Economic Evaluation of Inland Fisheries
Module A: Economic Evaluation of Fishing Rights

R&D Project Record W2-039/PR/1

Module A: A F Radford[1], G Riddington[1] and D Tingley[2]

Research Contractor:
1: Division of Economics and Enterprise,
Glasgow Caledonian University, Glasgow G4 0BA

2: MacAlister Elliot Partners,
56 High Street, Lymington, Hampshire SO41 9AH

Publishing Organisation
Environment Agency, Rio House, Waterside Drive, Aztec West, Almondsbury,
BRISTOL, BS32 4UD.

Tel: 01454 624400 Fax: 01454 6244
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This report summarises the findings of research carried out as part of an economic evaluation of inland recreational fisheries in England and Wales. The economic value of fishing rights were examined. The information within this document is for use by Environment Agency staff and others involved in the management of inland fisheries.

Keywords
Priced Recreational Fisheries, Fishing Rights, Hedonic Pricing, Economic Rent, Consumers' Surplus.

Research Contractor
This document was produced under R&D Project W2-039 by:
MacAlister Elliott & Partners, 56 High Street, Lymington, Hampshire SO41 9AH

Tel: 01590 679016 Fax: 01590 671573 Email: mep@macalister-elliott.com
Website: http://www.macalister-elliott.com

Environment Agency's Project Leader
The Environment Agency's Project Leader for Project W2-039 was:
Dr Phil Hickley, National Coarse Fisheries Centre

Further copies of this report are available from:
Environment Agency R&D Dissemination Centre,
WRc, Frankland Road, Swindon, Wilts SN5 8YF

tel: 01793-865138 fax: 01793-514562 e-mail: publications@wrcplc.co.uk

FOREWORD

This Project Record has been prepared for Module A '*Evaluation of Fishing Rights*' of the Environment Agency's R&D Project *Economic Evaluation of Inland Fisheries* (W2-039).

It provides additional information to that found in the associated R&D Technical Report: W2-039/TR/1 which covers both Modules A and B.

This document details all the work undertaken during the course of the project, including background information, the specific objectives and the research agenda associated with each, full details of survey work, statistical analysis, detailed conclusions and a series of appendices which contain questionnaires used in the surveys and results from the econometric modelling of the value of individual fisheries.

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EXECUTIVE SUMMARY

Theoretical Background and Previous Studies

Module A concerns itself with the market values for inland fisheries. Apart from a few studies of salmon fisheries, very little economic work has been undertaken on the market value of these fisheries and their sensitivity to changes in fishery characteristics. There is an extensive, and largely North American, literature on the economic evaluation of fishery resources, but virtually all of this relates to the calculation of consumers' surplus in unpriced recreational fisheries. Almost all the inland fisheries of England and Wales are in private ownership and can be bought and sold in the market place.

Fisheries are differentiated from each other by their characteristics (average catches, length, number of pegs, access), and these characteristics influence their market price. With a sufficient number of owners' estimates of market value and details of the accompanying combinations of characteristics an '*implicit price function'* can be estimated. Given an estimated implicit price function, the market value of any fishery can theoretically be predicted from knowledge of its characteristics. More importantly, this relationship can be used to predict how the market value of fisheries would vary with overall changes in individual characteristics. The same data set can be used to estimate the total market value for each fishery type, provided that an appropriate scaling factor is available

Radford et al (1991) in a study for the Ministry of Agriculture Fisheries and Food estimated the total market value salmon rod fisheries in England and Wales at current prices to be £117.3m. The 1991 estimated implicit price function for salmon fisheries suggests that the marginal value per fish varies with the level of the catch, (and the magnitude of other variables in the equation). The calculated elasticity coefficient suggests that a 10% increase in the five year salmon average would increase market values by 5.47%.

Primary Data

A data base of owners was assembled from a variety of sources including, Orton's "Where to Fish", Agency Guides to local fisheries, Stillwater Fisheries Associations, lists of Angling Clubs and Associations. It is thus possible that very exclusive and very poor fisheries are excluded. The only characteristic that could be used to stratify the database was whether the fishery was riverine or stillwater.

