and Lakes Woodruff (Class VIII) and Dannelly (Class IX) was predicted by the discriminant function to belong to Class III. However, there were no observable patterns among the values of the independent variables for these three projects.

Similarly, both projects Norfolk and Pomme de Terre were predicted by the discriminant function to belong Class IX when initially classified into Class III. Closer observation of these projects reveals that they had similar values to each other as well as to the mean values of Class IX for per capita retail sales, distance to the nearest MSA, percent retail sales, and percent boaters (Appendix B and C).

Table 12. Casewise Results of the Discriminant Analyses (N=108)¹

Corps of Engineers Project	Initial Classification Category	Second Discriminant Analysis	Initial Classification Category ²	Third Discriminant Analysis ²
Canyon Lake	1	1	1	2*
Cheatham	1	4*	1	2*
David D. Terry	1	2*	1	2*
Hansen Dam	1	1	1	1
J. Percy Priest	1	4*	1	2*
Pine Flat	1	3*	1	1
Saylorville Lake	1	1	1	2*
Sepulveda Dam	1	1	1	1
Shenango River	1	5*	1	2*
Smithville Lake	1	5*	1	2*
Whittier Narrows	1	1	1	1
William H. Harsha	1	4*	1	2*
Barkley	2	6*	1	2*
Beaver	2	2	1	2*
Bluestone Lake	2	5*	1	2*
Stockton Lake	2	2	1	1
Table Rock	2	5*	1	2*
Whitney Lake	2	5*	1	2*
Willamette	2	3*	1	1
Bull Shoals	3	3	1	1
Englebright	3	3	1	3*
New Hogan	3	8*	1	1
Norfork	3	9*	1	2*
Oahe	3	2*	1	1
Ouachita	3	3	1	1
Pomme de Terre	3	9*	1	3*
Rathbun Lake	3	6*	1	2*
Sharpe	3	3	1	2*
Waco Lake	3	5*	1	1
Addicks Dam	4	4	2	2
Alum Creek Lake	4	4	2	2
Blue Marsh Lake	4	7*	2	2
Bonneville	4	4	2	2
Chatfield Lake	4	4	2	2
Cherry Creek	4	4	2	2
Deer Creek Lake	4	1*	2	2
Grapevine Lake	4	4	2	2
Hartwell Lake	4	4	2	2
J. Strom Thurmon	4	5*	2	2
Joe Pool Lake	4	7*	2	2
Keystone Lake	4	4	2	2
Lewisville Lake	4	7*	2	2

¹Discriminant analysis was computed using regional population, number of retail establishments, per capita retail sales, percent boaters, distance to the nearest metropolitan statistical area, percent retail sales, and median household income as independent variables.

²Type III sales multipliers were transformed into dummy variables and used as the dependent variable

*Misclassified Corps of Engineers projects

Table 12. Continued

Corps of Engineers Project	Initial Classification Category	Second Discriminant Analysis	Initial Classification Category	Third Discriminant Analysis
Oologah Lake	4	4	2	2
Cecil M. Harden	5	2*	2	1*
Center Hill	5	6*	2	2
John H Kerr	5	9*	2	3*
Kaweah	5	9*	2	3*
Lake O' The Pines	5	5	2	2
McNary	5	5	2	2
Murray	5	2*	2	1*
Nolin River Lake	5	6*	2	2
Raystown	5	6*	2	2
Senecavill Lake	5	5	2	2
Shelbyville	5	5	2	2
Success	5	5	2	2
Texoma Lake	5	5	2	2
West Point Lake	5	9*	2	3*
Barren River Lake	6	6	2	2
Belton Lake	6	5*	2	3*
Black Butte	6	9*	2	2
Cordell Hull	6	6	2	2
Cumberland	6	6	2	2
Dardanell	6	6	2	2
Degray Lake	6	6	2	2
Eufaula Lake	6	6	2	2
Fort Gibson Lake	6	9*	2	3*
Greers Ferry Lake	6	6	2	3*
Harry S. Truman	6	6	2	3*
Laurel River	6	6	2	2
Lower Granite	6	3*	2	2
Mark Twain Lake	6	6	2	3*
Mendocino	6	5*	2	2
Milford	6	6	2	2
Millwood	6	6	2	2
Sam Rayburn	6	6	2	2
Somerville Lake	6	3*	2	1*
Summersville	6	6	2	2
Tenkiller Ferry	6	6	2	2
Wappapello	6	6	2	2
Wright Patman	6	5*	2	2
Allatoona Lake	7	7	3	2*
B Everett Jordan	7	4*	3	2*
Falls Lake	7	7	3	2*
Lavon Lake	7	7	3	2*
Sidney Lanier	7	7	3	2*
Monroe Lake	8	5*	3	2*
Rend Lake	8	6*	3	2*
W. Kerr Scott	8	6*	3	2*
Woodruff	8	3*	3	1*

Table 12. Continued

Corps of Engineers Project	Initial Classification Category	Second Discriminant Analysis	Initial Classification Category	Third Discriminant Analysis
Arkabutla Lake	9	9	3	3
Blue Mountain	9	9	3	2*
Canton Lake	9	9	3	3
Carlyle Lake	9	9	3	2*
Dale Hollow	9	6*	3	2*
Dannelly	9	3*	3	3
Dworshak	9	9	3	3
Eastman	9	9	3	3
Grenada Lake	9	9	3	3
Hensley	9	9	3	3
Lake Celilo	9	6*	3	2*
Lake Seminole	9	6*	3	3
Lake Umatilla	9	9	3	3
Lewis and Clark	9	6*	3	2*
Nimrod	9	9	3	3
Philpott Lake	9	9	3	2*
Rough River Lake	9	6*	3	2*
Sardis Lake	9	9	3	3
Walter F. George	9	9	3	3

The remaining COE project that was predicted by the discriminant function to belong to a class not directly adjoining the initial class was New Hogan. New Hogan was initially classified into Class III, but predicted to belong to Class VIII. However, values of the independent variables for New Hogan used to obtain the discriminant function were not consistently similar to Class VIII variable means.

Classes that had poor classification rates (less than 40 percent correct classification) were Classes II and VIII (Table 11). The discriminant function assigned two of the original seven projects to Class II. Of the five misclassified projects, three were predicted to belong to Class V which has lower Type III sales multipliers and similar values of per capita retail sales and percent retail sales. The discriminant function assigned zero out of the original four projects to Class VIII. Two of the four projects

were predicted to belong to Class VI (Rend Lake, and W. Kerr Scott). Both Rend Lake and W. Kerr Scott had values of retail establishments and Type III sales multipliers similar to the break points (Appendix B).

Classes having greater than 60 percent correct classification rate included Classes IV, VI, VII and IX, which represent 61 of the 108 COE projects. The discriminant function assigned 9 of the original 14 projects to Class IV (64%). Three of the 5 misclassified projects in Class IV were predicted by the discriminant function to belong Class VII which had lower Type III sales multipliers. Sales multipliers for both Joe Pool and Lewisville Lakes were similar to the break points. The discriminant function assigned 16 of the original 23 projects to Class VI (70%). Three of the 7 misclassified projects in this category were predicted to belong to Class V. However, none had values consistently similar to each other. Likewise, 4 of the 5 projects (80%) in Class VII were correctly classified. The lone misclassified project (B. Everett Jordon) in this class was predicted to belong to Class IV which was not an adjacent category. Additionally, the discriminant function assigned 13 of the original 19 projects to Class IX (68%). Five of the 6 misclassified projects were predicted to belong to class VI. With exception of Lewis and Clark, each of the misclassified projects had similar values for each of the independent variables included in the analysis. Lewis and Clark had a smaller sales multiplier (1.52) than the remaining misclassified projects that had multipliers close to the break point of 2.0.

To determine if a 54.6 percent “correct” classification rate is satisfactory, the percentage of correctly classified Corps of Engineers projects was compared to the prior probability that projects could be classified correctly by chance alone. To compute the

prior probability of chance classification, a proportional chance criterion was used (Aaker, Kuma and Day, 1995). Proportional chance was computed by squaring the original proportion of COE projects within each class (number of projects within each class divided by 108). These squared class values were then added together to obtain a proportional chance classification. The proportional chance rate was:

$$(12/108)^2 + (7/108)^2 + (10/108)^2 + (14/108)^2 + (14/108)^2 + (23/108)^2 + (5/108)^2 + (4/108)^2 + (19/108)^2 = 13.9$$

Thus, there is only a 13.9 percent chance that the COE projects might have been correctly classified by chance. Compared to the 54.6 percent correct classification figure, the seven variables included in the discriminant analysis perform significantly greater than random chance classification for the sample of 108 Corps of Engineers projects. Thus, the remainder of the 462 projects can be classified by these characteristics, and similar classification results should be expected.

A third discriminant analysis was run using the same independent variables used in the second analysis, only using the Type III sales multiplier as the dependent variable as opposed to the class membership used in the first two. Type III sales multipliers were transformed into dummy variables representing the three levels of multipliers (High: 2.3+, Medium: 2.0-2.29, and Low: under 1.99). The purpose of the analysis was to determine how well Type III sales multipliers could be predicted within each of the given levels (rows) of COE projects (i.e. Row 1: Classes I-III, Row 2: Classes IV-VI, and Row 3: Classes VII-IX). If the independent variables satisfactory discriminate between

different levels of Type III sales multipliers, multipliers can be effectively assigned to non-surveyed projects based on the given regional and project characteristics.

Two discriminant functions were obtained from the three variable model (Rows 1-3) where the first function accounted for 84.6 percent of the total variance. Independent variables within the first function with the strongest correlations were per capita retail sales and percent retail sales, followed closely by regional population and the number of retail establishments (Table 13). Therefore, it is assumed that per capita retail sales and percent retail sales are the best discriminating variables between levels of sales multipliers. The degree of discrimination for both regional population and the number of retail establishments is unknown since they are highly correlated (Table 3).

Table 13. Structure Matrix of Correlations Between Variables and the Standardized Discriminant Function in the Third Discriminant Analysis.¹

Independent Variable	Function 1 ²
Per Capita Retail Sales	-0.589 ³
Percent Retail Sales	0.419
Regional Population	-0.338
Number of Retail Establishments	-0.330
Distance to Nearest MSA	0.240
Median Household Income	-0.210
Percent Boaters	0.179

¹Discriminant function was obtained using Type III sales multipliers as the dependent variable.

²Function two was excluded from the analysis since it does not significantly contribute to the total variance. Function one accounted for 84.6 percent of the variance.

³Within-classes correlations between discriminating variables and standardized discriminant functions.

Using Type III sales multipliers as the dependent variable resulted in a correct classification of 59.3 percent (64) of the 108 COE projects (Table 14). Thus, there were 44 misclassified projects within the three levels of sales multipliers (Table 12). Eighteen of those misclassified projects were in Row 1 where 16 projects were predicted to belong in Row 2 by the discriminant function. Likewise, 16 projects were misclassified in Row 3 where all but one was predicted to belong in Row 2. Row 2 had a correct classification rate of 80.4 percent (41/51). Of the misclassified projects in Row 2, 7 were predicted to belong to Row 3.

Table 14. Predicted Row Memberships of the Initial and the Third Discriminant Classification Systems.¹

Initial Row Membership	Predicted Row Membership by the Discriminant Function			Total
	1	2	3	
1 (Classes I-III)	11 ²	16	2	29 ³
2 (Classes IV-VI)	3	41	7	51
3 (Classes VII-IX)	1	15	12	28
Total	15	72	21	108

¹59.3% of original grouped Corps of Engineers projects correctly classified using Type III sales multipliers as the dependent variable.

²Number of Corps of Engineers projects predicted by the discriminant function to have membership in a class.

³Number of Corps of Engineers projects predicted by the a priori classification system to have membership in a class.

Nearly all the misclassified COE projects had values of Type III sales multipliers close to the break points of the particular row the discriminant function predicted membership for. In other words, many of the projects predicted to belong to Row 2 rather than Row 1 had values of Type III sales multipliers close to the 2.30 break point.

Likewise, many of the misclassified projects in Row 3 had values of sales multipliers similar to the 1.99 break point. Thus, the initial classification system may perform significantly better in the third discriminant analysis if ranges of Type III sales multipliers were slightly increased to reflect the misclassification results.

