Fiscal impacts of forest-rangeland policies on local communities: an empirical study of the Flagstaff, Arizona trade area

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FISCAL IMPACTS OF FOREST-RANGELAND POLICIES ON LOCAL COMMUNITIES:

AN EMPIRICAL STUDY OF THE FLAGSTAFF, ARIZONA TRADE AREA

by

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APPROVAL BY THESIS DIRECTOR

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES--<u>Continued</u>

LIST OF ILLUSTRATIONS

ABSTRACT

United States Forest Service policies which will impact on

local sustaining industries in the Flagstaff Trade Area are discerned.

Estimates of impacts on employment and income distribution resulting

from these policies are made utilizing employment elasticities derived

from a "from-to" model of the area. Changes in sales and property tax

revenues and impacts on the demand for local public goods and services

are also appraised.

The timber and range policies were found to be significantly

regressive with respect to income distribution. The recreation policy

to increase tourism was progressive. Much of the additional employ-

ment is, however, highly seasonal. The net impact of the combined

policies is a 1.9% increase in total area employment.

The net impact of each policy on supply of government revenues

is quite small (relative to the overall budget). The net result of all

three policies is an estimated increase of $81,325 in revenues. No

significant change in the demand for or ability to provide public goods

and services due to the implementation of the specified policies is

expected.

Policy impacts vary among areas of differing economic structure.

This was illustrated via a brief analysis of another area. Rather than

an overall "stabilizing" effect, which was the net result in the

primary study area, the net effect in this second area was a net decline in area employment.

Policy implications for the Forest Service, state and local government agencies, and local planners are presented.

CHAPTER 1

INTRODUCTION

> We have recognized the dominant role of federal public land
> in the twelve far western states. In large measure, the future
> of those states may depend upon the adoption of sound public
> land laws and policies that will assure environmental quality
> and, at the same time, encourage healthy economic growth.
> Public Land Law Review Commission, 1970, p. 20.

The national forests of the United States include 8 percent of

the total land area of the nation, have a sale or liquidation value

estimated at $42 billion and in recent years their cash receipts have

ranged from $400 to $500 million. Their output or use directly or in-

directly affects everyone in the United States. The national forests

are predominantly in the West--one third being located along the

Pacific Coast, over 40 percent in the Rocky Mountains, and only one-

fourth in the entire eastern half of the country (Clawson, 1976).

The national forests are owned by the people of the United

States and managed by the U.S. Forest Service. Because of its exten-

sive management responsibility, it exerts, on an a priori basis, a

powerful influence on the economic activity and well-being of many

communities in areas where national forest lands predominate.

The Forest Service plays an especially important role in land

and resource management in the State of Arizona. Some 15.9% of the

land area in Arizona is managed by the Forest Service.

In many areas of Arizona, local economies are thought to be heavily dependent on forest-rangeland industries such as lumbering, ranching, and tourism. Thus, land use and resource allocation decisions of the Forest Service may determine, to a considerable extent, the level of sales and employment in these basic industries. Local government revenue and expenditure levels and patterns may also be affected.

Policies that significantly affect a community's economy are necessarily of concern to local planners. If local governments are to provide goods and services in a manner that represents local needs, concerns and priorities, it is important for planning officials to know how changes in public land use policies, which affect local sustaining industries, will impact on local income, employment, tax revenues and demand for public goods and services. For example, should policies be implemented which reduce grazing allotments or allowable timer cut, ranch and timber operations lose revenues, as do other firms in the community that are supplied by, or supply them with, goods and services. The impacts extend to income levels and distribution, employment, and tax revenues. The demand for public goods and services such as schools, police and fire protection, sewers, water, and utilities may also be affected.

Objectives of the Research

The overall objective of this research is to demonstrate and use a method for making estimates of fiscal impacts of plausible forest and rangeland policies. The method will be used for the Flagstaff

Trade Area. Specific objectives are:

1. to estimate direct and indirect employment and income distribu-
   tion changes induced by specific Forest Service policies,

2. to estimate how these changes will impact on the supply of
   local government revenues and demand for the goods and services
   provided by units of the local government, and

3. to draw policy implications.

The Study Area

This study focuses on the portion of Coconino County south of
the northern section of the Kaibab National Forest and east of Seligman,
Arizona (excluding Indian Reservations), and will be called the Flag-
staff Trade Area. Over 50% of the study area is National Forest land
(Figure 1).

Coconino County is the largest county in Arizona, and the
second largest in the United States. Although large in land area, it
is one of the most sparsely populated of Arizona's counties, having
only 3.8 persons per square mile.[1] The largest community in the county
is Flagstaff with a population of 31,370 (Valley National Bank, 1977).
Status of land ownership in the county is shown in Table 1.

The general area is characterized by scenic beauty in the form
of rugged mountains and thick forests of spruce, pinon, oak, pine and
aspen. Outdoor recreation facilities, important sight-seeing landmarks

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[1]By comparison, Maricopa County, Arizona, the State of Califor-
nia, and the State of Wyoming have population densities of 140, 135 and
4 persons per square mile respectively.
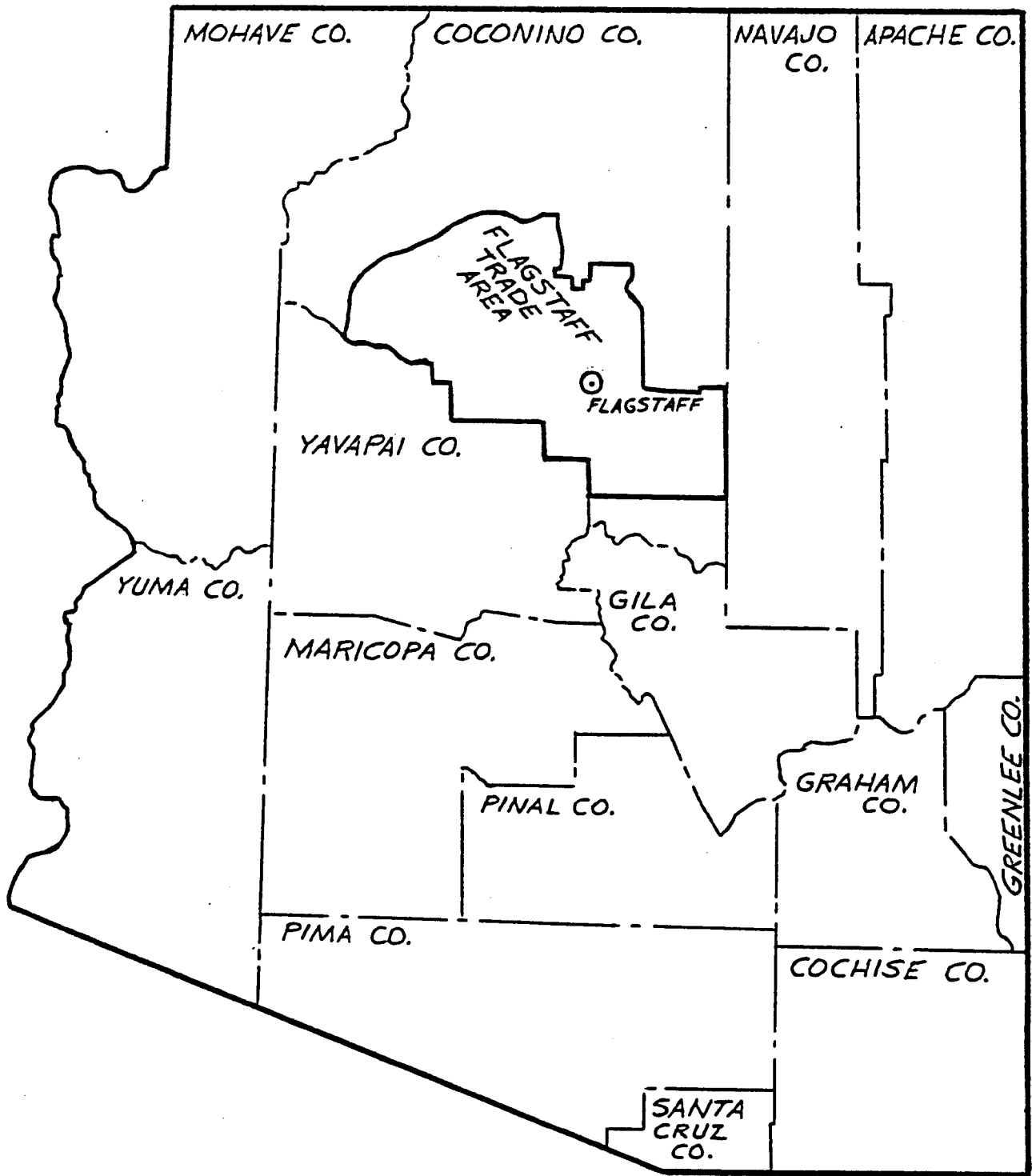
Figure 1. Flagstaff Trade Area

Table 1. Status of Land Ownership, Coconino County, 1976

U.S. Forest Service	28%
U.S. Bureau of Land Management	5%
Indian Reservation	37%
State of Arizona	9%
Individual or Corporate	14%
Other[a]	7%

[a]Includes land administered by National Park Service, Department of Defense, Bureau of Sport Fisheries and Wildlife, Bureau of Reclamation, and other miscellaneous public land (County, State, and Federal).

Source: Valley National Bank, 1977.

like the Grand Canyon, San Francisco Peaks and Indian Reservations, and excellent climate combine to offer a wide variety of summer and winter sight-seeing and recreational activities which attract large numbers of tourists, retirees, and seasonal residents.

Many retail and service businesses derive most of their sales from tourists, and, in fact, sales to tourists are the largest generator of employment in the private sector of the Flagstaff Trade Area.

Local, state and federal government employment directly accounts for approximately one-third of the employment in the Area. The leading employer in Flagstaff is Northern Arizona University (NAU) (Baskett, 1976).

The lumber resources of the surrounding national forests have given rise to several contract logging operations, sawmill activity, various paper and wood products manufacturing plants, and the School of Forestry at NAU. The bulk of agricultural employment in the Trade Area is provided by cattle ranching operations. A summary of the number of local businesses and employment by type of business is given in Table 2.

A from-to model[2] of the Flagstaff Trade Area indicates that approximately 657 employment units or "person years" (6.9% of total private sector employment) are directly related to the tourist trade; and, approximately 248 employment units (2.6% of total private sector employment) are directly related to the beef cattle production industry.