Questionnaires were distributed via three mechanisms: Firstly, it was learned that HCC Publishing were about to mail a final mail shot to fisheries in their apparently very large database and it was agreed that (for a fee) HCC would include some supplementary questions on market value in their mailing to contributors. Unfortunately, it later transpired that an unknown yet probably significant proportion of HCC questionnaires were misdirected; Secondly, survey work on both riverine, canal and stillwater fisheries was undertaken to supplement the first set of responses obtained; and thirdly, questionnaires for canal fisheries were distributed in conjunction with the British Waterways Annual Customer Feedback Survey. The number of useable responses returned in total covered 127 riverine fisheries, 207 stillwater fisheries and 219 canal fisheries.

Estimated Implicit Price Functions

Separate implicit price functions were estimated for Migratory Salmonid, Riverine Trout, Riverine Coarse, Stillwater Trout, Stillwater Coarse and Canal fisheries. Summary details are given below:

Table 1 Summary of Models Generated for Fishing Rights Values

	Dependent Variable	Independents	Explanation
Migratory Salmonid	Value	Constant Average 5-yr annual salmon catch Parking Local Population within 20km	45.4%
Riverine Trout	Value per metre	Constant Weight (lbs) of fish per angler Width in metres Percentage of wild brown trout in catch	83.7%
Riverine Coarse	Value	Constant Length (metres) Width Parking Weight per angler day (lbs)	65.8%
Stillwater Trout	Value	Constant Number of swims Weight per angler day (lbs)	38.8%
Stillwater Coarse	Value	Constant Number of swims	25.5%
Canals	Rent per annum	Constant Length (metres) Number of pegs	51.2%

As expected salmon catch was an important explanatory variable for migratory salmonid fisheries as well as parking access and the local population density. The elasticity coefficient was close to the value estimated by Radford (1991). The catch variable was important for all river fisheries and stillwater trout fisheries and Environment Agency efforts that increase catch rates in these fisheries should translate to increases in their market value. Surprisingly, catch was not significant for stillwater coarse fisheries and for these fisheries the exploitation of the physical characteristics (improved access, more swims) would appear to be the best way to maximise value.

The functional form, used for all the models, was log-log and in almost every case we were disappointed with the degree of explanation achieved. Hedonic models are traditionally very successful in explaining variations in the price of goods. Typically for a product like cars and housing we might expect around 75% to 80% of the variation to be explained by the characteristics. It was anticipated that certain independent variables, specifically proximity to centres of population, would be important and considerable effort was devoted to calculating population densities around individual fisheries. Unfortunately the population density variables had a generally insignificant effect in explaining values. Despite the extensive range of independent variables employed, other excluded variables are having an effect, but these variables are difficult to incorporate analytically.

Total Value of fisheries in England and Wales

The procedure adopted was to identify the value by the most important variable (catch or size) in England and Wales separately, and thence use key data on catch or acreage or river length to aggregate to all fisheries. To establish average values the data was partitioned between England and Wales. The principal results are given below:

Table 2 Total Value of Fisheries in England and Wales by Surface Water

Surface Water		England	Wales	Total
Stillwater	£m	1,892.3	36.1	1,928.4
Moving Water and Canals	£m	992.7	110.9	1,103.6
Total	**£m**	**2,885.0**	**147.0**	**3,032.0**

Table 3 Total Value of Fisheries in England and Wales by Fishery Type

Fishery type		England	Wales	Total
Migratory Salmonid	£m	86.0	41.6	127.6
Coarse	£m	2235.1	42.5	2277.6
Trout	£m	563.9	62.9	626.8
Total	**£m**	**2,885.0**	**147.0**	**3,032.0**

It has been established that the inland fisheries of England and Wales are extremely valuable economic assets with a combined value of £3,032m with only 4.8% of this attributed to Welsh fisheries. It is reassuring that the estimated total value of salmon fisheries is very similar to the Radford (1991) estimate. Coarse fisheries are undoubtedly the most valuable category of fishery type and we were surprised that coarse fisheries accounted for over 75% of the total market value of all inland fisheries.