To determine if a 59.3 percent “correct” classification rate is adequate, the percentage of correctly classified Corps of Engineers projects was compared to the prior probability that projects could be classified correctly by chance alone. The proportional chance criteria (Aaker, Kuma and Day, 1995) computed a prior probability of chance classification of 36.2 percent $((29/108)^2 + (51/108)^2 + (28/108)^2 = 36.2)$. Thus, the initial classification system performed moderately well when predicting rows (i.e. sales multipliers) of COE projects. However, other independent variables need to be explored to increase the third discriminant analysis’ ability to predict Type III sales multipliers. Otherwise, some sales multipliers may be incorrectly assigned to COE project regions.

Chapter 5

SUMMARY AND CONCLUSIONS

Several factors were identified in the literature that influence levels of visitor spending and regional economic impacts. Considering differing levels of these factors, COE projects were classified into homogeneous groups. The resulting classes of COE projects were statistically tested to determine the validity of the classification system. A summary of the findings from these methods are presented, along with the limitations of the design and the data. Additionally, the step-by-step process of assigning visitor spending profiles and regional sales multipliers to non-surveyed projects is outlined for the “look-up” table. Conclusions are drawn on the utility of the “look-up” table for public recreation agencies based on the findings and limitations. Additionally, recommendations are made for future testing and refinements to the classification system.

Summary of Findings

The first study objective was to identify Corps of Engineers project and regional socio-economic factors, from past research studies, that influence levels of visitor spending. Factors identified as influencing visitor spending include: gravity-type spatial

interaction factors (English and Bergstrom, 1994), economic industry agglomeration (Fujita, 1990), location factors (Richardson, 1969), and retail attractiveness factors (Richardson, 1969). Additionally, travel distance, type of recreation activity, length of stay, type of lodging, degree of urbanization, and number of recreation related sectors within a region were the most common variables used to predict variations in visitor spending. Several variables were chosen from readily available secondary data sources to represent these factors. They included number of retail establishments, regional population, per capita retail sales, distance to the nearest MSA, median household income, and percentage of boaters and campers. However, not all factors were included because important variables such as length of stay, travel distance, visitor origin, and type of lodging were not available at the secondary data level. Because of the importance relayed in the literature, regional population and the number of retail establishments were used to develop the initial, nine category classification system (Table 4).

Recreation spending data were then provided for each of the nine categories. To do so, average per person trip spending developed in the 12 lakes study (Propst et al., 1992) were aggregated for day-user, camping, hotel (visitors staying in hotels or with family or friends), and non-camping (day-users and hotel visitors) spending categories (Tables 5 and 6). The spending averages from the one or more of the twelve lakes from Propst et al. (1992) were assigned to all the projects in a given class. Since none of the twelve projects fell into classes IV and VIII, additional primary spending data will need to be collected. In the interim, spending averages from adjacent classes may be used for Class IV and VIII projects. When two or more of the twelve lakes fell into a given class (i.e., Classes III, V and VI), the spending averages were generally similar enough to allow

any set of averages to be used. However, there were exceptions. In particular, estimates of visitor spending for Cumberland Lake and Lake Sidney Lanier may be misleading. Cumberland Lake (Class VI) experienced a unique visitation pattern of houseboaters who spent a significant amount on trip-related items. Additionally, the Lake Sidney Lanier region is located just outside Metropolitan Atlanta giving it regional characteristics much more like Class I than Class VII. Thus, these projects may be poor representations of the non-surveyed projects in their respective classes. This is not a problem for Class VI as the spending averages for Lakes Mendocino or Milford may be used. However, Lake Sidney Lanier is the only primary data project in Class VII. Judgment and the additional information contained in Appendices B, C and E will be necessary in deciding whether or not to use Sidney Lanier's averages or adjacent class averages to represent Class VII.

Objective two was to identify COE project and regional socio-economic factors that explain variations in regional economic impacts of visitor spending. Factors identified in the literature that influence economic impacts are based on theories in regional economics. Those factors included population demand, regional trade center factors (Richardson, 1969; Fujita, 1990), and location factors (Richardson, 1969). Several variables were chosen from readily available secondary data sources to represent these factors. They included Type III sales multipliers, regional population, distance to the nearest MSA, percent retail sales, percent campers and boaters, and COE project visitation. Along with the number of retail establishments, Type III sales multipliers and regional population were used to develop the classification system. From the results of the discriminant analysis, it was shown that these three variables, along with distance to the nearest MSA and percent retail sales were good discriminating variables. However,

COE project visitation, percent camping and percent boating did not have statistical differences in class means, therefore, do not appear to be good discriminators.

Objective three was to develop a classification system based on project and regional socio-economic factors identified in objectives one and two. The goal was to use the smallest number of variables possible that would a) indicate variations in visitor spending and b) explain variations in regional economic impacts. In addition, the data had to be readily available from reliable data sets. Results of the initial classification system (using Type III sales multipliers, number of retail establishments and regional population) were encouraging. Corps of Engineers projects were distributed relatively well across the nine classes. Only Classes VII and VIII were represented by five or fewer projects, and Class VI by twenty or more. Additionally, seven of the nine classes were represented by one or more projects in Propst et al. (1992) study of twelve COE projects. Thus, more than 80 percent of the projects in the sample set of 108 are represented for the purpose of assigning spending data. For those projects not represented by a COE project (Classes IV and VIII) from the Propst et al. (1992) study, visitor spending data can be estimated by the methods outlined in the "look-up" table section to follow in this chapter.

To accomplish objective four (statistical examination of the system) the first step was to include each of the independent variables listed in Table 1 in an ANOVA to determine if their means were statistically different between the nine classification categories. All the independent variables, except for percent campers and total COE project visitation, were found to have significant differences in class means. Therefore, it was assumed that variables with different class means came from statistically different populations and could be used to segment COE projects. The Dunnett T3 multiple

comparison post hoc procedure showed that Type III sales multipliers, regional population, the number of retail establishments, per capita retail sales, and median household income were consistently different across many of the initial classification classes. Therefore, they were assumed to be good discriminators between COE projects. Those variables that were not statistically significant across any of the nine classes included the percentage of campers and boaters, and annual COE project visitation. The remaining variables (percent retail sales and distance to the nearest MSA) were statistically different across some of the classes. However, the percentage of retail sales and the distance to the nearest MSA were not as good at distinguishing between classes as those previously. All variables identified by the ANOVA as having significant differences between class means were included in the discriminant analyses.

Based on results of the discriminant analyses, the classification scheme did an adequate job of segmenting COE projects into homogeneous classes. Using the seven independent variables identified as having statistically different class means, the initial classification scheme and the discriminant function (Table 11) agreed on class membership 55 percent of time. Classes that had poor classification rates (less than 40 percent correct classification) were Classes II and VIII (Table 11). Classes having greater than 60 percent correct classification rate included Classes IV, VI, VII and IX, which represent 61 of the 108 COE projects. In most cases, projects “incorrectly” classified were near the borders of the classes defined by breakpoints (Table 2) derived by visual examination of the data. For example, results of the last discriminant analysis (Table 14) suggests that the initial classification system would perform significantly better if ranges of Type III sales multipliers were slightly increased to reflect the misclassification results.

For instance, the classification system might predict Type III sales multipliers better if the center range was increased from 2.00 - 2.29, to 1.90 - 2.29.

Overall, it is concluded that the classification system is appropriate for assigning spending profiles and sales multipliers to the majority (80 percent) of the Corps of Engineers projects in the study sample. The statistical differences between class means for variables used in the classification system provided evidence of the system's validity in segmenting projects. Results of the discriminant analysis supported the choice of the appropriate discriminating variables upon which the classification was built.

Improvements to the classification system includes a) expansion of the ranges of the Type III sales multipliers, and b) primary visitor spending data collection for representative projects in Classes IV, VIII, and possibly VII (See "Study Limitations").

Study Limitations

Given the dynamic relationships between recreation spending and the impacts of that spending across regions, it is impossible to have a completely encompassing data set which lacks specification errors. In meeting the first two study objectives, variables were chosen from secondary data sources to represent those factors which influence visitor spending and regional economic impacts. Relying on readily available secondary sources, data were obtained from the U.S. Census Bureau, the Corps of Engineers, and the Propst et al. (1992) study of twelve COE projects. In this study, specification error is present since not all of the factors identified in the literature were included in the

classification system. Not all factors were included because secondary data were not available for important variables such as length of stay, group size, travel distance, visitor origin, and type of lodging. These variables were identified in the literature as being determinants of visitor expenditures.

Caution should be taken when using secondary data sources, as measurement error can be a critical problem. Measurement error was suspected in this study, as Corps of Engineers' visitation data was questionable. Additionally, distance to the nearest MSA is not the best indication of regional economic activity. Although, those regions with MSAs within thirty miles are more economically diverse, other regions appeared to be just as diverse but did not contain an MSA (Appendix B and E).

Small sample size is another limitation of the study. With small sample sizes it was difficult to interpret some of the statistical comparisons. Likewise, many of the classes in the initial classification system had small samples, except for maybe Classes VI and IX which had 23 and 19 projects respectively. In addition, two of the nine classes were not represented by Corps of Engineers projects from the 12 lakes study (Propst et al., 1992). Hence, there were not enough COE projects with previously defined spending profiles and sales multipliers to represent all 108 sample projects. This is not a serious problem for multipliers because they can be derived from IMPLAN's secondary data sources and matrix computations. However, it is a problem for spending profiles because primary data are required. Since there is no primary spending data for Classes IV and VIII and since Lake Sidney Lanier may be more appropriately assigned to Class I than VII, expenses must either be incurred for data collection or spending profiles must be chosen from one of the neighboring classes in the "look-up" table.

Recommendations for Management and Planning

Given the limitations, the proposed classification system has utility in assigning visitor spending averages and regional sales multipliers to Corps of Engineers projects that lack primary visitor expenditure data. The classification system can be used as a “look-up” table to place COE projects into homogeneous classes (Table 4) and find the corresponding spending data and sales multipliers that reflect the socio-economic characteristics of an area. The procedures for assigning the spending averages and sales multipliers are described in the following section for the purpose of computing total economic impacts of recreation visitors.

Procedures for Estimating Total Economic Impacts of Recreation Spending

To compute total economic impacts of visitor spending, three basic pieces of information are required: total visitation by visitor segment, average visitor spending, and a region’s effective sales multiplier. Average per person visitor spending (Tables 4,5, and 6), and Type III sales multipliers (Table 4, and Appendix B or C) can be obtained from the classification system. Total visitation by visitor segment must be derived from total COE project visitation reported in the NRMS (U.S.C.O.E., 1994). This is done by multiplying total project visitation by percent campers (U.S.C.O.E., 1994) to obtain total camper visits. Total camper visits can then be subtracted from total project visits to obtain non-camper visits.



To determine which spending profiles and sales multipliers from the classification system to use in computing total economic impacts, the following steps are provided to described the process:

1. If the COE project in question is one of the 108 in the sample set (Appendix A and Table 4), this step may be skipped. For the remaining 354 projects, the next step is to determine membership in one of the nine classes.
 - a) For those projects not in the sample set of 108, a determination must first be made about which counties to include in the economic region. Users have the option of defining their own regions based on the requirements of their particular scenario, or using the criteria outlined in Chapter 3 (“Delineation of Economic Impact Regions”). It should be noted that the spending profiles derived in the Propst et al. (1992) study and the classification system are based on 30-mile regions. Thus, it is recommended that the criteria in Chapter 3 be adhered to as closely as possible.
 - b) Once a region has been defined, county level data can be aggregated from Census Bureau sources for the remaining 354 projects to determine class membership. The number of retail establishments can be obtained from the 1992 Economic Census (U.S. Bureau of the Census, 1997) and regional population can be obtained from USA Counties 1994 (U.S. Bureau of the Census, 1997). These data can generally be downloaded from libraries or U.S. Government web pages on the internet.