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[2] A from-to model of the Flagstaff Trade Area for the base year 1973 was developed by Baskett for the U.S. Forest Service. In the model, data for 29 sectors indicate the distribution of employment among sectors.

Table 2. Businesses and Employment by Type of Industry, Flagstaff Trade Area, 1973[a].

Type of Business/Industry	Number of Businesses	Number Employed
Retail and Wholesale Trade	546	4,967
Services	394	1,492
Manufacturing	37	346
Lumber-Related Businesses	14	689
Agriculture	86	327
Construction	109	727
Mining	0	0
Transportation, Communication and Public Utilities	35	462
Finance, Insurance and Real Estate	135	529
Subtotal	1,356	9,537
Government[b]		4,768
TOTAL		14,305

[a]Totals shown include all area businesses and employment. Employment is average annual employment in 1973.

[b]Government employment is an estimate based on the proportion of government employment in the Area in the past 8 years. The proportion has averaged 33 percent of total area employment.

Source: Baskett, 1976.

Together they account directly for 29.1% of total private sector employ-
ment.

These direct employees, however, are not the only ones depend-
ent on the lumber-wood products, tourism, and cattle industries. These
businesses provide basic employment in the area and, as they and their
employees trade with other local businesses, provide for the existence
and growth of other local concerns. Thus, there is a "multiplier
effect", and the importance of basic sustaining industries goes beyond
initial, observed, direct employment.

Selected Policies

Demand for the goods and services provided by natural resources
of the national forests is growing steadily. Often these demands are
conflicting. There exists a growing awareness of the necessity to
manage these resources in a manner which provides for the conservation
and protection of these resources and our environment while continuing
to enhance economic efficiency, development and growth.

In 1974, Congress passed the Forest and Rangeland Renewable Re-
sources Planning Act (RPA) (U.S. Congress PL93-378, 1974). The RPA
requires the Forest Service to make an assessment of the current forest
situation in the United States and to prepare a national forestry pro-
gram designed to satisfy the demands of all Americans: cleaner,
healthier outdoor environments; easier access to outdoor recreation;
ample supplies and quality of water, wilderness, range, timber, and
wildlife; and continued production of forest output which will enhance

economic growth and well being. Consequently, changes in management

practices are expected and the impacts of these changes merit examina-

tion.

Numerous personal discussions with individuals from the Rocky

Mountain Forest and Range Experiment Station (Brown, 1977-78) and Coco-

nino National Forest Supervisors Office (Ott and Utley, 1977-78), as

well as estimates and proposals put forth in the Coconino's RPA plan-

ning statement (Coconino National Forest, 1976), suggest the Forest

Service policies will result in a (1) 10% reduction in allowable

timber cut, (2) 20% decline in number of animal units, and, (3) 10% in-

crease in recreational activities and opportunities. These are the

direct policy impacts upon which this study focuses.

CHAPTER 2

FRAMEWORK OF ANALYSIS: MODEL, DATA AND METHODS

A from-to model (a variation of an input-output model) devel-
oped by Baskett, along with various side calculations are used to
estimate impacts on employment, income distribution, tax revenues and
the demand for local public goods and services which result from the
specified forest and range policies.

In this chapter, input-output (I/O) analysis, the basis of
from-to analysis, is briefly described, followed by a short discussion
of from-to analysis and how it compares to I/O analysis. Attention is
then given to the specifics of the Baskett model. Data accumulation
and utilization procedures are then discussed, followed by a discussion
of theory for estimating expenditure and revenue changes. The chapter
concludes with an example of estimation procedures.

The Input-Output Model

Input-output (I/O) analysis is a flexible, analytical tool used
to study the structure of economic systems--the way the component parts
of an economy interact. Direct plus indirect changes in regional in-
come and/or employment resulting from policy induced changes in final
demand sales of a particular sector or sectors may be estimated with
input-output analysis. There has been a rapid growth of small area I/O

10

studies in recent years and there are many areas and communities which have I/O models available. The models can be very beneficial for local fiscal planning.

The I/O model consists of three basic components: a transactions or flow table, a set of direct (sometimes called technical) coefficients, and direct-indirect (sometimes called interdependence) coefficients. The transactions table is the base of the model--the coefficients are derived from it. The transactions table shows the sales of goods and services by firms in each of a region's endogenous sectors made to other endogenous sectors (including itself) as inputs for further production, or as being made to the final demand sector. In other words, the production of each sector is used within the sector, purchased by other sectors, or purchased for final demand by consumers.

To illustrate, consider a model having three highly aggregated producing sectors (1, 2, and 3) with toal sales of X_1, X_2, and X_3 respectively, and a single final demand sector Y. Total primary inputs, X_4, are supplied to the region's industries by exogenous sectors, those which do not take part in secondary business transactions within the region. The relationships among sectors are shown in equation (2.1).

$$X_1 = X_{11} + X_{12} + X_{13} + Y_1$$

$$X_2 = X_{21} + X_{22} + X_{23} + Y_2$$

$$X_3 = X_{31} + X_{32} + X_{33} + Y_3 \qquad (2.1)$$

$$X_4 = X_{41} + X_{42} + X_{44} + Y_4$$

The first row, for example, indicates the distribution of sector 1's total output (X_1) to producing sectors 1, 2 and 3, for further processing and to final demand. That is, sector 1 sells to itself amount X_{11}, and sells X_{12} and X_{13} to sectors 2 and 3 for further processing. Sector 1 also sells Y_1 to final demand. Reading down the center columns indicates the amount of input purchased by column sector j from row sector i. For all producing sectors, total output sales (X_i) equal total input purchases (X_j).

Direct coefficients indicate the input requirements per unit of output for a given sector. Direct coefficients pertain only to processing sectors and are computed for only the columns of the purchasing sectors. Calculation of the coefficients consists of dividing all the entries in each industry's column by the total output for that sector (Xij/Xj), and by convention, are labeled a_{ij}.

In matrix notation, the interindustry model is formulated as:

$$X = AX + Y \tag{2.2}$$

where:

A = matrix of direct coefficients

Y = vector of final demand

X = vector of total output.

Thus, the total output used by processing sectors (AX) plus that sold to final demand sectors (Y) equals the total output produced in the system (X).

While the direct or technical coefficients indicate the "first round" effect of a change in final demand in a given sector, they do not represent the total addition to output resulting from additional sales to final demand. An increase in final demand will lead to both direct and indirect increases in output.

Direct-indirect (interdependence) coefficients indicate the total change in regional output generated by a one unit change in final demand of a given sector. The table of direct-indirect coefficients is the inverse of the difference between an identity matrix and the matrix of direct coefficients. Thus, from (2.3) the model is formulated as follows:

$$X = (I-A)^{-1}Y \qquad\qquad (2.3)$$

where:

I = identity matrix

$(I-A)^{-1}$ = the direct-indirect requirements matrix.

Once a general solution or table of direct-indirect coefficients has been obtained, various predictive devices, including income, output, and employment multipliers, can be computed and the model used for a variety of analytical purposes. Any particular element of the $(I-A)^{-1}$ matrix shows the total direct plus indirect amount of inputs from row sector i required to produce one more unit of output from column sector j for sales to final demand. The sum of these elements of the jth producing sector over the i input supply sectors is the

sector multiplier (Mj). Thus, Mj shows the total change in regional

output (ΔXr) associated with a one unit change in final demand sales

from sector j, (ΔYj):

$$Mj = \frac{\Delta Xr}{\Delta Yj} \qquad\qquad (2.4)$$

Input-output analysis is one of the economist's most powerful

tools for regional economic studies. This method of analysis does,

however, include several assumptions which are recognized to be depar-

tures from real world conditions. These include: linear and constant

coefficients, the equality of average and marginal coefficients, and

lack of input or output substitution.

From-To Analysis

Kalter (1969) and Levin (1961) compared from-to analysis and

input-output analysis and their results have been summarized by Tweeten

and Brinkman (1976). From-to analysis, a variation of I/O analysis,

emphasizes exports from the given area to another as the source of

growth and as the base of the given area's economy. Unlike the I/O

model, the from-to model requires no information on the amount of in-

puts purchased by the endogenous industries from the exogenous or

"primary inputs" sector. One major advantage of this is that data re-

quirements are greatly reduced. The only information needed is the

amount and to whom the firms sold their products. The transactions

table thus shows input flows between the endogenous sectors and sales

to final demand. This information is sufficient to compute needed

multipliers. The principle disadvantage of from-to analysis is that

the cross-checking mechanism found in the I/O model is precluded. In the I/O model, row totals equal column totals, but in from-to analysis, the omission of primary input purchases precludes this check. However, the assumptions of the from-to model are no less realistic than those of the I/O model, and nearly all the analytic power of an I/O model is retained.

Baskett From-To Model

This research utilizes a from-to model estimated by Baskett. The overall objective of the Baskett research was to determine the impact of public land management policies upon employment within five local areas of the Salt-Verde Basin in Arizona. A from-to model based on primary data was used because primary data of from-to analysis were fewer and are less costly and time consuming to collect and, several of the more specific objectives of the research simply could not be met with secondary data or previously published input-output coefficients. For example, with some additions and refinements, estimates were made of the impacts on the number and distribution of jobs created (1) as the length of run changed, (2) by skill level, (3) as industries changed technologies and rates of plant use, and (4) by season.

The transactions table and resulting technical coefficients for a from-to model may be specified in physical or monetary terms. The Baskett model was specified in employment terms for two reasons. First, the study objectives were to determine the impacts of alternative policies on employment opportunities. Second, data on the dollar value of a company's sales are often difficult to obtain, in that they

are considered confidential. Thus, each firm was asked to specify the percent of its total sales going to each sector, and the firm's total employment. From these data, an employment transactions matrix and employment technical coefficients were developed.