- c) Users can now begin the process of determining which class most represents their project of interest. This is accomplished by first determining which column in Table 4 a particular project belongs to (i.e. “High Retail Establishments/High Population,” “High Retail Establishments/Low Population,” and “Low Retail Establishments/Low Population”) based on the data aggregated in the previous step. Once the user has determined which column the project is most similar to, the number of possible classes is reduced to three.
 - d) To determining which class within a particular column a project belongs, Appendix B and E are used as a guide in finding a region with similar economic characteristics. Appendix E provides a qualitative description of each of the nine classes. The descriptions rely on information about each of the twelve projects from the Propst et al. (1992) study. By studying each of the three classes within the chosen column, a decision can be made about which class most reflects the economic activity within the study project’s region.
2. Once the final decision has been made as to which class most reflects the economic activity of a particular COE project, the spending profiles can be assigned. For all 462 projects, choose the appropriate spending figures from Tables 5 and 6, one for campers and one for non-campers. Multiply the number of campers and non-campers by the appropriate Tables 5 and 6 spending figures. The results will be total spending (in 1990 dollars) separately for campers and

non-campers. It should be noted that the same can be done for day-users and hotel visitors if the total number of visitors within each visitor segment is known.

- a) If two or more COE projects with differing spending profiles from the Propst et al. (1992) study represent a class, Appendix E should be used to determine which project most represents the study project's region. Descriptions of each of the surveyed projects should serve as a guide in determining which project is most similar to the project of interest in terms of its economic structure.
- b) However, if there are no projects from the Propst et al. (1992) study to represent a particular class (i.e., Classes IV and VIII), the user has the option of using Appendix E to choose a surveyed project that most reflects the project in question. The user of the "look-up" table also has the option of creating a new spending profile from the range of profiles given in Tables 5 and 6. This can be accomplished by looking at the profiles given for classes on each side of the unrepresented class. For instance, day-user spending profiles can be created for Class VIII by taking the average between profiles for Class VII and IX. However, it should be noted that spending patterns between classes are not consistent and newly derived estimates of spending may not reflect actual visitor expenditures. Therefore, caution should be taken when using these methods.

3. Using the information in Appendices B, C and E, choose an appropriate sales multiplier. To assign a multiplier from the given range of multipliers, users have



the option of choosing an average multiplier or one from either end of the range, based on variable comparisons. This multiplier is multiplied by the appropriate “capture rate,” which averages 65 percent across the twelve COE project regions (Propst et al., 1992; Stynes and Propst, 1996). The result is called the effective sales multiplier (Stynes and Propst, 1996). Since not all of the total camper and non-camper expenditures are captured by a local region’s economy (i.e. there is some “leakage”), the aggregate Type III sales multiplier must be reduced by the capture rate to account for such leakage (See Stynes and Propst, 1996, for more discussion of the capture rate and effective sales multiplier concepts).

4. To compute total economic impacts (sales), multiply the total expenditure figures from step 2 by the effective sales multiplier from step 3. The results may then be summed across campers and non-campers. Since the value will be in 1990 dollars, it may be converted to more recent year dollars by applying the relevant Consumer Price Index (CPI). Total economic impacts will be for sales (output) only and may be converted to aggregate income (wages) or employment effects with knowledge of appropriate income/sales or employment/sales ratios.

The “short-cut” method introduced here will allow recreation planners and managers a means by which to quickly and cost effectively analyze economic impacts of recreation visitor spending on regional economies. Although, the proposed classification system has been developed for Corps of Engineers purposes, the “look-up” table method has utility in estimating economic impacts of recreation visitor spending for many

applications. With modification of the data, the proposed “look-up” table method could be used by different kinds of natural resource recreation agencies interested in quickly estimating the regional economic impacts of their visitors. The Corps of Engineers uses these estimates of economic impacts for quantifying the significance of their recreation programs to Congress for budget purposes. Additionally, a quick and cost effective system of estimating economic impacts will allow the Corps of Engineers and other recreation agencies to assess the economic implications of proposed policies and management plans prior to implementation. Hence, the economic ramifications of proposed policies can be determined at non-surveyed projects prior to agency implementation.

Recommendations for Future Study

Future research should focus on further testing and refinements of the classification system. One recommendation is to collect primary data for a sample of Corps of Engineers projects not included in the initial classification system. Economic impacts would be estimated for each of these projects using the IMPLAN/MI-REC input-output model. Results of the impact assessments would then be compared to results of economic impact analyses where spending profiles and regional sales multipliers were assigned to projects based on the “look-up” table methods. Comparison of the two methods would indicate the degree of error for the “look-up” table.

A method of testing the validity of the statistical classification systems would be to aggregate data used in this study for an additional sample of Corps of Engineers projects. This set would constitute a “hold-out” sample to test the discriminant function (Aaker et al., 1995). Using the discriminant function obtained with the initial sample, the hold-out sample of COE projects can be classified. If the percentage of correctly classified projects for the hold-out sample is similar to that obtained with the first sample, it is assumed that the discriminant function is valid. However, if the discriminant function does a poor job of classifying the additional projects, a new discriminant function should be obtained with different discriminating variables.

Results of the classification system can also be used to identify variables that are good discriminators between classes of Corps of Engineers projects. Identified variables can be used in multiple regression analyses to predict levels of spending, as well as predict regional economic impacts from visitor spending. Thus, regression analysis can be used to assign visitor spending profiles and regional sales multipliers to COE projects for which no primary expenditure data have been collected.

Discriminating variables that explain uniqueness of regional economies such as population densities, degree of urbanization, regional diversity, and other factors identified in the literature but not included in the analyses, should be considered for future investigations. Variables such as these may be useful in further refinement of the classification system. Additionally, other variables are needed to further determine if the initial classification scheme is valid or if class memberships are functions of other factors not identified in this thesis.

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APPENDICES



APPENDIX A



Appendix A. Counties Located Within 30 miles of Corps of Engineers Projects

Project Name	County	Project Name	County
Canyon Lake, TX	Bexar Blanco Comal Guadalupe Hays Kendall	Smithville Lake, MO	Leavenworth, KS Wyandotte, KS Buchanan Clay Clinton Platte
Cheatham, TN	Cheatham Davidson Dickson Houston Montgomery Robertson Williamson	Whittier Narrows, CA	Los Angeles Orange
		William. H Harsha, KY	Bracken Campbell Kenton Pendleton Brown, OH Clermont, OH Hamilton, OH
David D. Terry, AR	Faulkner Lonoke Pulaski Saline	Barkley, KY	Caldwell Calloway Christian Crittenden Graves Livingston Lyon Marshall McCracken Trigg Dickson, TN Houston, TN Humphreys, TN Montgomery, TN Stewart, TN
Hansen Dam, CA	Los Angeles		
J. Percy Priest, TN ¹	Cannon Cheatham Davidson Dickson Robertson Rutherford Sumner Williamson Wilson		
Pine Flat, CA	Fresno		
Saylorville, IA	Boone Dallas Polk Story Warren	Beaver, AR	Benton Carroll Madison Washington Barry, MO
		Whitney, TX	Bosque Hill Johnson McLennan Somervell
Sepulveda Dam, CA	Los Angeles		
Shenango, PA	Mahoning Trumbull Lawrence Mercer	Willamette, OR ¹	Lane

¹Corps of Engineers project included in the 12 lakes study (Propst et al., 1992)



Appendix A. Continued

Project Name	County	Project Name	County
Bluestone, WV	Bland, VA	Bull Shoals, AR	Baxter
	Giles, VA		Boone
	Montgomery, VA		Marion
	Pulaski, VA		Ozark, MO
	Mercer		Taney, MO
	Monroe		Dewey
	Raleigh		Hughes
	Summers		Potter
	Radford, VA		Stanley
	Carroll		Sully
	Marion		Walworth
	Barry, MO		
	Christian, MO	Ouachita, AR ¹	Garland
	Stone, MO		Hot Spring
	Taney, MO		Montgomery
Englebright, CA	Nevada	Oahe, SD ¹	Burleigh, ND
	Sutter		Emmons, ND
	Yuba		Morton, ND
New Hogan, CA	Amador		Campbell
	Calaveras		Dewey
			Hughes
Norfork, AR	Baxter		Potter
	Fulton		Stanley
	Izard		Sully
	Marion		Walworth
	Stone	Pomme de Terre, MO	Cedar
	Ozark, MO		Dallas
Rathbun Lake, IA	Appanoose		Hickory
	Davis		Polk
	Lucas	Lake Sharpe, SD	Buffalo
	Monroe		Hughes
	Wapello		Lyman
	Wayne	Waco Lake, TX	McLennan
Cherry Creek, CO	Arapahoe		
	Denver	Deer Creek, OH	Fayette
	Douglas		Franklin
	Jefferson		Madison
			Pickaway
Addicks, TX	Fort Bend		Ross
	Harris		
	Waller		



Appendix A. Continued

Project Name	County	Project Name	County
Alum Creek Lake, OH	Delaware Franklin Knox Licking Marion Morrow Union	Blue Marsh, PA	Berks Lancaster Lebanon Schuylkill
Grapevine Lake, TX	Dallas Denton Tarrant	Bonneville, OR	Hood River Multnomah Skamania, WA
Hartwell Lake, GA	Banks Elbert Franklin Habersham Hart Madison Rabun Stephens White Jackson, NC Transylvania, NC Abbeville, SC Anderson, SC Greenville, SC Oconee, SC Pickens, SC	Chatfield Lake, CO	Arapahoe Denver Douglas Jefferson
J Strom Thurmond, SC	Columbia, GA Elbert, GA Lincoln, GA McDuffie, GA Richmond, GA Wilkes, GA Abbeville Aiken Edgefield Greenwood McCormick	Keystone Lake, OK	Creek Osage Pawnee Tulsa
		Lewisville Lake, TX	Collin Cooke Dallas Denton Tarrant
		Oologah Lake, OK	Craig Nowata Rogers Tulsa Washington
		Cecil M. Harden, IN	Clay Montgomery Parke Putnam Vermillion Vigo
		Raystown, PA ¹	Bedford Blair Fulton Huntingdon Mifflin

Appendix A. Continued

Project Name	County	Project Name	County
Joe Pool Lake, TX	Dallas Ellis Tarrant	Center Hill, TN	Bledsoe Cannon De Kalb Grundy Jackson Putnam Smith Van Buren Warren White Wilson
Lake O' The Pines, TX	Camp Cass Gregg Harrison Marion Morris Titus Upshur		
McNary, OR ¹	Umatilla Benton, WA Franklin, WA	John H. Kerr, NC	Franklin Granville Person Vance Warren
Murray, AR	Faulkner Pulaski Saline		Brunswick, VA Charlotte, VA Halifax, VA Lunenburg, VA Mecklenburg, VA South Boston, VA
Nolin River, KY	Barren Butler Edmonson Grayson Green Hardin Hart Larue Warren	Kaweah, CA	Tulare
		Texoma Lake, TX	Bryan, OK Carter, OK Johnson, OK Love, OK Marshall, OK Murray, OK Cooke Grayson
Senecaville, OH	Belmont Guernsey Monroe Muskingum Noble		
		West Point, AL	Chambers Lee Randolph Carroll, GA Coweta, GA Harris, GA Heard, GA Meriwether, GA Troup, GA
Shelbyville, IL ¹	Christian Coles Cumberland Douglas Effingham Macon Moultrie Shelby		

Appendix A. Continued

Project Name	County	Project Name	County
Success, CA	Tulare	Barren River Lake, KY	Allen Barren Edmonson Metcalfe Monroe Simpson Warren Macon, TN
Cumberland, KY ¹	Adair Casey Clinton Cumberland Lincoln McCreary Metcalfe Pulaski Rockcastle Russell Wayne Pickett, TN	Belton Lake, TX	Bell Coryell
		Black Butte, CA	Glenn Tehama
Dardanelle, AR	Conway Franklin Johnson Logan Perry Pope Yell	Cordell Hull, TN	Cumberland, KY Monroe, KY Clay De Kalb Jackson Macon Overton Putnam Smith Trousdale Wilson
Eufaula Lake, OK	Haskell Latimer McIntosh Muskogee Okmulgee Pittsburg	Degray, AR	Clark Hempstead Hot Spring Montgomery Pike
Fort Gibson, OK	Osage Washington	Lower Granite, WA	Latah, ID Nez Perce, ID Asotin Garfield Whitman
Greers Ferry Lake, AR	Cleburne Independence Stone Van Buren White	Harry S. Truman, MO	Bates Benton Cedar Henry Hickory Johnson Pettis St. Clair
Mark Twain Lake, MO	Audrain Marion Monroe Ralls Randolph Shelby		