Technical coefficients and final demand column vectors were used to develop four types of multipliers: sectoral multipliers, and very short run, short run, and long run final demand multipliers. From these multipliers employment elasticities were developed. Elasticity of employment shows the percentage change in a local area's total employment resulting from a one percent change in sales to final demand for a particular sector.[3]

Employment and Income Data and Calculations

Initial employment and income distribution statistics for the Flagstaff Trade Area were computed primarily from data developed by Baskett. Baskett obtained primary data on the number of professional, skilled, semi-skilled, and unskilled employees in each industry from a

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[3]Ayer and Baskett (1978), in comparing multipliers and elasticities, found that while the multiplier has been the principle policy statistic, elasticities are often easier to employ because they are used with more readily available and comprehended data. Also, elasticities better represent a sector's relative importance by accounting for both multiplier impacts and sector size.

stratified sample of firms in the region.[4] From these data the propor-

tion of each sector's total employment in each skill level was

calculated (Appendix Table A-1). Multiplying the percentage of each

sector's employment in the various skill levels by each sector's annual

average employment (Appendix Table A-2) yields total employment by

skill level for the Area (Appendix Table A-3). Skill level groups were

then converted to income groups for the purpose of examining income

distribution changes (Table 3).

Estimates of policy induced changes in employment by skill

level are made with employment elasticities by skill level (E_{SL}) listed

by Baskett (Table 4). Skill level employment elasticities show the

percentage change in area employment of a particular skill level

brought about by a one percent change in sales to final demand from a

given sector. Sectors of concern in this study include the endogenous

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[4]Those in the "professional" skill level include: administrative and technical workers, owners, managers, accountants, architects, engineers, doctors, lawyers, registered nurses, health technicians, teachers, writers, etc.

Those in the "skilled" category include: craftsmen, foremen, machinists, bakers, bricklayers, carpenters, mechanics and repairmen, plumbers and pipe fitters, tailors, upholsterers, precision machine operators, sawyers, skilled secretarial, real estate appraisers, insurance examiners and adjusters, etc.

Those in the "semi-skilled" category are: salesworkers, clerical, bookkeepers, office machine operators, ticket agents, stock clerks, telegraph operators, weighers, cooks, truck drivers, construction, electrical and machine apprentices, etc.

Those in the "unskilled" category are: waitresses, laborers, carpenter's helpers, construction laborers, stock handlers, lumbermen, woodchoppers, vehicle washers and equipment cleaners, freight material handlers, garbage collectors, etc.

Table 3. Income by Skill Level, Flagstaff Trade Area, 1973

Skill Level	1969 Median[a] Income ($)	1973 Median[b] Income ($)
Professional	9,329	12,168
Skilled	7,625	10,184
Semi-skilled	6,733	9,560
Unskilled	4,901	6,381

[a]The only available data on income by skill level was from the 1970 census. Listed were median earnings in 1969 of persons in the experienced civilian labor force for selected skill level groups by county. The income figures include the Indian Reservations. There are really no suitable data available to properly separate on-and-off reservation economic conditions.

[b]The 1969 income figures were inflated to reflect 1973 dollars utilizing an index from Weekly and Hourly Earnings Data from the Current Population Survey, Special Labor Force Report 195, U.S. Department of Labor, Bureau of Labor Statistics, 1977a.

Table 4. Elasticity of Employment by Skill Level and Sector, Flagstaff Trade Area, 1973[a]

| Policy Affected Export Final Demand Sector | Skill Level | | | |
	Professional	Skilled	Semi-skilled	Unskilled
Beef Cattle Production	.0028	.0042	.0083	.0038
Lumber, Wood Products	.0135	.0204	.0292	.0499
Tourists, Seasonal (C)[b]	.0677	.0497	.1051	.1225

[a]Elasticities by skill level show the percentage change in area employment of a particular skill level brought about by a one percent change in sales to final demand by the beef cattle and lumber-wood products sectors. For the tourist sector, the elasticities show the percentage change in area employment of a particular skill level induced by a one percent change in sales from various sectors to tourists. For example, if tourist expenditures increase by one percent, total area employment of semi-skilled persons will increase by .1051 percent.

[b](C) represents consumption expenditures.

beef cattle and lumber-wood products sectors and a sector representing

consumption expenditures by seasonal tourists. Elasticities for the

latter sector show the percentage change in employment induced by a one

percent change in purchases from a variety of sectors by tourists.

The procedure for calculating the change in employment for a

given skill level ($\Delta Empl_{SL}$) resulting from an N percent change in final

demand sales is: E_{SL} (Area Employment)/N = $\Delta Empl_{SL}$. Because skill

level groups also represent income groups, changes in income distribu-

tion from the employment change calculations are directly implied.

Revenue and Expenditure Data and Procedures

Data for revenues and expenditures of Coconino County were

acquired from the Board of Supervisors of Coconino County, "Adopted

Budget for the Fiscal Year 1973-1974." Table 5 shows the most important

budget items.

The assessment of changes in sales tax revenues requires that

certain basic assumptions be made regarding consumption patterns.

Initially, it is assumed that increases in unemployment in the Area

will lead to a decline in incomes and consumption levels and subse-

quently, sales tax revenues. Thus, to estimate the decline in sales

tax revenues, the decline in consumption must first be estimated.

Friedman (1957) hypothesized that consumption is not based on

current income, but rather on what the household considers to be its

future expected income. He calls this expected future income the

household's permanent income. Accordingly, a short-run decline in

Table 5.   Summary of Revenues and Expenditures, Coconino County, 1973

Revenues

Source	($)
Revenue sharing programs	
state and local fiscal assistant act of 1972	599,445
national forest acts	407,322
State government	
privilege sales taxes	1,889,642
5¢ state motor vehicle fuel tax	538,750
2¢ " " " " "	266,841
7¢ state use fuel tax (diesel)	212,540
sub total	3,914,540
All other sources (other than property taxation)	836,193
sub total	4,750,733
Property taxes	14,963,345
total	19,714,078

Expenditures

Elementary schools	8,674,059
High schools	5,189,101
sub total	13,863,160
All other expenditures	5,850,918
total	19,714,078

Source: Board of Supervisors of Coconino County, "Adopted Budget for the Fiscal Year 1973-1974."

income is not accompanied by a proportional decline in consumption.

Rather, the decline is at a lesser rate, along some short-run consumption function (Figure 2). The theory suggests that the consumer plans

his expenditures not on the basis of the income received during the
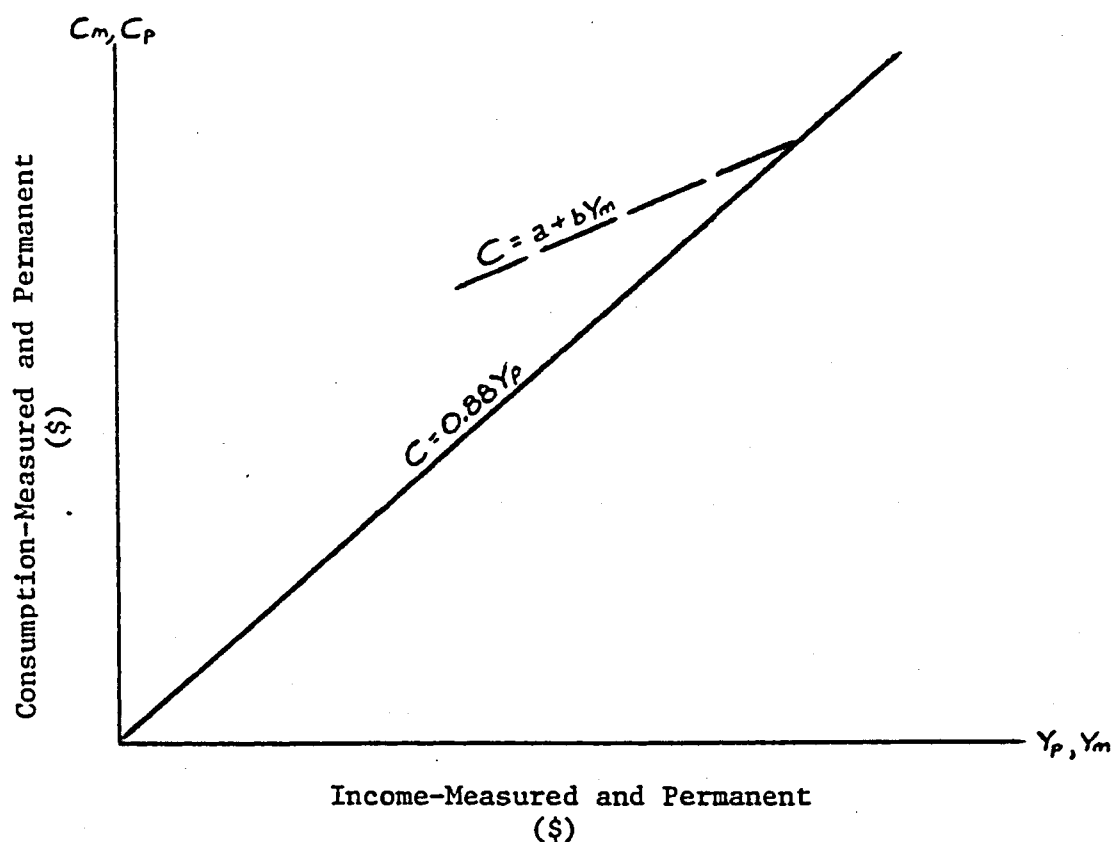
Figure 2. The Effect of a Fall in Measured Income Upon Consumption
          When Consumption is a Function of Permanent Income

Source: Glahe, (1973, p. 87).

current period but rather on the basis of his long-run income expectations. A substantial literature has appeared since the late 1950's

testing or making use of the permanent income or life cycle theories

(Ferber, 1978). As Evans (1969, p. 34) indicates:

> Without making final judgment on whether the strict terms of
> the permanent income hypothesis all hold, it can be fairly said
> that the weight of evidence supports this theory . . . . Fried-
> man's formulation has reshaped and redirected much of the
> research on the consumption function. It is unusual today to
> discuss the consumption function without referring to Friedman's
> terms of reference.

Past studies have rendered support for the permanent income

hypothesis (Lee, 1964; R. E. Smith, 1962). Information from previous

studies suggests that even though unemployed and facing a current de-

cline in income, people will continue to need and purchase necessary

non-durables (e.g., food, shelter, utilities, etc.). This information

implies that if there is to be any significant decline in sales tax

revenues, it will result from a decline in household purchases of dura-

ble goods (automobiles, major appliances, furniture, etc.).

Data on average annual commodity expenditures, by family in-

comes before taxes, were obtained from a report by the Bureau of Labor

Statistics (1977b). It is assumed that expenditure levels and trends in

the study area are similar to those nationally. Table 6 shows average

annual expenditures for various consumer durables by skill level (occu-

pational or income group) for the Flagstaff Trade Area in 1973.

Impacts on property tax revenues and demand for public goods

and services are evaluated based on model estimates of population and

sales changes as well as personal discussions with local government

representatives.

Table 6. Average Annual Per Capita Expenditures on Consumer Durables by Skill Level (Income Group), Flagstaff Trade Area, 1973[a]

Skill Level and 1973 Income	Household Purchases[b] ($)	Vehicle Purchases ($)
Professional ($12,168)	640	1,145
Skilled ($10,184)	402	816
Semi-skilled ($9,560)	286	549
Unskilled ($6,381)	137	229

[a]Expenditure figures are weighted averages which represent the amount spent in the study area. See Appendix B for computations.

[b]Includes furniture, household textiles and floor coverings, small and major appliances, and housewares.

Source: Bureau of Labor Statistics, 1977b.

Summary of Estimation Procedures

Estimates of changes in employment, income distribution, and sales tax revenues induced by one of the policies are made as follows:

1. Estimates of changes in employment, by skill level, induced by the policy are made utilizing skill level employment elasticities developed by Baskett.

2. Estimates of income distribution changes induced by the policy are derived directly from the employment change computations as skill level groups also represent income groups.

3. Estimates of changes in sales tax revenues induced by the policy are made in the following manner:

   a. Average annual per capita expenditures on consumer durables, by skill level, are calculated (Table 6).

   b. Estimates of changes in sales of consumer durables are obtained by multiplying expenditure estimates (from a.) by the number of persons in each skill level unemployed as a result of the policy.

   c. The estimate of the reduction in sales tax revenues is computed by multiplying the estimated decline in sales (from b.) by the sales tax rate (.04).

Changes in property tax revenues are estimated from estimated changes in population and sales in the area. For example, should a policy induce substantial unemployment and in turn cause people to leave the area changes in the residential property tax base would be likely to occur. Also, significant declines in area employment and

population would cause local business's sales to decline, causing firms to reduce capital investments and thus result in a declining commercial property tax base.

Finally, policy induced impacts on the demand for local public goods and services are evaluated based on model estimates of changes in population (employment), sales and property tax revenues, the nature and characteristics of public goods, and personal discussions with local government representatives.

CHAPTER 3

RESULTS OF THE ANALYSIS

In this chapter, the estimated impacts on employment, income

distribution, supply of revenues and demand for public goods and serv-

ices, induced by those U.S. Forest Service policies which will affect

local key industries (as outlined in Chapter 1) are presented.

Initially, impacts are examined on a policy-by-policy basis. The over-

all, net impacts of all three policies in conjunction are then

examined.

Timber Policy Impacts

Table 7 shows the estimated impacts on employment and income

distribution as a result of a 10% reduction in allowable timber cut

from the area's national forest lands.

The impact of the timber policy is regressive. Substantially

more low income individuals lose their jobs than those with higher in-

comes. Forty-four percent of the unemployment induced by the timber

policy is in the lowest income group (unskilled). The lower two income

groups account for 70% of induced unemployment.

Changes in the major sources of local government revenue (out-

lined in Table 5) are also induced by the timber policy. The two

major subdivisions of tax revenues are non-property tax revenues and

property tax revenues. Non-property tax revenues are examined first.

27

Table 7. Initial Employment and Direct Plus Indirect Change in Employ-
          ment and Income Distribution Induced by 10 Percent Decrease
          in Allowable Timber Cut, Flagstaff Trade Area, 1973

Skill Level and 1973 Income	Number of Initial "Person Years" Employment	Number of Change in Employment
Professional ($12,168)	1,846	-13
Skilled ($10,184)	1,861	-19
Semi-skilled ($9,560)	2,945	-28
Unskilled ($6,381)	2,885	-48
Total	9,537	-108

We begin with an examination of revenues received in Coconino County from sources other than property taxation. These non-property tax sources include: (1) State and Local Fiscal Assistance Act of 1972, (2) National Forest Acts, and (3) Sales Tax Revenues.

Revenues received from the State and Local Fiscal Assistance Act of 1972 represent 12.6% of the $4.75 million collected from non-property tax revenue sources. This allocation is based on a highly complicated system of computations. The determination of exact amounts of these allocations requires over 300,000 pieces of demographic and taxation data as well as complex data handling procedures. These procedures and data are not generally available. The Office of Revenue Sharing states that preparation of estimates of revenue sharing allocations by local governments is risky and that any such estimates should be used with great caution. In a conversation with the Coconino County Manager (Smith 1978) it was learned that these allocations have changed very little over the past five years, and he felt the policies considered here would not affect these allocations. Therefore, this study assumes no change in these allocations as a result of the posited U.S. Forest Service policy changes.

The $407,322 allocated under the National Forest Acts represents 8.6% of all non-property tax revenues. This money is paid, in lieu of property taxes, to counties which have national forests within their boundaries. Allocation of these funds within the county is to the public schools and roads on a fifty-fifty basis.

Table 8 shows annual collections on the Coconino National

Forest for the National Forests Fund, by resource class, for fiscal

year 1977. Based on these data and information received from the Ad-

ministrative Officer for the Coconino National Forest (Couch, 1978)

regarding past and present collections, it is estimated that approxi-

mately 90% of the total base for the payments to the county is derived

from timber sales.[5] It is estimated that, as a result of the 10%

reduction in allowable timber cut, National Forests Fund revenues to

Coconino County will decline by approximately $36,660 (407,322 x .9 x

.1 = 36,660).

Estimates of changes in sales tax revenues induced by the

timber policy are calculated utilizing methods previously described

(Chapter 2). Expenditure decline estimates are shown in Table 9.

As a result of these expenditure declines it is estimated that

the total sales tax revenue decline resulting from the timber policy is

$3,492. This amount represents only about two-tenths of one percent of

the total sales tax revenues for Coconino County in fiscal year 1972-73.

Attention is now focused on the largest producer of revenues,

property taxes. Property tax revenues in Coconino County in fiscal

year 1972-73 totaled $14,963,345. Conversations with the Coconino

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[5]Timber sales revenues are a result of both direct and indirect
costs to timber purchasers. Direct costs are simply the stumpage fees
paid for the timber. Indirect costs are those charged for reforesta-
tion and timber stand improvements under the Knutson-Vanderberg Act and
purchaser credits paid to counties for road construction. Thus, the
proportion of revenues from timber on the Coconino National Forest in
1977 is (13,073,701 + 3,824,043 + 1,192,614) ÷ 20,763,543 = .87. (See
Table 8.)

Table 8. Annual Collection Statement, National Forests Fund, Coconino National Forest and Totals from All National Forests in Arizona, by Resource Class, Fiscal Year 1977

Resource Class	Coconino National Forest ($)	Arizona ($)
Timber	4,759,559	13,073,701
Land Use	39,069	135,767
Recreation (Undesignated areas)	20,716	221,745
Power	4,953	32,909
Minerals	(9,216)[a]	12,741
Admission and User Fees (Designated areas)	77,473	261,042
Grazing	201,757	2,008,981
Total NFF	5,094,312	15,746,886
Knutsen-Vandenberg	1,752,904	3,824,043
Purchaser Credits	437,047	1,192,614
Total Base for Payments[b]	7,283,452	20,763,543

[a]In this particular year, the deficit in the "Minerals Resource Class" is shown due to an accounting error from a previous year.

[b]Counties receive 25% of revenues earned from National Forests within their boundaries.

Source: Coconino National Forest Supervisors Office (FSM 6531.12b), 1977.

32

Table 9. Total Decline in Expenditures on Consumer Durables Induced by Timber Cut Policy, by Skill Level (Income Group), Flagstaff Trade Area, 1973

Skill Level and 1973 Income	Expenditure Decline in Household Durables[a] ($)	Expenditure Decline in Vehicle Purchases ($)
Professional ($12,168)	8,318	14,890
Skilled ($10,184)	7,636	15,511
Semi-skilled ($9,560)	8,017	15,370
Unskilled ($6,381)	6,575	10,989
Total	30,545	56,759

[a]Includes furniture, household textiles and floor coverings, small and major appliances, and housewares.

County Manager suggest that 60% of all property tax revenues come from the railroads and public utility companies (Santa Fe, El Paso Natural Gas, Arizona Public Service, etc.). The remaining 40% come from residential (20%) and commercial (20%) properties.

The timber policy would not cause any significant (if any) change in capital investment by railroads and public utilities, and therefore no change in this portion of the property tax base is perceived. While the timber policy does cause a loss of sales in the area, this loss is not large. Further, the from-to model indicates the losses are distributed relatively evenly among the business in the area and therefore will not greatly affect any one business. Accordingly, in the short run, no significant reduction in capital investments affecting the property tax base (land, buildings, etc.) are projected. Finally, with respect to the impact of the timber policy on the residential property tax base, while no short-run change is likely, there is of course the possibility of a long-run change. However, from the preceding analysis we know that the majority of individuals which might leave the area (and their homes) as a result of long-run unemployment are those in the lower income groups. Thus, the loss of property tax revenues incurred would be from the lowest revenue producing properties.