Appendix A. Continued

Project Name	County	Project Name	County
Laurel River, KY	Knox Laurel McCreary Pulaski Whitley	Carlyle, IL	Bond Clinton Fayette Marion Washington
Wappapello, MO	Butler Carter Stoddard Wayne	Mendocino, CA ¹	Mendocino
Wright Patman, TX	Miller, AR Bowie Cass Morris	Milford, KS ¹	Clay Dickinson Geary Riley
Sam Rayburn, TX	Angelina Jasper Nacogdoches Sabine San Augustine Shelby	Millwood, AR	Hempstead Howard Little River Miller Sevier Bowie, TX
Allatoona Lake, GA	Bartow Cherokee Cobb Dawson Floyd Forsyth Fulton Gordon Paulding Pickens Polk	Somerville, TX	Brazos Burleson Lee Washington
		Summersville, WV	Clay Fayette Nicholas
		Tenkiller, OK	Adair Cherokee Haskell Muskogee Sequoyah
B Everett Jordon, NC	Chatham Durham Harnett Lee Orange Wake	Falls Lake, NC	Durham Franklin Granville Orange Person Vance Wake
Lavon Lake, TX	Collin Dallas Hunt Rockwall		

Appendix A. Continued

Project Name	County	Project Name	County
Sidney Lanier, GA ¹	Banks	Rend Lake, IL	Franklin
	Barrow		Hamilton
	Cherokee		Jackson
	Dawson		Jefferson
	De Kalb		Marion
	Forsyth		Perry
	Franklin		Washington
	Gwinnett		Williamson
	Habersham	W. Kerr Scott, NC	Alexander
	Hall		Alleghany
	Jackson		Ashe
	Lumpkin		Caldwell
	Pickens		Watauga
	Stephens		Wilkes
	Union	Woodruff, AL	Autauga
	White		Dallas
Monroe, IN	Bartholomew		Lowndes
	Brown		Montgomery
	Greene	Arkabut, MS	De Soto
	Jackson		Tate
	Lawrence		Tunica
	Martin	Blue Mountain, AR	Logan
	Monroe		Yell
Dale Hollow, TN	Morgan	Canton, OK	Blaine
	Owen		Dewey
	Clinton, KY		Major
	Cumberland, KY		
	Monroe, KY	Lake Umatilla, OR	Sherman
	Wayne, KY		Klickitat, WA
	Clay		
	Fentress	Lewis and Clark, SD	Cedar, NE
	Jackson		Knox, NE
	Macon		Bon Homme
Dannelly, AL	Overton		Clay
	Pickett	Nimrod, AR	Yankton
	Putnam		
	Dallas		Perry
	Lowndes		Yell
	Marengo		
	Wilcox		
Dworshak, ID ¹	Clearwater		
	Lewis		

Appendix A. Continued

Project Name	County	Project Name	County
Eastman, CA	Madera Mariposa	Philpott Lake, VA	Floyd Franklin Henry Martinsville Patrick
Grenada Lake, MS	Calhoun Carroll Grenada Montgomery Tallahatchie Yalobusha	Rough River Lake, KY	Breckinridge Grayson Hancock Hardin Meade Ohio
Hensley, CA	Madera		
Lake Celilo, WA	Hood River, OR Sherman, OR Wasco, OR Klickitat	Sardis Lake, MS	Lafayette Marshall Panola Tate Yalobusha
Lake Seminole, FL	Gadsden Jackson Decatur, GA Grady, GA Miller, GA Seminole, GA	Walter F. George, AL	Barbour Henry Russell Calhoun, GA Clay, GA Early, GA Quitman, GA Randolph, GA Stewart, GA

APPENDIX B



Appendix B. Final Data Set of Independent Variables

Corps of Engineers Projects	Type Sales Multiplier	Regional Population	Number of Retail Establishments	Retail Sales (\$)	Per Capita Retail Sales (\$)	Annual COE Project Visitation	Percent ² Camping	Percent ³ Boating	Distance to MSA (miles) ⁴	Percent Retail Sales ⁵	Median Household Income (\$)	Total Regional Counties ⁶
Class I: High Sales Multiplier / High Retail Establishments / High Population												
J. Percy Priest, TN ¹	2.51	1,034,071	6,336	9,115,575	8,815	8,900,800	20%	14%	0	25.8	30.5	9
Canyon Lake, TX	2.32	1,445,815	7,698	10,309,521	7,131	1,487,700	6%	21%	0	26.4	26.2	6
Cheatham, TN	2.39	832,656	5,728	8,094,138	9,721	2,932,249	17%	9%	28	27.9	28.8	7
David D. Terry, AR	2.31	525,741	3,222	4,499,355	8,558	1,545,800	4%	14%	13	26.4	25.7	4
Hansen Dam, CA	2.34	9,053,645	43,225	63,127,489	6,973	1,063,600	0%	0%	0	20.6	35.0	1
Pine Flat, CA	2.40	705,613	3,610	4,626,742	6,557	381,500	15%	41%	0	24.7	26.4	1
Saylorville, IA	2.70	505,943	3,307	4,419,622	8,735	1,062,719	5%	14%	0	26.7	29.1	5
Sepulveda Dam, CA	2.34	9,053,645	43,225	63,127,489	6,973	2,271,900	0%	0%	0	20.6	35.0	1
Sherango, PA	2.51	713,992	4,291	4,935,021	6,912	1,137,100	6%	17%	0	28.4	24.8	4
Smithville Lake, MO	2.69	546,571	2,906	3,722,986	6,812	1,083,100	5%	32%	5	25.0	29.7	6
Whittier Narrows, CA	2.35	11,538,434	57,119	84,367,625	7,312	1,782,000	2%	0%	0	20.5	40.4	2
William. H Harsha, KY	2.33	1,315,950	7,772	10,222,663	7,768	1,291,200	11%	18%	12	29.4	27.0	7

Class II: High Sales Multiplier / High Retail Establishments / Low Population

Williamette, OR ¹	2.32	290,866	1,989	2,458,659	8,453	1,630,000	34%	45%	0	23.9	25.3	1
Barkley, KY	2.37	454,000	2,823	3,095,862	6,819	6,796,000	39%	7%	60	31.8	21.1	15
Beaver, AR	2.30	286,200	1,858	2,133,323	7,454	7,087,000	2%	21%	0	28.9	21.5	5
Bluestone, WV	2.46	317,318	1,785	2,170,018	6,839	1,415,800	3%	5%	25	28.4	20.8	9
Stockton Lake, MO	2.52	287,743	1,987	2,806,366	9,753	1,320,400	11%	33%	30	28.4	19.9	5
Table Rock, AR	2.33	279,962	1,955	1,809,275	6,463	8,871,500	3%	17%	8	28.5	21.4	8
Whitney, TX	2.50	339,808	1,967	2,225,164	6,548	1,668,500	5%	17%	15	30.1	24.9	5

¹ Projects in Propst, et al. (1992) 12 Lakes Pilot Study

² Percent of total Corps of Engineers visitors who camp per year

³ Percent of total Corps of Engineers visitors who boat per year

⁴ Road miles to the nearest Metropolitan Statistical Area (MSA) from Corps of Engineer projects

⁵ Ratio of total non-agricultural sales in a region attributed to retail trade.

⁶ Number of counties included in the aggregated economic service region (See Appendix A and discussion in Chapter 3).

Appendix B. Continued

Corps of Engineers Project	Type Sales Multiplier	Regional Population	Number of Retail Establishments	Retail Sales (\$)	Per Capita Retail Sales (\$)	COE Project Visitation	Percent Visitation Camping	Percent Visitation Boating	Distance to MSA (miles)	Percent Retail Sales	Median Household Income (\$)	Total Regional Counties
Class III: High Sales Multiplier / Low Retail Establishments / Low Population												
Oahe, SD ¹	2.52	126,287	986	1,025,612	8,121	1,718,700	13%	30%	2	29.8	21.4	10
Ouachita, AR ¹	2.42	110,489	790	812,063	7,350	1,201,600	18%	26%	26	26.5	18.7	3
Bull Shoals, AR	2.61	110,411	937	846,216	7,664	4,020,400	6%	24%	36	28.5	18.7	5
Englebright, CA	2.55	213,508	1,171	1,231,851	5,770	138,200	19%	56%	3	24.2	26.9	3
Lake Sharpe, SD	2.36	20,676	171	156,531	7,571	1,113,400	5%	19%	157	23.4	21.2	3
New Hogan, CA	2.33	67,228	453	586,873	8,730	259,055	26%	51%	12	26.4	29.0	2
Norfolk, AR	2.72	85,435	513	396,797	4,644	3,800,000	4%	33%	55	29.4	16.7	6
Pomme de Terre, MO	2.36	55,400	312	252,344	4,555	1,321,900	29%	36%	40	29.4	17.1	4
Rathbun Lake, IA	2.30	81,915	572	475,937	5,810	1,181,600	10%	15%	50	29.6	19.8	6
Waco Lake, TX	2.36	191,560	1,147	1,390,795	7,260	1,102,200	2%	21%	0	26.3	22.7	1

Class IV: Medium Sales Multiplier / High Retail Establishments / High Population

Addicks, TX	2.03	3,251,360	17,004	26,368,531	8,110	2,032,963	0%	0%	0	24.8	32.0	3
Alum Creek Lake, OH	2.10	1,370,810	7,714	12,126,031	8,846	1,988,600	3%	9%	0	25.2	29.9	7
Blue Marsh, PA	2.20	1,046,238	6,284	7,667,265	7,328	1,455,239	0%	30%	0	27.9	29.5	4
Bonneville, OR	2.19	626,642	4,534	5,586,820	8,915	2,965,693	8%	11%	37	22.5	27.0	3
Chatfield Lake, CO	2.26	1,433,597	8,708	12,774,095	8,911	1,633,700	2%	6%	0	19.1	38.3	4
Cherry Creek, CO	2.26	1,433,597	8,708	12,774,095	8,911	2,009,800	1%	6%	0	19.1	38.3	4
Deer Creek, OH	2.03	1,180,736	6,819	11,024,887	9,337	1,977,400	8%	3%	25	28.1	27.1	5
Grapevine Lake, TX	2.05	3,428,264	19,449	30,257,565	8,826	1,191,700	1%	19%	0	23.7	33.6	3
Hartwell Lake, GA	2.13	878,532	5,486	6,073,944	6,914	14,863,000	7%	29%	0	28.4	24.0	16
J Strom Thurmond, SC	2.09	574,363	3,282	3,866,991	6,733	5,542,200	25%	10%	22	28.2	24.2	11
Joe Pool Lake, TX	2.00	3,221,601	18,636	28,964,752	8,991	1,166,800	10%	48%	0	24.2	31.5	3
Keystone Lake, OK	2.15	639,809	4,094	5,478,343	8,562	1,466,847	6%	14%	11	25.7	24.2	4
Lewisville Lake, TX	2.11	3,750,085	21,018	32,764,530	8,737	2,568,500	3%	14%	0	25.2	34.3	5
Oologah Lake, OK	2.15	650,029	4,296	5,813,845	8,944	1,320,986	19%	11%	35	26.7	24.5	5