No major changes are expected in either the demand for government provided goods and services or the ability of local government units to provide them as a result of the timber policy. There exists, however, the possibility of long-run impacts on local school districts. An examination of the itemized summary of expenditures (Table 10) shows

Table 10. Summary of Expenditures, Coconino County, Fiscal Year
1973-74

Fund and/or Department	Adopted Budget Last Year ($)	Actual Expenditures Last Year ($)	Adopted Budget This Year ($)
General Fund:			
Assessor	105,293	104,547	111,784
Attorney	105,469	112,181	115,896
Board of Supervisors	157,872	109,508	150,346
County Buildings and Grounds	122,967	135,087	155,508
Hospital	0	0	0
Clerk of Superior Court	48,923	52,149	54,490
Data Processing	0	0	0
Emergency Service	23,000	16,961	23,970
Justice Courts	121,932	142,400	141,588
Parks and Recreation	0	0	0
Planning and Zoning	47,191	49,081	49,434
Recorder	36,710	36,160	40,484
Sanitary Land Fill	0	0	0
School Superintendent	46,038	49,803	51,316
Sheriff	511,920	539,846	565,133
Superior Courts	151,372	151,271	147,816
Treasurer	42,038	40,043	43,760
Medical Investigator	640,628	540,402	651,381
Juvenile	98,880	91,744	120,502
Miscellaneous	323,063	299,551	310,259
SUBTOTAL	2,584,024	2,470,734	2,733,667

Table 10. (Continued)

Fund and/or Department	Adopted Budget Last Year ($)	Actual Expenditures Last Year ($)	Adopted Budget This Year ($)
Special General Fund:			
Elections	55,000	56,729	28,944
Voter Registration	0	0	0
Retirement and Social Security	147,000	166,654	191,000
Junior College	75,000	64,142	75,000
SUBTOTAL	277,000	287,525	294,944
Road Fund:			
Highway Department	657,400	626,449	723,805
Bond Fund:			
Interest	0	0	0
Redemptions	0	0	0
SUBTOTAL	0	0	0
Public Works:			
Highway Department	400,000	228,657	440,000
Construction and Improvement	514,363	514,372	450,000
Parks and Recreation	55,216	38,069	62,286
Landfill	500,000	40,025	100,000
SUBTOTAL	1,019,579	821,123	1,052,286
Auto License Plate Fund	72,169	80,823	86,655
Rabies Control	0	0	0
Teacher's Retirement	835,614	834,007	1,118,424
Aid to County Schools	213,177	222,910	220,351
Health Services	0	0	0
Vital Statistics	0	0	0

Table 10. (Continued)

Fund and/or Department	Adopted Budget Last Year ($)	Actual Expenditures Last Year ($)	Adopted Budget This Year ($)
Air Pollution	0	0	0
Federal Revenue Sharing	207,800	207,800	1,079,492
2¢ Motor Fuel Tax	300,000	299,547	330,000
SUBTOTAL	6,166,763	5,850,918	7,639,624
Public Schools:			
Total Elementary	8,962,797	8,674,059	10,299,024
Total High Schools	5,381,251	5,189,101	6,366,333
Total Elementary and High Schools	14,344,048	13,863,160	16,665,357
TOTAL	20,510,811	19,714,078	24,304,981

Source: Board of Supervisors of Coconino County, "Adopted Budget for Fiscal Year 1973-74."

the largest single expenditure item to be the public schools system.

A related item, though listed as a separate expenditure, is the

$834,000 for the Teacher's Retirement Fund. Should the unemployment

induced by the timber policy create a long-run situation where those

unemployed are forced to leave the area, then the long-run impact on

the public school system would be greatest on the low income school

districts as the majority of those becoming unemployed are lower income

persons. Thus, lower income school districts would be confronted with

declining enrollments and fewer teachers required. Changes in other

expenditure items, such as public works funds, are expected to be

marginal as indicated by model estimates of population changes and con-

versations with local government representatives (Smith, 1978; Weidman,

1977, 1978) about resulting changes in these expenditures.

Rangeland Policy Impacts

The estimated impacts on employment and income distribution re-

sulting from a 20% reduction in the number of animal unit allotments on

the area's national forest grazing lands are shown in Table 11.

The greatest impact of the range policy is upon those individu-

als in the "semi-skilled" income group. Approximately 64% of those

unemployed as a result of the range policy are from the lowest two in-

come groups. As in the case of the timber policy, employment in the

highest income group is least affected. The key feature of the employ-

ment impact of this policy is, however, that total employment is hardly

affected.

Table 11. Initial Employment and Direct Plus Indirect Change in
Employment and Income Distribution Induced by 20 Percent
Decrease in Animal Units, Flagstaff Trade Area, 1973

Skill Level and 1973 Income	Number of Initial "Person Years" Employment	Number of Change in Employment
Professional ($12,168)	1,846	-5
Skilled ($10,184)	1,861	-8
Semi-skilled ($9,560)	2,945	-16
Unskilled ($6,381)	2,885	-7
Total	9,537	-37

Major sources of non-property tax revenues which may be affected by the rangeland policy are: (1) National Forests Acts, and (2) Sales Tax Revenues. Collections from grazing on the Coconino National Forest represent only 3% of the total base for payments to the county. The decline in National Forest Fund revenues induced by the expected range policy (20% reduction in AU's) is estimated to be only $2,444 (407,322 x .03 x .2 = $2,444).

Results of expenditure and sales tax revenue declines are shown in Table 12. The estimated loss in sales tax revenues induced by a 20% reduction in number of animal units on the area's national forests is negligible, representing less than one-tenth of one percent of total sales tax revenues collected in Coconino County in fiscal year 1972-73.

No short-run change in property tax revenues is expected and any long-run change is expected to be quite small.

The previous discussion of the impacts of the timber policy on the demand for and supply of public goods and services holds true for the range policy also. Once again, rather than generating a situation of significant change in demand or ability to provide, the policy is relatively neutral in this regard.

Recreation Policy Impacts

Estimated impacts on employment and income distribution result-ing from a recreation policy which increases recreation activity by 10 percent are shown in Table 13. Total area employment increases

Table 12. Total Decline in Expenditures on Consumer Durables and Sales
Tax Revenues Decline Induced by Rangeland Policy, by Skill
Level (Income Group), Flagstaff Trade Area, 1973

Skill Level and 1973 Income	Consumer Durables Expenditure Decline	Sales Tax Revenue Decline
Professional ($12,168)	-8,926	-357
Skilled ($10,184)	-9,746	-390
Semi-skilled ($9,560)	-13,364	-535
Unskilled ($6,381)	-2,561	-102
Total	-34,597	-1,384

Table 13. Initial Employment and Direct Plus Indirect Change in
Employment and Income Distribution Induced by 10 Percent
Increase in Recreation, by Skill Level (Income Group),
Flagstaff Trade Area, 1973

Skill Level and 1973 Income	Number of Initial "Person Years" Employment	Number of Change in Employment
Professional ($12,168)	1,846	65
Skilled ($10,184)	1,861	47
Semi-skilled ($9,560)	2,945	100
Unskilled ($6,381)	2,885	117
Total	9,537	329

substantially. Once again the greatest impact is on those in the lower income groups. But, in this case, it is a positive one.

The increases in employment are expected to lead to associated increases in income, consumption, and in turn, sales tax revenues. As before, weighted average annual expenditures (in this case total expenditures for both durable and non-durable goods) are calculated, by income group. From these, sales tax revenue changes are computed. The results, excluding fuel tax revenues, are shown in Table 14.

The inpact on sales tax revenues to the county, resulting from the Forest Service's policy to increase recreational opportunities (and thus tourism), is both positive and fairly significant. The increase in sales tax revenues represents an increase of approximately 5.5% of the total sales tax revenues for fiscal year 1972-73.

Increased tourist activity in the area will result in an increase in gasoline sales and motor vehicle fuel tax revenues. Estimates of increases in motor vehicle fuel tax revenues are shown in Table 15. The estimated increase of $14,006 represents an increase in non-diesel fuel tax revenues of approximately 1.7 percent.

In contrast to the estimated negligible impact of the timber and range policies on property tax revenues, it is conceivable that the increases in sales from the recreation policy would encourage capital investment by businesses and thus increase the commercial property tax base.

A study by Hirsch (1964) designed to estimate effects of local industrialization and growth on employment, income, and net fiscal

Table 14. Total Increase in Consumption Expenditures and Sales Tax
Revenues Induced by Recreation Policy, by Skill Level
(Income Group), Flagstaff Trade Area, 1973

Skill Level and 1973 Income	Consumption Expenditures[a] Increase ($)	Sales Tax Revenue Increase ($)
Professional ($12,168)	747,083	29,883
Skilled ($10,184)	373,201	15,928
Semi-skilled ($9,560)	618,466	24,739
Unskilled ($6,381)	427,492	17,100
Total	1,866,243	86,650

[a]Consumption expenditures exclude personal insurance, gifts
and contributions, and gasoline purchases.

Table 15. Average Annual Per Capita Gasoline Consumption and Estimates
of Increases in Motor Vehicle Fuel Tax Revenues ·Induced by
Recreation Policy, by Skill Level (Income Group), Flagstaff
Trade Area, 1973

Skill Level and 1973 Income	Average Annual[a] Gasoline Consumption (Gallons)	Motor Vehicle Fuel Tax Revenues Increase[b] ($)
Professional ($12,168)	1,036.6	4,717
Skilled ($10,184)	822.1	2,705
Semi-skilled ($9,560)	606.4	4,245
Unskilled ($6,381)	285.7	2,340
Total	2,749.8	14,006

[a]See Appendix B for the method of calculation.

[b]Fuel tax revenue changes are computed for non-diesel fuels
only.

resources showed significant positive changes in commercial property tax revenues. In the Hirsch study capital-output coefficients were utilized to yield estimates of changes in the property tax base.

In the Baskett research, area businesses were asked to estimate investment changes resulting from various levels (10, 25, 50, and 100%) of sales increases. From the response data, capital-to-sales ratios were derived. The ratios for the 10% increase were near 1.0, indicating that for a 10% increase in sales, capital investments are expected to increase by 10%.

As previously shown, Table 14, total sales increases induced by the recreation policy amounted to $1,866,243. Retail sales in Coconino County in 1973 totaled $189,134,000 (Valley National Bank, 1974). Thus, the retail sales increase is approximately one percent. The estimated change in commercial property tax revenues, induced by the recreation policy is estimated to be $29,927 (14,963,345 x .2 x .01 = 29,927).[6]

Any change in capital investments which affect the property tax base would, by definition, be a long-run occurrence. Also, relative to the $14.9 million in 1973 property tax revenues, an increase of $30 thousand is minute.

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[6]This figure is somewhat overestimated because not all additional capital investments caused by the sales increases will be included in the property tax base. However, this overestimation is partially offset by the fact that the retail sales figure is for the entire county. Thus, the percentage increase in sales would be somewhat larger were there data available on a Flagstaff Trade Area basis.

With the influx of seasonal residents and tourists, additional garbage collection services and police and fire protection may be required. However, conversations with representatives of NACOG and the Coconino County Manager's Office provided information to the contrary. In part, the apparent lack of government response to a change in the demand for government goods and services arises because of the characteristics of public goods (Herber, 1975; Hirsch, 1970). Public goods are jointly consumed and are nonexcludable. Nonexcludability often implies that public, instead of private, institutions must supply these goods. The characteristic of joint consumption means that consumption by one person does not preclude consumption by another. Thus, once such goods are provided by the government sector, additional consumers may enjoy the benefits of these goods without increasing the total cost of government provision. The cost and availability of many services does not change with marginal changes in population (demand).

Combined Policy Impacts

The estimated impacts on employment and income distribution of the posited U.S. Forest Service policies are summarized in Table 16. The net effect of the policies is an overall increase in employment of 185 person years, 64% (118) of which are in the lower two income groups.

The beneficial aspects of the estimated increases in employment resulting from increased tourism in the Area should be viewed with caution. A 1977 report prepared by the Northern Arizona Council of Governments (NACOG) states (p. 7, 16), "35% of total employment in Coconino County is already related to tourism . . . further dependence on

Table 16. Initial Employment and Direct plus Indirect Change in Employment and Income Distribution Induced by Posited Forest-Rangeland Policies, Flagstaff Trade Area, 1973

Skill Level and 1973 Income	Initial "Person Years" Employment in the Area	Total Direct plus Indirect Change in Employment due to:			
		10% Decrease in Lumber-Wood Products	20% Decrease in Beef Cattle Production	10% Increase in Tourism	Net Change
Professional ($12,168)	1,846	-13	-5	65	47
Skilled ($10,184)	1,861	-19	-8	47	20
Semi-skilled ($9,560)	2,945	-28	-16	100	56
Unskilled ($6,381)	2,885	-48	-7	117	62
Total	9,537	-108	-36	+329	+185

tourism in Coconino County should be viewed as a mixed blessing." The blessing is considered mixed because tourism related employment is low paying and highly seasonal (Morgan, 1978; Weidman, 1977, 1978). This view holds that while the additional employment induced by the recreation policy would seemingly offset the low income unemployment caused by the timber and range policies, highly seasonal jobs are being created in place of permanent, year-round jobs. In support of this view Wycoff (1977, p. 17) notes, "The allocation of public lands to grazing or timber production may support a fairly large local population which generates economic activity on a year-round basis. Allocation for recreational purposes may result in a seasonal business activity with participants being non-residents."

However, many of the jobs which are directly related to the timber and beef-cattle production industries are highly seasonal themselves. For instance, much logging activity is prevented by winter climatic conditions and a number of "cowboy" jobs exist only during round-up periods. Thus, not all timber and range related employment can be considered as year-round.

Table 17 summarizes the changes in non-property and property tax revenues induced by the combined, expected Forest Service policies. The estimates show that no individual policy or any combination of policies will have much effect on total government revenues. The most pronounced revenue changes are caused by the recreation policy. Revenues are estimated to increase by $131,132 which represents only .7 percent of total government revenues in Coconino County in 1973. The

Table 17. Total Change in Government Revenues Induced by Posited U.S. Forest Service Policies,
          by Revenue Source, Flagstaff Trade Area, 1973

	Estimated Change in Revenues due to:			
Source of Revenue	10% Decline in Allowable Timber Cut ($)	20% Decline in Number of Animal Units ($)	10% Increase in Recreational Activities and Opportunities (Tourism) ($)	Net Change in Revenues ($)
National Forest Fees	-36,660	-2,444	550	-38,554
Motor Vehicle Fuel Tax	-4,185	-1,642	14,005	+8,178
Sales Tax Revenues	-3,492	-1,384	86,650	+81,774
Property Tax Revenues	0	0	29,927	+29,927
Total	-44,337	-5,470	131,132	+81,325

net result of the combined policies is an estimated increase of only

$81,325 in total government revenues, or an increase of only .4 percent

of the total.

Impacts of Policies Outside the Flagstaff Trade Area: A Comparison

In this section, a partial analysis is done of the impacts of

forest and range policies on a "more rural" area of East-central

Arizona. Impacts on employment and income distribution are analyzed.[7]

The area investigated includes the northern half of Graham and Greenlee

Counties, along with the lower, non-Indian Reservation portions of

Navaho and Apache Counties (Figure 3). The area is referred to here as

the White Mountain Area.

The White Mountain Area is similar to the Flagstaff Trade Area

in that lumber and wood products, beef cattle production, recreation

and tourism are major industries dependent on the timber and grassland

resources of the area's National Forests. The two areas contrast

sharply, however, in population, city size, and economic structure. A

summary of the number of local businesses and employment by type of

business is given in Table 18.

Estimated impacts on employment and income distribtuion of the

posited Forest Service policies are shown in Table 19. The estimates

indicate the greatest impacts occur as a result of the allowable timber

cut policy. This policy is regressive in that substantially more lower

_____

[7]A full analysis is precluded by data limitations. The region
analyzed coincides with Baskett's Local Area 1. Data acquisition is
extremely difficult because the area is bounded by National Forest,
Indian Reservation, and Ranger Districts, instead of county boundaries.
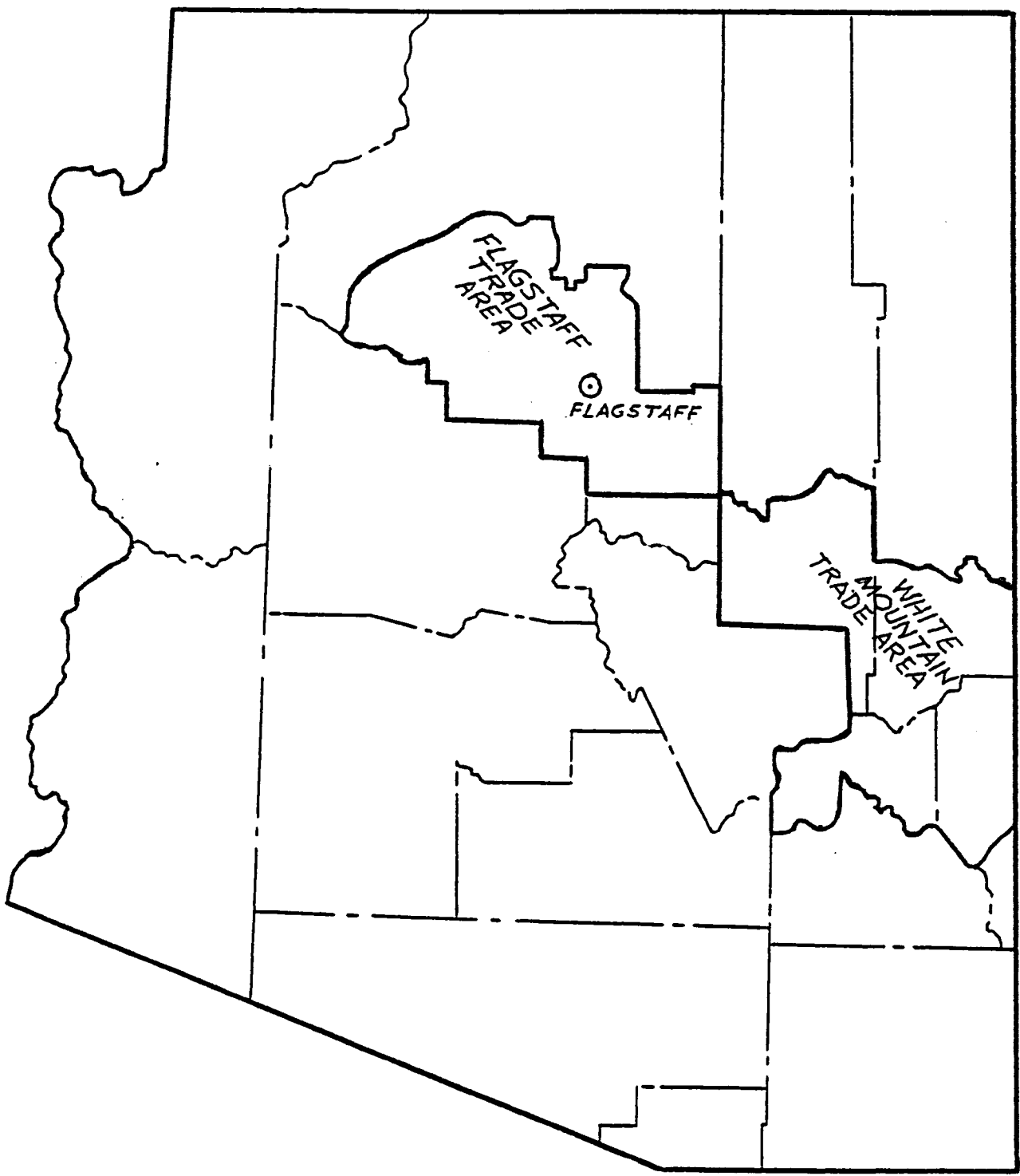
Figure 3.   White Mountain and Flagstaff Trade Areas

Table 18. Businesses and Employment by Type of Industry, White
            Mountain Area, 1973

Type of Business/Industry	Number of Businesses	Number Employed[a]
Retail and Wholesale Trade	346	1,694
Services	235	723
Manufacturing	8	30
Lumber-related Businesses	17	1,442
Agriculture	207	338
Construction	76	245
Mining	4	2,495
Transportation, Communication, and Public Utilities	27	332
Finance, Insurance, and Real Estate	65	201
Subtotal	985	7,500
Government[b]		2,704
Total		10,204

[a]Employment is average annual employment in 1973.

[b]Government employment total is an estimate based on the pro-
portion of government employment in all four counties included in the
area for the past 8 years (Valley National Bank, 1971-78). No demogra-
phic data available for the area as outlined, making even the simplest
estimates of policy induced impacts difficult.

Source: Baskett, 1976.

Table 19. Initial Employment and Direct Plus Indirect Change in Employment and Income Distribution Induced by Posited Forest-Rangeland Policies, White Mountain Area, 1973

Skill Level and 1973 Income[a]	Initial "Person Years" Employment in the Area	Total Direct Plus Indirect Change in Employment due to:			
		10% Decrease in Lumber-Wood Products	20% Decrease in Beef Cattle Production	10% Increase in Tourism	Net Change
Professional ($11,445)	1,274	-13	-15	22	-6
Skilled ($10,699)	1,559	-26	-12	19	-19
Semi-skilled ($9,389)	2,426	-33	-18	31	-20
Unskilled ($5,083)	2,241	-87	-15	26	-76
Total	7,500	-159	-60	98	-121

[a]Income figures are weighted averages for the four counties of which portions are included in the White Mountain Area.

income persons become unemployed as a result of the timber policy. Over
half of the unemployment induced by the timber policy occurs in the
"unskilled" income group.