Appendix B. Continued

Corps of Engineers Project	Type Sales Multiplier	Regional Population	Number of Retail Establishments	Retail Sales (\$)	Per Capita Retail Sales (\$)	COE Project Visitation	Percent Visitation Camping	Percent Visitation Boating	Distance to MSA (miles)	Percent Retail Sales	Median Household Income (\$)	Total Regional Counties
Class V: Medium Sales Multiplier / High Retail Establishments / Low Population												
McNary, OR ¹	2.03	222,059	1,348	1,660,007	7,476	4,934,386	2%	12%	0	26.1	26.7	3
Raystown, PA ¹	2.15	285,304	1,692	1,903,533	6,672	984,000	9%	28%	30	29.5	22.9	5
Shelbyville, KY ¹	2.28	302,358	1,880	2,211,332	7,314	2,057,358	14%	20%	22	27.4	26.0	8
Cecil M. Harden, IN	2.02	231,189	1,372	2,371,242	10,257	1,063,200	7%	16%	9	28.9	24.9	6
Center Hill, TN	2.03	255,343	1,383	1,387,550	5,434	5,579,200	53%	8%	60	28.5	21.3	11
John H. Kerr, NC	2.13	270,867	1,503	1,279,656	4,724	3,290,132	19%	25%	47	29.1	21.7	11
Kaweah, CA	2.05	331,081	1,591	1,821,980	5,503	475,000	7%	26%	22	28.1	24.5	1
Lake O' The Pines, TX	2.25	284,898	1,902	1,980,598	6,952	1,386,700	7%	28%	0	31.1	20.9	8
Murray, AR	2.25	484,826	3,037	4,310,475	8,891	1,637,100	2%	7%	0	25.4	26.3	3
Nolin River, KY	2.01	278,910	1,816	1,990,623	7,137	2,199,600	4%	21%	50	30.9	19.4	9
Senecaville, OH	2.03	219,541	1,449	1,477,189	6,729	1,094,900	0%	5%	7	29.8	21.6	5
Success, CA	2.05	331,081	1,591	1,821,980	5,503	568,900	8%	24%	0	28.1	24.5	1
Texoma Lake, TX	2.24	243,237	1,545	1,600,556	6,580	5,140,192	14%	24%	0	30.3	19.8	8
West Point, AL	2.06	387,577	2,045	2,126,125	5,486	2,145,966	7%	28%	25	29.7	23.7	9

Class VI: Medium Sales Multiplier / Low Retail Establishments / Low Population

Cumberland, KY ¹	2.01	195,586	1,115	888,539	4,543	7,416,683	49%	15%	50	33.9	14.6	12
Mendocino, CA ¹	2.26	81,688	707	594,480	7,277	495,100	17%	22%	30	26.8	26.4	1
Milford, KS ¹	2.15	128,346	802	738,823	5,756	571,700	13%	21%	70	30.3	22.1	4
Barren River Lake, KY	2.16	190,766	1,290	1,376,293	7,215	1,310,500	10%	12%	73	33.6	18.5	8
Belton Lake, TX	2.00	254,861	1,238	1,410,825	5,536	1,322,600	4%	19%	0	32.3	23.6	2
Black Butte, CA	2.06	77,409	395	406,980	5,258	145,800	20%	29%	30	25.6	22.6	2
Cordell Hull, TN	2.02	227,972	1,293	1,232,348	5,406	3,892,164	34%	11%	49	32.1	19.9	11
Dardanelle, AR	2.01	148,124	853	819,405	5,532	3,505,800	5%	31%	40	30.2	19.4	7
Degray, AR	2.03	87,581	501	469,704	5,363	1,147,735	14%	25%	53	28.8	18.0	5
Eufaula Lake, OK	2.05	185,871	1,047	1,050,255	5,650	2,716,500	16%	12%	80	30.2	17.9	6
Fort Gibson, OK	2.08	90,508	466	425,026	4,696	3,639,001	18%	6%	33	28.5	26.7	2

Appendix B. Continued

Corps of Engineers Project	Type Sales Multiplier	Regional Population	Number of Retail Establishments	Retail Sales (\$)	Per Capita Retail Sales (\$)	COE Project Visitation	Percent Visitation Camping	Percent Visitation Boating	Distance to MSA (miles)	Percent Retail Sales	Median Household Income (\$)	Total Regional Counties
Class VI: Medium Sales Multiplier / Low Retail Establishments / Low Population (Continued)												
Greens Ferry Lake, AR	2.25	133,075	822	777,514	5,843	5,228,500	6%	22%	37	29.1	18.4	5
Harry S. Truman, MO	2.24	157,286	1,063	849,424	5,401	1,855,300	6%	63%	52	31.1	18.9	8
Laurel River, KY	2.10	143,726	1,100	1,147,966	7,987	477,100	0%	0%	75	32.8	15.8	5
Lower Granite, WA	2.26	125,790	812	835,794	6,644	1,538,415	2%	25%	75	25.3	23.5	5
Mark Twain Lake, MO	2.27	99,182	667	570,697	5,754	1,696,376	13%	41%	130	27.4	21.1	6
Millwood, AR	2.13	184,340	1,085	1,272,082	6,901	572,700	7%	40%	28	30.0	20.6	6
Sam Rayburn, TX	2.19	197,355	1,210	1,280,004	6,486	1,863,400	9%	40%	65	31.9	18.8	6
Somerville, TX	2.02	178,518	1,024	1,255,902	7,035	1,253,600	14%	23%	19	26.1	21.2	4
Summersville, WV	2.07	85,006	472	462,850	5,445	1,113,300	8%	16%	32	32.0	15.9	3
Tenkiller, OK	2.24	169,059	915	830,525	4,913	1,505,600	20%	17%	55	32.6	17.8	5
Wappapello, MO	2.18	86,327	579	581,132	6,732	2,182,090	2%	30%	135	29.0	15.9	4
Wright Patman, TX	2.27	163,844	977	1,103,410	6,735	1,407,900	8%	13%	0	31.2	21.1	4
Class VII: Low Sales Multiplier / High Retail Establishments / High Population												
Sidney Lanier, GA ¹	1.86	1,418,622	8,257	11,358,312	8,007	6,683,574	8%	32%	45	28.6	28.4	16
Allatoona Lake, GA	1.91	1,581,542	9,955	13,457,193	8,509	4,576,900	8%	34%	0	26.1	30.6	11
B Everett Jordon, NC	1.86	897,747	6,037	7,222,527	8,045	1,914,077	3%	12%	0	27.2	28.9	6
Falls Lake, NC	1.83	892,789	5,955	7,096,391	7,949	2,260,100	1%	35%	0	29.0	27.9	7
Lavon Lake, TX	1.89	2,298,200	13,544	21,303,280	9,270	2,055,200	3%	23%	7	23.9	36.3	4
Class VIII: Low Sales Multiplier / High Retail Establishments / Low Population												
Monroe, IN	1.97	392,123	2,402	2,503,560	6,385	1,392,600	15%	19%	0	29.4	26.6	9
Rend Lake, IL	1.83	282,372	1,901	1,926,711	6,823	1,124,259	15%	28%	39	28.7	21.3	8
W. Kerr Scott, NC	1.85	230,095	1,501	1,389,950	6,041	1,537,700	16%	26%	30	30.3	22.0	6
Woodruff, AL	1.93	311,840	1,886	2,416,002	7,748	1,578,800	6%	49%	0	28.0	21.7	4

Appendix B. Continued

Corps of Engineers Project	Type Sales Multiplier	Regional Population	Number of Retail Establishments	Retail Sales (\$)	Per Capita Retail Sales (\$)	COE Project Visitation	Percent Visitation Camping	Percent Visitation Boating	Distance to MSA (miles)	Percent Retail Sales	Median Household Income (\$)	Total Regional Counties
Class IX: Low Sales Multiplier / Low Retail Establishments / Low Population												
Dworshak, ID ¹	1.65	12,294	102	54,188	4,408	108,669	11%	36%	145	25.4	22.4	2
Arkabuta, MS	1.91	103,922	466	532,964	5,129	1,289,900	6%	29%	16	29.4	21.6	3
Blue Mountain, AR	1.83	38,753	185	177,425	4,578	255,700	7%	20%	40	28.6	19.3	2
Canton, OK	1.83	24,142	191	95,184	3,943	1,104,134	16%	15%	43	28.4	21.0	3
Carlyle, IL	1.88	126,365	805	711,473	5,630	2,100,724	13%	16%	50	27.0	24.8	5
Dale Hollow, TN	1.89	168,445	1,001	897,127	5,326	4,211,600	63%	14%	100	32.4	16.0	11
Dannelly, AL	1.77	97,636	537	463,086	4,743	1,660,100	5%	52%	0	30.8	15.8	4
Eastman, CA	1.77	114,361	537	545,998	4,774	65,400	25%	0%	37	27.5	26.3	2
Grenada Lake, MS	1.76	85,174	490	356,822	4,189	2,130,200	6%	25%	90	30.7	16.6	6
Hensley, CA	1.77	99,023	420	463,348	4,679	115,900	11%	37%	23	26.3	27.4	1
Lake Celilo, WA	1.98	58,539	455	400,633	6,844	1,908,312	7%	27%	30	30.5	24.5	4
Lake Seminole, FL	1.90	146,354	871	762,330	5,209	1,271,956	8%	33%	29	34.2	19.8	6
Lake Umatilla, OR	1.64	19,088	107	59,717	3,129	3,689,102	7%	35%	0	32.6	24.0	2
Lewis and Clark, SD	1.52	59,419	514	340,339	5,728	1,630,700	7%	11%	65	29.9	19.6	5
Nimrod, AR	1.78	26,379	100	81,741	3,099	329,900	8%	21%	50	28.2	18.6	2
Philpott Lake, VA	1.95	143,674	780	747,293	5,201	1,164,400	2%	14%	27	27.5	24.0	5
Rough River Lake, KY	1.94	175,969	957	1,043,942	5,933	2,182,700	9%	15%	50	29.5	21.2	6
Sardis Lake, MS	1.87	128,662	710	600,827	4,670	1,501,500	6%	34%	45	31.4	18.5	5
Walter F. George, AL	1.91	125,968	689	519,538	4,124	4,793,895	9%	40%	0	31.1	17.1	9

APPENDIX C

Appendix C. Independent Variable Descriptives

Type III Regional Sales Multipliers	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Range	
					Lower Bound	Upper Bound	Minimum	Maximum
High Mult. / High Retail / High Pop.	12	2.43	0.14	0.04	2.34	2.52	2.31	2.70
High Mult. / High Retail / Low Pop.	7	2.40	0.09	0.03	2.32	2.48	2.30	2.52
High Mult. / Low Retail / Low Pop.	10	2.45	0.14	0.04	2.35	2.55	2.30	2.72
Medium Mult. / High Retail / High Pop.	14	2.13	0.08	0.02	2.08	2.17	2.00	2.26
Medium Mult. / High Retail / Low Pop.	14	2.11	0.10	0.03	2.05	2.17	2.01	2.28
Medium Mult. / Low Retail / Low Pop.	23	2.13	0.10	0.02	2.09	2.18	2.00	2.27
Low Mult. / High Retail / High Pop.	5	1.87	0.03	0.01	1.83	1.91	1.83	1.91
Low Mult. / High Retail / Low Pop.	4	1.90	0.07	0.03	1.79	2.00	1.83	1.97
Low Mult. / Low Retail / Low Pop.	19	1.82	0.12	0.03	1.76	1.88	1.52	1.98
Total	108	2.13	0.24	0.02	2.09	2.18	1.52	2.72

Number of Retail Establishments								
High Mult. / High Retail / High Pop.	12	15,720	19,749	5,701	3,172	28,268	2,906	57,119
High Mult. / High Retail / Low Pop.	7	2,052	348	132	1,730	2,374	1,785	2,823
High Mult. / Low Retail / Low Pop.	10	705	351	111	454	956	171	1,171
Medium Mult. / High Retail / High Pop.	14	9,717	6,376	1,704	6,035	13,398	3,282	21,018
Medium Mult. / High Retail / Low Pop.	14	1,725	436	116	1,474	1,977	1,348	3,037
Medium Mult. / Low Retail / Low Pop.	23	888	279	58	768	1,009	395	1,293
Low Mult. / High Retail / High Pop.	5	8,750	3,156	1,412	4,831	12,669	5,955	13,544
Low Mult. / High Retail / Low Pop.	4	1,923	369	185	1,335	2,510	1,501	2,402
Low Mult. / Low Retail / Low Pop.	19	522	291	67	382	662	100	1,001
Total	108	4,185	8,515	819	2,561	5,810	100	57,119