In contrast to the impacts of the range and tourism policies
in the Flagstaff Trade Area, each of these two policies are quite neu-
tral with respect to income distribution in this area. The net effect
of the combined policies is substantially regressive. The increases
in employment resulting from the increase in tourism more than offsets
the decline in employment brought about by the rather large decrease in
animal units (beef cattle production); however, the increase in employ-
ment due to the recreation policy is not sufficient to offset the
combined negative employment impacts caused by the timber and range
policies.

This brief example illustrates the need for examination of the
impacts of national and/or large region oriented policies on sub-
region and local economies. The same policies have very different
impacts on local, sub-regions, depending upon the economic character of
the particular region.

CHAPTER 4

SUMMARY AND CONCLUSIONS

In many Western States, including Arizona, vast amounts of land

and resources are within National Forest boundaries. The economies of

many local communities are heavily dependent on the products (timber,

water, forage, wildlife, recreation) of the national forests. In areas

such as these, the wealth and income structure is inextricably tied to

the U.S. Forest Service policies allocating the use of the resources.

Forest Service policies regulating allowable timber cut, grazing allot-

ments, and recreational use alternatives can have significant impacts

on the economies of communities in these areas.

The following "mission statements" seem best to describe cur-

rent U.S. Forest Service policy emphasis in the Southwest: (U.S.

Forest Service, Southwestern Region, 1977, p. 1, 2)

> Provide for the preservation of scenic beauty and
> opportunity for citizens to enjoy it.
>
> Provide dispersed recreation opportunities in a natural
> setting.
>
> Provide for the sustained, moderate production of
> timber and forage with emphasis on rural community
> stability, job opportunity, and preservation of a
> lifestyle consistent with local cultural heritage.

Based upon these general policy criteria, current specific

legislative directives, and discussions with Forest Service officials,

three forest-rangeland policies likely to be implemented in the study

area in the near future were discerned. These policies would result

in: a 10 percent reduction in allowable timber cut, a 20 percent re-

duction in grazing allotments (animal units) and, a 10 percent increase

in recreation activities (tourism).

The first objective of this study was to estimate direct and

indirect employment and income distribution changes in the Flagstaff

Trade Area induced by the specific U.S. Forest Service policies. Elas-

ticities of employment derived from a "from-to model" of the area were

utilized in making these estimates.

The results indicate that the timber and range policies are

regressive in that substantially more lower income persons become unem-

ployed as a result of the forest and range policies. The policy

intended to increase recreational opportunities and activities (and

thus tourism) in the area is progressive in that substantially more

low income persons are employed than those in higher income groups.

The total unemployment (144 person years) induced by the timber and

range policies represents only 1.5% of total 1973 area employment. The

additional employment (329 person years) caused by the recreation

policy represents approximately a 3.5% increase. The net impact of the

combined policies is a 1.9% increase. This result does not mean that

individual displacement and hardship would not occur. The impact of

the policies on individual ranchers, in addition to individual employ-

ees in the timber and range industries, could be severe.

The second objective was to estimate the impact of the policies on the supply of local government revenues and the demand for the goods and services provided by units of the local government. Revenue sources which were examined for possible policy induced changes were selected on the basis of their relative importance in the total budget and the likelihood of being affected by the expected policies. Policy impacts on the various revenue sources were examined on a policy-by-policy basis followed by an analysis of the net effects of the policies in combination.

The results of the analysis are somewhat surprising. The reduction in revenues resulting from the timber and range policies is very slight, especially when compared to the budget as a whole. Non-property tax revenue declines induced by the timber and range policies represent only 1% of the total non-property tax revenues in Coconino County in fiscal year 1972-73. No foreseeable short-run change and very little, if any, long-run change in property tax revenues are expected as a result of the timber and range policies.

The impact of the expected Forest Service recreation policy on the supply of tax revenues is a bit more pronounced. It results in an increase in revenues from all sources examined. Two-thirds of the $131,132 increase in revenues induced by the recreation policy are from increased sales tax revenues. An increase in property tax revenues is obtained ($29,927) but, this increase would be a long-run occurrence. The remainder of the increase ($14,005) is due to an increase in gasoline tax revenues.

The net impact of all three policies combined is an overall increase in tax revenues to the county and Flagstaff Trade Area. The estimated increase of $81,325 is, however, quite small in comparison to the overall budget.

Estimates of impacts on the demand for public goods and services are slight. Neither the unemployment induced by the timber and range policies nor the additional employment resulting from the recreation policy is of sufficient magnitude to cause any significant change in the demand for public goods and services. The small changes in demand for public goods and services would not likely require changes in the supply of these goods. The very nature and characteristics of public goods lend support to this conclusion. Conventional marginal cost and pricing principles do not apply to public goods. Up to some point, additional goods and services can and are provided without the need for additional employees, equipment, and facilities.

The impacts of Forest Service policies will be different in areas of contrasting economic structure. To illustrate this point, a brief analysis of the impacts of the same Forest Service policies on another area in East-central Arizona was presented. In this second area the net effect of the combined policies was substantially regressive with respect to income distribution. Also, unlike the net employment impact in the Flagstaff Trade Area, the net effect on employment in this second area was an overall decline in area employment. The increase in employment induced by the recreation policy was not sufficient to offset the negative employment impacts caused by the

timber and range policies. The usefulness of this type of analysis is that it facilitates the comparison of the impacts of Forest Service policies in different areas. Out of these comparative analyses evolve different policy implications, especially at the local level.

Not only does this type of analysis facilitate the comparison of the impacts of a given policy on contrasting areas, but estimates of impacts of different policy changes are also readily obtained. For example, should policy changes other than those examined in this analysis be implemented, the impacts can easily be estimated. These impacts can be estimated by simply multiplying the impact of one or more of the policies analyzed in this study by the ratio of the alternative policy change to the already analyzed policy change. If the proposed policy is to decrease allowable timber cut by 25 percent instead of 10 percent, then the impact will be $25 \div 10 = 2.5$ times as great. Thus, the framework utilized in this study provides an important means of analyzing the impacts of different policy changes.

The third and final objective of this work was to draw policy implications from the analysis. The policy to reduce allowable timber cut by 10 percent causes the greatest negative impacts. This policy does not lend support to the stated goal of providing job opportunities in rural communities. The greatest hardships caused by the policy will fall on those most vulnerable--low income groups. Local and state government employment and welfare agencies may use these estimates in planning and provision of their services.

Reducing grazing allotments by 20 percent yields negative employment impacts but, these impacts are relatively slight. Of note is the finding that the unemployment which results from a relatively large decrease in beef cattle production is more than offset, in each income category, by the expected increase in tourism. These results have important policy implications in areas where ranching and recreation interests are in conflict.

The policy to increase area recreation activities and opportunities (and thus tourism) by 10% results in significant, positive employment and distributional impacts. The policy also generates increases in revenues to the local governments. This policy is compatible with stated Forest Service goals. More importantly, the policy aids in the mitigation of the negative effects generated by the timber and range policies.

The findings of the study suggest that the combination of policies will not adversely affect the economic well-being and stability of the Flagstaff Trade Area. Consequently, in this area, Forest Service policy goals are achieved. Such is not the case, however, in the White Mountain Area. In this case the overall impact of the policies is a net decrease in area employment. Thus, the area is faced with a declining economy as a result of the Forest Service policies. This situation would require some policy alteration if stated Forest Service goals are to be achieved. Or, at least planning agencies in the local area can be alerted and possibly aided in efforts to reduce negative impacts.

Efforts by the U.S. Forest Service to achieve stated goals will require continued, area-by-area, monitoring and evaluation of the impacts of National Forest policies on the communities and citizens dependent on the resources of our National Forests. The framework utilized in this study provides an important means of analysis.

APPENDIX A

EMPLOYMENT DATA

Table A-1. Employment Skill Level by Endogenous Sector, Flagstaff
Trade Area, 1973[a]

Sector Description	Professional	Skilled	Semi-skilled	Unskilled
1. Agr. products, services	.3920	.1959	.0529	.3592
2. Beef cattle production	.1104	.2353	.4994	.1550
3. Forest Operations	.2437	.6332	.1231	.0000
4. Copper mining	.0000	.0000	.0000	.0000
5. Other mining	.0000	.0000	.0000	.0000
6. Construction	.1364	.4653	.2576	.1407
7. Non-lumber Mfg.	.2708	.1833	.2511	.2947
8. Lumber, wood products	.0533	.1472	.2132	.5863
9. Public utilities	.1458	.5639	.1877	.1026
10. Trans., Comm.	.2658	.3338	.3513	.0492
11. Wholesale	.1910	.1174	.4768	.2148
12. Dept., variety stores	.1946	.0702	.5290	.2062
13. Restaurants, bars	.1282	.0482	.1903	.6333
14. Food stores	.1335	.0590	.6054	.2021
15. Furniture stores	.2738	.3466	.2754	.1041
16. Auto. sales, parts	.1701	.3612	.3588	.1099
17. Building materials	.1992	.1987	.4902	.1119
18. Gas. svc. stations	.1158	.1017	.3342	.4484
19. Clothing	.3752	.2398	.3610	.0239
20. Other retail	.3058	.2248	.4315	.0379
21. Banking, finance	.2055	.3867	.3413	.0664
22. Insurance	.3127	.5401	.1472	.0000
23. Real estate	.5103	.1234	.1782	.1882
24. Motels, lodging	.2234	.0499	.2843	.4425

64

Table A-1. (Continued)

Sector Description	Professional	Skilled	Semi-skilled	Unskilled
25. Personal, business svcs.	.1939	.3338	.1654	.3069
26. Recreation	.2089	.2431	.4114	.1366
27. Auto. repair, rental	.2296	.3800	.0646	.3258
28. Medical, health svcs.	.5850	.1732	.2358	.0060
29. Other services	.3844	.3073	.3083	.0000

^aNumbers indicate the proportion of total employment in the sector named at the left which are in the skill level at the sector named at top.

Source: Baskett, 1976.

Table A-2.   Sector Employment, Flagstaff Trade Area, 1973

Sector	Total Average Annual Employment in "Person Years"
1. Agricultural products, services	77
2. Beef cattle production	248
3. Forest operations	32
4. Copper mining	0
5. Other mining	0
6. Construction	727
7. Non-lumber manufacturing	346
8. Lumber, wood products	657
9. Public utilities	173
10. Transportation, communications	289
11. Wholesale	320
12. Department, variety stores	387
13. Restaurants, bars	1,792
14. Food stores	591
15. Furniture stores	91
16. Automotive sales, parts	460
17. Building materials	143
18. Gas, service stations	510
19. Clothing	82
20. Other retail	491
21. Banking, finance	209
22. Insurance	123

Table A-2. (Continued)

	Sector	Total Average Annual Employment in "Person Years"
23.	Real estate	197
24.	Motels, lodging	527
25.	Personal, business services	358
26.	Recreation	99
27.	Automotive repair, rental	123
28.	Medical, health services	241
29.	Other services	144
	Total	9,537

Source: Baskett, 1976.

Table A-3. Total Average Area Employment by
            Skill Level, Flagstaff Trade Area,
            1973

	Number
Professional	1,846
Skilled	1,861
Semi-skilled	2,945
Unskilled	2,885
Total	9,537

APPENDIX B

EXPENDITURE DATA AND COMPUTATIONS

Weighted average expenditures for total consumption (excluding
personal insurance, gifts and contributions, and gasoline), consumer
durables, and gasoline purchases were calculated. These calculations
approximate 1973 Flagstaff Trade Area conditions.

Average annual expenditures by income group for the aforemen-
tioned commodities were obtained from the Bureau of Labor Statistics
report #455-4, 1977 (Table B-1). Data on income of persons in Coconino
County were obtained from the 1970 Census (Table B-2).

The income data are on a county-wide basis but, what is desired
is sub-county data reflecting the Flagstaff Trade Area. Table B-3
shows number and percentage of persons in each skill level (income
group) in the Area in 1973. Multiplying these percentages by the
county-wide figure of 10,333 allows the division of persons in the en-
tire county into the four major skill level groups (professional,
skilled, semi-skilled, unskilled) in the same proportions as in the
study area. For example, the percentage of persons in the Flagstaff
Trade Area in the "professional" skill level group is 1846 ÷ 9537, or
19%. Thus, the number of persons in Coconino County in "professional"
skill level group is 19% x 10,333 = 2,000.

The next step in calculating the weighted averages is to com-
bine the income groupings from the Bureau of Labor Statistics report

Table B-1.   Average Annual Expenditures by Income Class, United States,
1972-73

Income Before Taxes	Item.			
	Total Consumption Expenses[a]	Housefurnishings and Equipment	Vehicle Purchases	Gasoline
Under $3,000	2,936	99	182	103
$3,000 to $3,999	3,857	147	208	143
$4,000 to $4,999	4,354	161	292	178
$5,000 to $5,999	4,878	213	321	222
$6,000 to $6,999	5,475	237	472	250
$7,000 to $7,999	5,866	280	515	282
$8,000 to $9,999	6,588	307	586	333
$10,000 to $11,999	7,504	371	779	385
$12,000 to $14,999	8,449	438	860	441
$15,000 to $19,999	10,144	568	1,024	495
$20,000 to $24,999	12,038	677	1,228	554
$25,000 and over	16,738	913	1,511	570

[a]Excluding personal insurance, gifts and contributions and, gasoline purchases.

Source: Bureau of Labor Statistics, 1977b.

Table B-2.   Income of Families in Coconino County, 1969

Family Income	Number
All Families	10,333
Less than $1,000	575
$1,000 to $1,999	500
$2,000 to $2,999	529
$3,000 to $3,999	460
$4,000 to $4,999	462
$5,000 to $5,999	637
$6,000 to $6,999	741
$7,000 to $7,999	745
$8,000 to $8,999	724
$9,000 to $9,999	792
$10,000 to $11,999	1,236
$12,000 to $14,999	1,265
$15,000 to $24,999	1,335
$25,000 to $49,999	298
$50,000 or more	34

Source: U.S. Department of Commerce, Bureau of Census,
          1970 Census of Population, 1971.

Table B-3. Total Area Employment by Skill Level, Flagstaff Trade Area,
1973

	Number	Percent
Professional . . . . ($12,168)	1,846 =	19,356
Skilled . . . . ($10,184)	1,861 =	19.513
Semi-skilled . . . . ($9,560)	2,945 =	30.880
Unskilled . . . . ($6,381)	2,885 =	30.251
Total	9,537 =	100%

(Table B-1) with those from the 1970 Census (Table B-2). For example, the expenditure figures in the $15,000-$19,999 group and those in the $20,000-$24,999 group were combined to have one average expenditure figure which would coincide with the $15,000-$24,999 income group in the 1970 Census. Once this was done the procedure for weighted average calculations was simply to sum the products of the number of persons in each income group by the expenditure for that group and then divide by the total number of people in the skill level or income group.

Changes in gasoline tax revenues were calculated as follows:

1. Weighted average per capita expenditures on gasoline by skill level were calculated.

2. Expenditure figures were converted to quantity consumed in gallons by dividing amount spent by an assumed $.50/gal.

3. Estimates of gasoline tax revenues were obtained by mulitplying average annual per capita consumption (from 2 above), by skill level, by change in employment in each skill level, by the gasoline tax rate ($.07/gal).

Results of all computations are summarized in Table B-4.

Table B-4. Summary of Weighted Average Annual Per Capita Expenditures, by Skill Level, Flagstaff Trade Area, 1973

Skill Level	Item			
	Total Consumption Expenses[a] ($)	Housefurnishings and Equipment ($)	Vehicle Purchases ($)	Gasoline ($)
Professional	11,494	640	1,145	518
Skilled	7,940	402	816	411
Semi-skilled	6,185	286	549	303
Unskilled	3,654	137	229	143

[a]Excluding personal insurance, gifts and contributions and, gasoline purchases.

LIST OF REFERENCES

Ayer, Harry W. and James H. Baskett. "Elasticities: Supplementary
    Statistics from Interindustry Studies." Western Journal of
    Agricultural Economics, 3(July 1978):75-79.

Baskett, James H. "Economic Impacts of United States Forest Service
    Policies on Local Communities: An Interindustry Analysis of
    the Salt-Verde Basin, Arizona." Ph.D. dissertation, University
    of Arizona, 1976.

Board of Supervisors of Coconino County. "Adopted Budget for the
    Fiscal Year 1973-74." (Chairman, Dio A. Dachias.)

Brown, Tom. Economist, United States Forest Service, Forest Sciences
    Laboratory, Northern Arizona University, Flagstaff, Arizona,
    personal communications, 1977, 1978.

Bureau of Labor Statistics. Weekly and Hourly Earnings Data from the
    Current Population Survey. Special Labor Force Report 195,
    1977a.

Bureau of Labor Statistics. Consumer Expenditure Survey Series: Inter-
    view Survey, 1972-73. Report 455-4, 1977b.

Clawson, Marion. The Economics of National Forest Management, Balti-
    more: Johns Hopkins University Press, RFF, 1976.

Coconino National Forest. "RPA Planning Statement," R-3, Form 8100,
    1976.

Coconino National Forest Supervisors Office. Annual Collection State-
    ment, National Forests Fund, (FSM 6531.126), 1977.

Couch, Forrest. Administrative Officer, Coconino National Forest,
    personal communications, 1978.

Evans, Michael K. Macroeconomic Activity, New York: Harper and Row,
    1969, p. 34.

Ferber, Robert. "Consumer Economics, A Survey," Journal of Economic
    Literature, XI (Dec. 1978):1303-42.

Friedman, Milton. A Theory of the Consumption Function, Princeton:
    Princeton University Press for National Bureau of Economic
    Research, 1957.

Glahe, Fred R. Macroeconomics: Theory and Policy, Ed. William J.
    Baumol, New York: Harcourt, Brace, Jovanovich, Inc., 1973.

Herber, Bernard P. Modern Public Finance: The Study of Public Sector
    Economics, Illinois: Richard D. Irwin, Inc., 1975:22-44.

Hirsch, Werner Z. "Local Impact of Industrialization on Local Schools,"
    Review of Economics and Statistics, 46(May 1964):191-99.

_____. The Economics of State and Local Government, McGraw-Hill, Inc.
    1970:p. 1-2.

Kalter, Robert. "An Interindustry Analysis of the Central New York
    Region," Agricultural Experiment Station Bulletin 1025, Ithaca,
    N.Y.: Cornell University, 1969.

Lee, Maw Lin. "Income, Income Change and Durable Goods Demand,"
    Journal of American Statistical Association, 59(Dec. 1964):1194-
    1202.

Levin, Charles. "Regional Income and Product Accounts," Design of
    Regional Accounts, Ed. Werner Hochwald, Baltimore: Johns
    Hopkins University Press, RFF, 1961.

Morgan, James. Co-Director of the Bureau of Business and Industrial
    Development, Assistant Professor of Economics, College of Busi-
    ness Administration, Northern Arizona University, Flagstaff,
    Arizona, personal communication, 1978.

Northern Arizona Council of Governments. Region III Economic Develop-
    ment Outlook 1977, Bill Wade, Executive Director, 1977: p. 7,
    16.

Ott, Tom and Jack Utley. Foresters, United States Forest Service,
    Forest Supervisors Office, Flagstaff, Arizona, personal communi-
    cations, 1977, 1978.

Public Land Law Review Commission, One-Third of the Nation's Land, U.S.
    Government Printing Office, June 1970, p. 20.

Smith, Jack. Coconino County Manager, Flagstaff, Arizona, personal
    communications, 1978.

Smith, R. E. "The Demand for Durable Goods: Permanent or Transitory
    Income," Journal of Political Economics, 70(Oct. 1962):500-4.

Tweeten, Luther and George L. Brinkman. Micropolitan Development, Ames, Iowa: Iowa State University Press, 1976, pp. 336-7.

U.S. Congress, PL93-378. Forest and Rangeland Renewable Resources Planning Act of 1974.

U.S. Department of Commerce, Bureau of Census. 1970 Census of Population, Arizona, PC(1)-C4, Dec. 1971.

U.S. Forest Service, Southwestern Region. RPA Program: A·Plan for Implementation of the Forest and Rangeland Renewable Resources Planning Act of 1974 in the Southwestern Region, May 1977, p. 1-2.

Valley National Bank. Arizona Statistical Review, 27th-34th Edition, Phoenix, Arizona: 1971-78.

Weidman, Joe. Economic Analyst, Community Planning Division, NACOG, Flagstaff, Arizona, personal communications, 1977, 1978.

Wycoff, J. B. "Allocation Probelms of Public Lands in the West," Western Journal of Agricultural Economics, 2(Dec. 1977):11-20.