Appendix C. Continued

Regional Population	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Range	
					Lower Bound	Upper Bound	Minimum	Maximum
High Mult. / High Retail / High Pop.	12	3,106,006	4,142,119	1,195,727	474,230	5,737,783	505,943	11,538,434
High Mult. / High Retail / Low Pop.	7	322,271	61,852	23,378	265,067	379,475	279,962	454,000
High Mult. / Low Retail / Low Pop.	10	106,291	59,325	18,760	63,852	148,730	20,676	213,508
Medium Mult. / High Retail / High Pop.	14	1,677,547	1,182,319	315,988	994,896	2,360,198	574,363	3,750,085
Medium Mult. / High Retail / Low Pop.	14	294,877	72,131	19,278	253,229	336,524	219,541	484,826
Medium Mult. / Low Retail / Low Pop.	23	147,488	50,640	10,559	125,590	169,386	77,409	254,861
Low Mult. / High Retail / High Pop.	5	1,417,780	580,519	259,616	696,983	2,138,577	892,789	2,298,200
Low Mult. / High Retail / Low Pop.	4	304,108	67,717	33,859	196,356	411,859	230,095	392,123
Low Mult. / Low Retail / Low Pop.	19	92,325	51,941	11,916	67,290	117,360	12,294	175,969
Total	108	756,079	1,715,942	165,117	428,755	1,083,403	12,294	11,538,434

Median Household Income (\$)								
High Mult. / High Retail / High Pop.	12	29,874	4,700	1,357	26,888	32,806	24,791	40,444
High Mult. / High Retail / Low Pop.	7	22,104	2,094	791	20,167	24,041	19,853	25,268
High Mult. / Low Retail / Low Pop.	10	21,205	4,049	1,280	18,309	24,102	16,663	28,955
Medium Mult. / High Retail / High Pop.	14	29,893	4,999	1,336	27,007	32,780	24,036	38,286
Medium Mult. / High Retail / Low Pop.	14	23,146	2,407	643	21,756	24,536	19,402	26,663
Medium Mult. / Low Retail / Low Pop.	23	19,949	3,228	673	18,553	21,345	14,602	26,737
Low Mult. / High Retail / High Pop.	5	30,423	3,453	1,544	26,135	34,711	27,919	36,340
Low Mult. / High Retail / Low Pop.	4	22,909	2,477	1,239	18,966	26,851	21,270	26,595
Low Mult. / Low Retail / Low Pop.	19	20,979	3,504	804	19,290	22,668	15,794	27,370
Total	108	23,787	5,386	518	22,759	24,814	14,602	40,444

Appendix C. Continued

Distance to Nearest MSA (miles)	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean			Range	
					Lower Bound	Upper Bound	Minimum	Maximum	
High Mult. / High Retail / High Pop.	12	5	9	3	-1	10	0	28	
High Mult. / High Retail / Low Pop.	7	20	21	8	0	39	0	60	
High Mult. / Low Retail / Low Pop.	10	38	46	15	5	71	0	157	
Medium Mult. / High Retail / High Pop.	14	9	14	4	1	17	0	37	
Medium Mult. / High Retail / Low Pop.	14	19	21	6	7	31	0	60	
Medium Mult. / Low Retail / Low Pop.	23	53	34	7	38	67	0	135	
Low Mult. / High Retail / High Pop.	5	10	20	9	-14	35	0	45	
Low Mult. / High Retail / Low Pop.	4	17	20	10	-15	49	0	39	
Low Mult. / Low Retail / Low Pop.	19	44	36	8	27	62	0	145	
Total	108	29	33	3	23	35	0	157	

Percent Retail Sales									
High Mult. / High Retail / High Pop.	12	25.2	3.1	0.9	23.2	27.2	20.5	29.4	
High Mult. / High Retail / Low Pop.	7	28.6	2.4	0.9	26.3	30.8	23.9	31.8	
High Mult. / Low Retail / Low Pop.	10	27.4	2.3	0.7	25.7	29.0	23.4	29.8	
Medium Mult. / High Retail / High Pop.	14	24.9	3.1	0.8	23.2	26.7	19.1	28.4	
Medium Mult. / High Retail / Low Pop.	14	28.8	1.7	0.4	27.8	29.7	25.4	31.1	
Medium Mult. / Low Retail / Low Pop.	23	30.0	2.5	0.5	28.9	31.1	25.3	33.9	
Low Mult. / High Retail / High Pop.	5	27.0	2.1	0.9	24.4	29.5	23.9	29.0	
Low Mult. / High Retail / Low Pop.	4	29.1	1.0	0.5	27.5	30.7	28.0	30.3	
Low Mult. / Low Retail / Low Pop.	19	29.5	2.3	0.5	28.4	30.7	25.4	34.2	
Total	108	28.1	3.1	0.3	27.5	28.6	19.1	34.2	

Appendix C. Continued

Retail Sales Per Capita	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean			Range	
					Lower Bound	Upper Bound	Minimum	Maximum	
High Mult. / High Retail / High Pop.	12	7,689	1,018	294	7,042	8,335	6,557	9,721	
High Mult. / High Retail / Low Pop.	7	7,475	1,216	459	6,351	8,600	6,463	9,753	
High Mult. / Low Retail / Low Pop.	10	6,747	1,454	460	5,707	7,788	4,555	8,730	
Medium Mult. / High Retail / High Pop.	14	8,433	834	223	7,952	8,915	6,733	9,337	
Medium Mult. / High Retail / Low Pop.	14	6,761	1,480	396	5,906	7,616	4,724	10,257	
Medium Mult. / Low Retail / Low Pop.	23	6,005	913	190	5,610	6,400	4,543	7,987	
Low Mult. / High Retail / High Pop.	5	8,356	557	249	7,664	9,048	7,949	9,270	
Low Mult. / High Retail / Low Pop.	4	6,749	739	369	5,574	7,924	6,041	7,748	
Low Mult. / Low Retail / Low Pop.	19	4,807	919	211	4,364	5,250	3,099	6,844	
Total	108	6,695	1,571	151	6,395	6,994	3,099	10,257	

Retail Sales

High Mult. / High Retail / High Pop.	12	22,547,352	29,304,445	8,459,465	3,928,199	41,166,506	3,722,986	84,367,625
High Mult. / High Retail / Low Pop.	7	2,385,524	438,722	165,821	1,979,776	2,791,272	1,809,275	3,095,862
High Mult. / Low Retail / Low Pop.	10	717,502	414,682	131,134	420,857	1,014,147	156,531	1,390,795
Medium Mult. / High Retail / High Pop.	14	14,395,835	10,460,669	2,795,731	8,356,025	20,435,645	3,866,991	32,764,530
Medium Mult. / High Retail / Low Pop.	14	1,995,918	736,524	196,844	1,570,661	2,421,174	1,279,656	4,310,475
Medium Mult. / Low Retail / Low Pop.	23	886,086	325,873	67,949	745,168	1,027,004	406,980	1,410,825
Low Mult. / High Retail / High Pop.	5	12,087,541	5,829,183	2,606,890	4,849,771	19,325,310	7,096,391	21,303,280
Low Mult. / High Retail / Low Pop.	4	2,059,056	513,229	256,615	1,242,406	2,875,706	1,389,950	2,503,560
Low Mult. / Low Retail / Low Pop.	19	465,999	290,029	66,537	326,209	605,788	54,188	1,043,942
Total	108	5,757,725	12,719,530	1,223,937	3,331,412	8,184,038	54,188	84,367,625

Appendix C. Continued

Annual COE Visitation	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Range
					Lower Bound	Upper Bound	
High Mult. / High Retail / High Pop.	12	2,078,306	2,245,588	648,245	651,527	3,505,084	381,500
High Mult. / High Retail / Low Pop.	7	4,112,743	3,314,133	1,252,624	1,047,698	7,177,788	1,320,400
High Mult. / Low Retail / Low Pop.	10	1,585,706	1,314,073	415,546	645,675	2,525,736	138,200
Medium Mult. / High Retail / High Pop.	14	3,013,102	3,588,615	959,098	941,097	5,085,107	1,166,800
Medium Mult. / High Retail / Low Pop.	14	2,325,474	1,735,123	463,731	1,323,644	3,327,304	14,863,000
Medium Mult. / Low Retail / Low Pop.	23	2,037,298	1,716,965	358,012	1,294,827	2,779,770	475,000
Low Mult. / High Retail / High Pop.	5	3,497,970	2,087,749	933,670	905,729	6,090,211	5,579,200
Low Mult. / High Retail / Low Pop.	4	1,408,340	205,540	102,770	1,081,284	1,735,395	1,914,077
Low Mult. / Low Retail / Low Pop.	19	1,658,673	1,356,924	311,300	1,004,657	2,312,690	1,124,259
Total	108	2,276,128	2,192,902	211,012	1,857,821	2,694,435	65,400
							14,863,000

Percent Boating

High Mult. / High Retail / High Pop.	12	0.15	0.13	0.04	0.07	0.23	0.00	0.41
High Mult. / High Retail / Low Pop.	7	0.21	0.14	0.05	0.08	0.34	0.05	0.45
High Mult. / Low Retail / Low Pop.	10	0.31	0.13	0.04	0.21	0.41	0.15	0.56
Medium Mult. / High Retail / High Pop.	14	0.15	0.13	0.03	0.08	0.22	0.00	0.48
Medium Mult. / High Retail / Low Pop.	14	0.19	0.08	0.02	0.15	0.24	0.05	0.28
Medium Mult. / Low Retail / Low Pop.	23	0.23	0.14	0.03	0.17	0.29	0.00	0.63
Low Mult. / High Retail / High Pop.	5	0.27	0.10	0.04	0.15	0.39	0.12	0.35
Low Mult. / High Retail / Low Pop.	4	0.31	0.13	0.06	0.10	0.51	0.19	0.49
Low Mult. / Low Retail / Low Pop.	19	0.25	0.13	0.03	0.19	0.31	0.00	0.52
Total	108	0.22	0.13	0.01	0.20	0.25	0.00	0.63

Appendix C. Continued

Percent Camping	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Range	
					Lower Bound	Upper Bound	Minimum	Maximum
High Mult. / High Retail / High Pop.	12	0.08	0.07	0.02	0.03	0.12	0.00	0.20
High Mult. / High Retail / Low Pop.	7	0.14	0.16	0.06	-0.01	0.28	0.02	0.39
High Mult. / Low Retail / Low Pop.	10	0.13	0.09	0.03	0.06	0.20	0.02	0.29
Medium Mult. / High Retail / High Pop.	14	0.07	0.07	0.02	0.02	0.11	0.00	0.25
Medium Mult. / High Retail / Low Pop.	14	0.11	0.13	0.04	0.03	0.19	0.00	0.53
Medium Mult. / Low Retail / Low Pop.	23	0.13	0.11	0.02	0.08	0.18	0.00	0.49
Low Mult. / High Retail / High Pop.	5	0.05	0.03	0.01	0.01	0.09	0.01	0.08
Low Mult. / High Retail / Low Pop.	4	0.13	0.05	0.02	0.06	0.20	0.06	0.16
Low Mult. / Low Retail / Low Pop.	19	0.12	0.13	0.03	0.05	0.18	0.02	0.63
Total	108	0.11	0.11	0.01	0.09	0.13	0.00	0.63

APPENDIX D

Appendix D. Analysis of Variance Between Classes Using Dunnett's T3 Multiple Comparison Method.¹

Independent Variable	Class	I	II	III	IV	Classes V	VI	VII	VIII	IX
Type III Regional Sales Multipliers										
	I	-								
	II		-							
	III			-						
	IV	***	***	***	-					
	V	***	***	***		-				
	VI	***	***	***			-			
	VII	***	***	***	***	***	***	-		
	VIII	***	***	***	*	*	*		-	
	IX	***	***	***	***	***	***			-

Independent Variable	Class	I	II	III	IV	Classes V	VI	VII	VIII	IX
Regional Population										
	I	-								
	II		-							
	III		***	-						
	IV		*	**	-					
	V			***	*	-				
	VI		**		*	***	-			
	VII							-		
	VIII				*				-	
	IX		***		**	***	*		*	-

¹Dunnett's T3 Multiple Comparison method is a Post hoc procedure assuming unequal class variances.

* Mean difference is significant at the 0.05 level

** Mean difference is significant at the 0.01 level

*** Mean difference is significant at the 0.001 level



Appendix D. Continued

Independent Variable	Class	I	II	III	IV	Classes V	VI	VII	VIII	IX
Number of Retail Establishments										
I		-								
II			-							
III			***	-						
IV			*	**	-					
V				***	*	-				
VI			***		**	***	-			
VII								-		
VIII				*	*				-	
IX			***		**	***	**		*	-

Independent Variable	Class	I	II	III	IV	Classes V	VI	VII	VIII	IX
Per Capita Retail Sales										
I		-								
II			-							
III				-						
IV					-					
V					*	-				
VI		**			***		-			
VII							***	-		
VIII									-	
IX		***	*		***	**	**	***		-

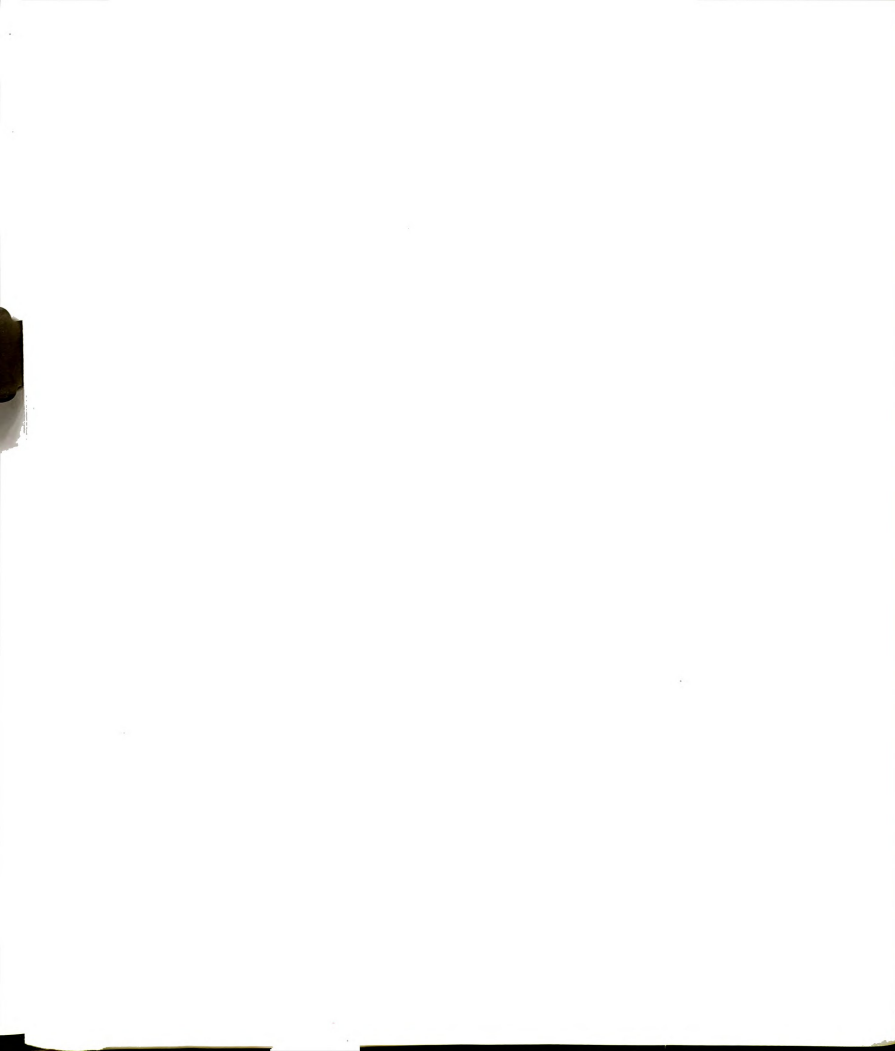




Appendix D. Continued

Independent Variable	Class	I	II	III	IV	Classes V	VI	VII	VIII	IX
Percent Boaters										
	I	-								
	II		-							
	III			-						
	IV				-					
	V					-				
	VI						-			
	VII							-		
	VIII								-	
	IX									-

Independent Variable	Class	I	II	III	IV	Classes V	VI	VII	VIII	IX
Distance to the Nearest MSA										
	I	-								
	II		-							
	III			-						
	IV				-					
	V					-				
	VI	***			***	*	-			
	VII							-		
	VIII								-	
	IX	**			*					-



Appendix D. Continued

Independent Variable	Class	I	II	III	IV	Classes V	VI	VII	VIII	IX
Percent Retail Sales										
	I	-								
	II		-							
	III			-						
	IV				-					
	V				*	-				
	VI	**			***		-			
	VII							-		
	VIII				*				-	
	IX	*			**					-

Independent Variable	Class	I	II	III	IV	Classes V	VI	VII	VIII	IX
Median Household Income										
	I	-								
	II	**	-							
	III	**		-						
	IV		**	**	-					
	V	*			**	-				
	VI	***			***		-			
	VII			*			*	-		
	VIII								-	
	IX	***			***			*		-



APPENDIX E



Appendix E. Qualitative Descriptions of Initial Classification Categories

Class I: High Multiplier / High Retail / High Population (N = 12)

Each project in this class is within 30 miles of a Metropolitan Statistical Area (MSA), and has a large number of retail establishments within the region, as well as high retail sales. Most of the projects in this class have a reportedly low level of camping.

The Corps of Engineers project from the Propst et al. (1992) study that was classified into this category was J. Percy Priest. J. Percy Priest is located just outside Nashville, TN in a relatively rural area. Of the 8.9 million visitors in 1994, approximately 20 percent were estimated to have camped within the project's boundaries, while 14 percent of the visitors engaged in some form of boating while at the project (NRMS, 1994). A ten county region was aggregated for J. Percy Priest. The region reported a total of \$32 billion in sales to final consumers in 1990 (final demand) (Propst et al., 1992). The percentage of those sales to COE visitors by individual recreation related sectors were: Hotel (8.3%), Recreation (3.3%), Eating and Drinking Establishments (2.8%), and Retail and Wholesale (1.8%) sectors. Nonresident visitors accounted for 20 percent of all visitors to J. Percy Priest and 38 percent of visitor spending in the local area. Average nonresident visitor spending was \$124.68 within 30 miles, while average resident spending was \$51.61. Average spending for all COE visitors within 30 miles was \$66.37, and \$88.48 per party trip.

Class II: High Multiplier / High Retail / Low Population (N = 7)

Corps of Engineers projects in this class generally were further away from MSAs, although many were still within 30 miles. Apart from Beaver, AR, each of the projects in this class are located in relatively rural areas in the vicinity of other popular recreation destination areas. For instance, the Willamette, OR projects are located in the vicinity of the Pacific Ocean and many other recreation areas. Additionally, Barkley, KY is located adjacent to the Tennessee Valley Authority's popular Land Between the Lakes Recreation Area, and Stockton Lake, MO and Table Rock, AR are located adjacent to the Ozarks.

The Corps of Engineers project from the Propst et al. (1992) study that was classified into this category was Willamette. Willamette is really an aggregation of three small projects (Cottage Grove, Fall Creek, and Fern Ridge) surrounding Eugene in Lane County, OR. Approximately 1.6 million visitors came to these three projects in 1994. Of those visitors, approximately 34 percent were estimated to have camped within the project's boundaries, while 45 percent of the visitors engaged in some form of boating (NRMS, 1994). In Propst et al. (1992) study of the Willamette project, Lane County reported a total of \$7.2 billion in sales to final consumers in 1990 (final demand). The percentage of those sales to COE visitors by individual recreation related sectors were: Hotel (5.0%),



Recreation (2.1%), Eating and Drinking Establishments (1.5%), and Retail and Wholesale (1.3%) sectors. Nonresident visitors accounted for 16 percent of all visitors to Willamette and 30 percent of visitor spending in the local area. Average nonresident visitor spending was \$101.48 within 30 miles, while average resident spending was \$44.53. Average spending for all COE visitors within 30 miles was \$53.64, and \$72.54 per party trip.

Class III: High Multiplier / Low Retail / Low Population (N = 10)

Corps of Engineers projects in this class are located in relatively rural areas, except for Waco, Englebright, and New Hogan. Waco is a primary provider of recreation opportunities, particularly day-use, for visitors living in nearby Waco, TX. Englebright and New Hogan are both small reservoirs located outside Yuba City, CA and Medesto, CA respectively. Neither Englebright nor New Hogan had a comparatively equal amount of recreation facilities to other projects in this class. As such, neither project is a significant provider of recreation opportunities within their respective regions. Additionally, many of the projects within this class are located in popular recreation areas, such as the Ozark Mountains in Missouri and Arkansas, and Sierra Nevada Mountains in California.

The Corps of Engineers projects from the Propst et al. (1992) study that were classified into this category were Lakes Oahe, SD and Ouachita, AR. Lake Oahe is a large river project spanning 231 miles from Bismarck, the capital of North Dakota, to Pierre, the capital of South Dakota along the Missouri River. Of the 1.7 million visitors in 1994, approximately 13 percent were estimated to have camped within the project's boundaries, while 30 percent of the visitors engaged in some form of boating while at the project (NRMS, 1994). A thirteen county region was aggregated for Lake Oahe. The region reported a total of \$3.8 billion in sales to final consumers in 1990 (final demand) (Propst et al., 1992). The percentage of those sales to COE visitors by individual recreation related sectors were: Hotel (30.1%), Eating and Drinking Establishments (9.4%), Recreation (6.5%), and Retail and Wholesale Trade (3.7%) sectors. Nonresident visitors accounted for 44 percent of all visitors to Lake Oahe and 71 percent of visitor spending in the local area. Average nonresident visitor spending was \$125.54 within 30 miles, while average resident spending was \$40.02. Average spending for all COE visitors within 30 miles was \$77.82, and \$131.09 per party trip.

Lake Ouachita is located 25 miles from Little Rock, AR on the Ouachita and Black Rivers in southern Arkansas and northern Louisiana. Of the 1.2 million visitors in 1994, approximately 18 percent were estimated to have camped within the project's boundaries, while 26 percent of the visitors engaged in some form of boating while at the project (NRMS, 1994). A five county region was aggregated for Lake Ouachita. The region reported a total of \$3.3 billion in sales to final consumers in 1990 (final demand) (Propst et al., 1992). The percentage of those sales to COE visitors by individual recreation related sectors were: Hotel (19.2%), Eating and Drinking Establishments (9.9%), Retail



and Wholesale Trade (5.3%), and Recreation (4.4%) sectors. Nonresident visitors accounted for 65 percent of all visitors to Lake Ouachita and 74 percent of visitor spending in the local area. Average nonresident visitor spending was \$129.91 within 30 miles, while average resident spending was \$86.48. Average spending for all COE visitors within 30 miles was \$114.71, and \$177.14 per party trip.

Class IV: Medium Multiplier / High Retail / High Population (N = 14)

Except for Bonneville, OR and Oologah Lake, OK, Corps of Engineers projects classified into this category generally were within 30 miles of an MSA. Additionally, 9 of the 14 projects in this class were located immediately adjacent to an MSA. As such there were a significant number of places to purchase recreation related goods and services. Additionally, adjacent to or within each of these project's boundaries were a number of resort style recreation areas providing golf courses, commercial and private lodging, and an assortment of urban type recreation facilities. Other than J. Strom Thurmond, project visitation was predominately day-use. Approximately 25 percent of 1994 visitors camped while at J. Strom Thurmond.

There were no Corps of Engineers projects from the Propst et al. (1992) study classified into this category. Thus, primary visitor spending data was not available to develop visitor spending profiles for this class. However, crude estimates of spending profiles can still be estimated for COE projects in this class if levels of retail establishments and regional population are known. For instance, the spending profiles of an adjacent class may be examined for projects in this class if the levels of retail establishments and regional population are somewhat similar (i.e. projects in this class having numbers of retail establishments and regional population close to the break points). However, caution should be taken when using this method as estimated spending profiles may not reflect visitors in this class. Additionally, spending profiles derived from adjacent classes for projects in this class should error on the side of conservative.

Class V: Medium Multiplier / High Retail / Low Population (N = 14)

Corps of Engineers projects classified into this class were in a variety of locations, ranging from remote to more urbanized areas. A majority of the projects in this class had relatively few campers during the 1994 season, except for Center Hill, TN. More than 50 percent of COE visitors were estimated to have camped or stayed in commercial lodges while at Center Hill.

The Corps of Engineers projects from the Propst et al. (1992) study that were classified into this category were McNary Lock and Dam, OR, Raystown, PA and Lake Shelbyville, KY. McNary Lock and Dam, located in the Columbia River George

National Scenic Area adjacent to Richland, OR and Kennewick, OR, backs up 64 miles of water to create Lake Wallula. Of the 4.9 million visitors in 1994, approximately 2 percent were estimated to have camped within the project's boundaries, while 12 percent of the visitors engaged in some form of boating while at the project (NRMS, 1994). Many of the project's visitors come to view the large hydroelectric plant in operation. A four county region was aggregated for McNary. The region reported a total of \$8.4 billion in sales to final consumers in 1990 (final demand) (Propst et al., 1992). The percentage of those sales to COE visitors by individual recreation related sectors were: Hotel (46.7%), Eating and Drinking Establishments (8.7%), Recreation (6.9%), and Retail and Wholesale Trade (3.2%) sectors. Nonresident visitors accounted for 38 percent of all visitors to McNary and 64 percent of visitor spending in the local area. Average nonresident visitor spending was \$72.82 within 30 miles, while average resident spending was \$25.31. Average spending for all COE visitors within 30 miles was \$43.51, and \$71.38 per party trip.

Raystown is located 30 miles from Altoona, PN. The project has thirteen public use facilities, a private recreation complex with cruise vessels, and overnight accommodations. Of the 980,000 visitors in 1994, approximately 9 percent were estimated to have camped within the project's boundaries, while 28 percent of the visitors engaged in some form of boating while at the project (NRMS, 1994). An eight county region was aggregated for Raystown. The region reported a total of \$13 billion in sales to final consumers in 1990 (final demand) (Propst et al., 1992). The percentage of those sales to COE visitors by individual recreation related sectors were: Recreation (2.2%), Hotel (1.4%), and Eating and Drinking Establishments (0.7%) sectors. Nonresident visitors accounted for 63 percent of all visitors to Raystown and 75 percent of visitor spending in the local area. Average nonresident visitor spending was \$53.01 within 30 miles, while average resident spending was \$30.87. Average spending for all COE visitors within 30 miles was \$44.86, and \$80.39 per party trip.

Lake Shelbyville is located 22 miles from Decatur, IL. Of the 2 million visitors in 1994, approximately 14 percent were estimated to have camped within the project's boundaries, while 20 percent of the visitors engaged in some form of boating while at the project (NRMS, 1994). A ten county region was aggregated for Lake Shelbyville. The region reported a total of \$12 billion in sales to final consumers in 1990 (final demand) (Propst et al., 1992). The percentage of those sales to COE visitors by individual recreation related sectors were: (10.8%), Eating and Drinking Establishments (2.8%), Recreation (2.5%), and Retail and Wholesale Trade (1.1%) sectors. Nonresident visitors accounted for 44 percent of all visitors to Lake Shelbyville and 71 percent of visitor spending in the local area. Average nonresident visitor spending was \$85.86 within 30 miles, while average resident spending was \$27.63. Average spending for all COE visitors within 30 miles was \$53.31, and \$87.67 per party trip.



Class VI: Medium Multiplier / Low Retail / Low Population (N = 23)

Except for Belton Lake, TX and Wright Patman, TX, Corps of Engineers projects classified into this category generally were in rural areas lacking an MSA within 30 miles of their boundaries. As such, there were fewer retail establishments and less per capita retail sales in comparison to the previous classes. Additionally, the percentage of total sales within the projects' regions attributed to retail trade was generally higher within this class. Many of the projects were predominately day-use. However, several projects received more than a fifth of their visitation as campers.

The Corps of Engineers projects from the Propst et al. (1992) study that were classified into this category were Lake Cumberland, KY, Mendocino, CA and Milford Lake, KS. Lake Cumberland is located 50 miles south of Lexington, KY adjacent to the Daniel Boone National Forest. Of the 7.4 million visitors in 1994, approximately 50 percent were estimated to have camped within the project's boundaries, while 15 percent of the visitors engaged in some form of boating while at the project (NRMS, 1994). The project is a popular area for many of the more than seven million visitors to stay overnight on houseboats, and engage in related recreation activities associated with houseboats, such as fishing and swimming. An eighteen county region was aggregated for Lake Cumberland. The region reported a total of \$6.3 billion in sales to final consumers in 1990 (final demand) (Propst et al., 1992). The percentage of those sales to COE visitors by individual recreation related sectors were: Hotel (256.3%)¹, Recreation (41.7%), Eating and Drinking Establishments (35.8%), and Retail and Wholesale Trade (15.8%) sectors. Nonresident visitors accounted for 59 percent of all visitors to Lake Cumberland, and 78 percent of visitor spending in the local area. Average nonresident visitor spending was \$172.91 within 30 miles, while average resident spending was \$70.47. Average spending for all COE visitors within 30 miles was \$131.21, and \$197.91 per party trip.

Mendocino is located on the Russian River 30 miles Santa Rosa, CA. The project has four campgrounds with limited recreational facilities. Of the 500,000 visitors in 1994, approximately 17 percent were estimated to have camped within the project's boundaries, while 22 percent of the visitors engaged in some form of boating while at the project (NRMS, 1994). In Propst et al. (1992) study of Mendocino, Mendocino county reported \$2 billion in sales to final consumers in 1990 (final demand). The percentage of those sales to COE visitors by individual recreation related sectors were: Hotel (7.3%), Recreation (4.4%), Eating and Drinking Establishments (3.4%), and the Retail and Wholesale (1.7%) sectors. Nonresident visitors accounted for 41 percent of all visitors to Mendocino, and 30 percent of visitor spending in the local area. Average nonresident visitor spending was \$62.86 within 30 miles, while average resident spending was

¹ Estimates of hotel spending exceeded 100% of 1990 sales in the hotel sector. This is likely due to allocation of houseboat rentals to the hotel sector. In fact, the houseboat rental business is so extensive that Lake Cumberland can be considered an outlier in terms of visitor spending and economic effects. Thus, it would be more appropriate to make comparisons to Lakes Milford and Mendocino in Class VI.



\$101.54. Average spending for all COE visitors within 30 miles was \$85.84, and \$126.20 per party trip.

Milford Lake is located 70 miles west of Topeka, KS off Interstate 70, adjacent to Fort Riley Military Base. The project has four marinas and nine developed recreation areas providing visitors with several places to purchase recreation related goods and services. Of the 570,000 visitors in 1994, approximately 13 percent were estimated to have camped within the project's boundaries, while 21 percent of the visitors engaged in some form of boating while at the project (NRMS, 1994). A five county region was aggregated for Milford. The region reported a total of \$2.9 billion in sales to final consumers in 1990 (final demand) (Propst et al., 1992). The percentage of those sales to COE visitors by individual recreation related sectors were: Hotel (5.9%), Eating and Drinking Establishments (1.9%), Recreation (1.6%), and the Retail and Wholesale (1.6%) sectors. Nonresident visitors accounted for 41 percent of all visitors to Milford Lake, and 51 percent of visitor spending in the local area. Average nonresident visitor spending was \$102.05 within 30 miles, while average resident spending was \$67.97. Average spending for all COE visitors within 30 miles was \$81.87, and \$128.49 per party trip.

Class VII: Low Multiplier / High Retail / High Population (N = 5)

The five Corps of Engineers projects assigned to this class were predominately day-use facilities. Except for Lake Sidney Lanier, the projects in this class were located adjacent to MSAs, and had comparatively high per capita retail sales. Given the fact that these projects are located adjacent to MSA, it is surprising that sales multipliers are low. Additionally, the projects in this class had relatively high amounts of boating activity in relation to their numbers of visitors, with the exception of B. Everett Jordon. B. Everett Jordon was estimated to have had only 12 percent of its visitors participate in boating activities while the other projects were estimated to have from 23 to 35 percent of their visitors participate in boating.

The Corps of Engineers project from the Propst et al. (1992) study that was classified into this class was Lake Sidney Lanier. The project is located 45 miles from Metropolitan Atlanta, GA, where a majority of the visitors reside. More than sixty public recreation areas are located on Lake Sidney Lanier, including a golf course, resorts, commercial lodging and other places for visitors to purchase recreation related goods and services. The region surrounding Lake Sidney Lanier is an economically large and diverse area, compared to other COE projects. However, a majority of the population and economic activity lie just outside 30 miles which partially explains the low multipliers. Of the 6.7 million visitors in 1994, approximately 8 percent were estimated to have camped within the project's boundaries, while 32 percent of the visitors engaged in some form of boating while at the project (NRMS, 1994). A twenty county region was aggregated for Lake Sidney Lanier. The region reported a total of \$41 billion in sales to final consumers in 1990 (final demand) (Propst et al., 1992). The percentage of those sales to COE visitors

by individual recreation related sectors were: Hotel (2.6%), Recreation (2.5%), Eating and Drinking Establishments (1.5%), and Retail and Wholesale (0.7%) sectors. Nonresident visitors accounted for 23 percent of all visitors to Lake Sidney Lanier, and 29 percent of visitor spending in the local area. Average nonresident visitor spending was \$72.58 within 30 miles, while average resident spending was \$51.64. Average spending for all COE visitors within 30 miles was \$56.39, and \$71.49 per party trip.

Class VIII: Low Multiplier / High Retail / Low Population (N = 4)

The four Corps of Engineers projects classified into this category were located in sparsely populated regions compared to many of the other projects. Even Woodruff, AL and Monroe, IN do not exceed 400,000 people within the region and they were located just outside Montgomery, AL and Bloomington, IN respectively. Additionally, the number of retail establishments and per capita retail sales were lower for this class than for Class VII.

There were no Corps of Engineers projects from the Propst et al. (1992) study classified into this category. Thus, primary visitor spending data was not available to develop visitor spending profiles for this class. However, crude estimates of spending profiles can still be estimated for COE projects in this class if levels of retail establishments and regional population are known. For instance, the spending profiles of an adjacent class may be examined for projects in this class if the levels of retail establishments and regional population are somewhat similar (i.e. projects in this class having numbers of retail establishments and regional population close to the break points). However, caution should be taken when using this method as estimated spending profiles may not reflect visitors in this class. Additionally, spending profiles derived from adjacent classes for projects in this class should error on the side of conservative.

Class IX: Low Multiplier / Low Retail / Low Population (N = 19)

Most of the projects classified into this category were located in rural areas with comparatively sparsely populated economic regions. As such, there were a limited number of places to purchase recreation related goods and services. Dale Hollow, TN was the only project in this class with more than 1,000 retail establishments (1,001). Per capita retail sales were lower for the regions in this class than in others. A majority of the projects in this class received little camping during the 1994 season. However, as high as 63 and 25 percent of the visitors in 1994 were estimated to have camped at Dale Hollow and Lake Eastman, CA, respectively. All the projects in this class received between 11 and 52 percent of their recreational use in the form of boating, except for Lake Eastman which had none.



The Corps of Engineers project from the Propst et al. (1992) study that was classified into this category was Dworshak Reservoir. The project is located in a largely rural area (1994 population of 12,300) 145 miles from Spokane, WA. Limited recreation facilities were located within the Dworshak region, as well as places to purchase recreation related goods and services. Of the 109,000 visitors in 1994, approximately 11 percent were estimated to have camped within the project's boundaries, while 36 percent of the visitors engaged in some form of boating while at the project (NRMS, 1994). A four county region was aggregated for Dworshak. The region reported a total of \$2.1 billion in sales to final consumers in 1990 (final demand) (Propst et al., 1992). The percentage of those sales to COE visitors by individual recreation related sectors were: (1.2%), Recreation (0.6%), Eating and Drinking Establishments (0.6%), and Retail and Wholesale (0.3%) sectors. Nonresident visitors accounted for 53 percent of all visitors to Dworshak, and 43 percent of visitor spending in the local area. Average nonresident visitor spending was \$38.44 within 30 miles, while average resident spending was \$55.90. Average spending for all COE visitors within 30 miles was \$46.71, and \$81.92 per party trip.



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