Monitoring and Updating Market Values

A declared aim of Module A is to evaluate the trends in the value of fishing rights, and to indicate the rate of change of values with a view to establishing a frequency for reviewing these values. We remain convinced that market data are a potentially important source of useful performance indicators. An examination of the available information of salmon and trout fisheries concluded that it would be unwise to devote resources to collecting and analysing actual transaction in individual fisheries. The Agency should however consider requesting that specialist agents and fishery consultants submit an annual return on a range of *average* values for different types of fisheries (values per acre, per metre of bank, per salmon etc). Elasticity coefficients are probably relatively stable over time, and given that large numbers of observations on individual fisheries are required to estimate them, less frequent updating would be appropriate.

1 BACKGROUND

1.1 Introduction

As part of the sustainable and integrated management of air, land and water the Environment Agency has specific responsibilities for water resources, pollution prevention and control, flood defence, fisheries, conservation, recreation and navigation. In particular, under the Salmon and Freshwater Fisheries Act 1975 as carried forward under the Environment Act 1995, the Agency has a statutory duty to "maintain, improve and develop the salmon, trout, freshwater and eel fisheries" of England and Wales, including up to 6 miles from the shore. The Agency also has a duty to have regard to costs and benefits when exercising its powers.

Recently the Government commissioned a review of policy and legislation relating to salmon and freshwater fisheries (MAFF 2000). The principal conclusion from the review was that the conservation of freshwater fish and the management of fisheries should aim to:

- ensure the conservation and maintain the diversity of freshwater fish, salmon, sea trout and eels and to conserve their aquatic environment;
- enhance the contribution salmon and freshwater fisheries make to the economy, particularly in remote rural areas and in areas with low levels of income;
- enhance the social value of fishing as a widely available and healthy form of recreation.

In addition, the Environment Agency has developed a vision for its contribution to sustainable development and within this vision there are two important components which recognise the human and fish dimensions of fisheries, namely improving the quality of life and enhancing wildlife.

So that the Agency can face the challenge of meeting its statutory obligations as an environmental regulator, whilst addressing its wider aims, certain operating principles need to be adopted, such as integrated catchment management, sustainable resource management and an appropriate level of funding. Fundamental to the Agency's potential success is a sound knowledge of the true economic value of inland fisheries and information on the economic consequences of its activities.

From those few economic evaluations of fisheries that have been undertaken it is clear that inland fisheries and fish stocks generate considerable 'economic value or benefit'. The Agency therefore has an important stewardship function. In this context, the Agency has to ensure that it secures commensurate funding for fisheries and appropriately allocates resources both within fisheries, and between fisheries and other activities.

To meet these demands requires good information on economic costs and benefits and the sensitivity of these to change and policy initiatives. Unfortunately, few economic evaluations of inland fisheries have been undertaken and the Agency may have difficulty in framing its priorities and meeting its requirements to appropriately manage and improve inland fisheries. One reason for the paucity of economic data is that the economic costs and benefits from improving fisheries are complex, varied and can be difficult to estimate. For example, the benefits from improving fisheries embrace benefits to anglers, casual users of surface water space, consumers of fish for the table, fishery owners, clubs, syndicates, as well as local economic communities. In some instances, economic benefits can be directly observed through collection and manipulation of market data, whilst other types of benefits leave no observable trace in the market. Thus, in addition to the economic benefits multidimensional, a range of estimation techniques has to be employed; some of these utilise available market data, others rely on direct contact with individuals.

1.2 Project Objectives

The overall objective of this multi-modular study of the economics of inland fisheries is to:

provide estimates of the economic value and benefits of inland fisheries in England and Wales and specifically to consider:

(Module A) • *The economics of fishing rights*

(Module B) • *The indirect economic values associated with fisheries including:-*
1. *anglers' Consumer Surplus, Option, Bequest and Existence values of fishing and fisheries*
2. *the social benefits of angling and the importance of angling in local economies*

1.3 Module A Objectives

With respect to Module A, the general approach was specified as: -

To provide an estimate of current values of recreational fishing rights, factors which will affect these values, historic trends in these values and to produce a paper based model which can be used to produce a value for fishing rights at any given time. The R&D will need to consider coarse, trout and migratory salmon fisheries independently and will also need to give separate consideration to riverine, stillwater and canal fisheries: the study must take an Agency wide view and be able to provide separate estimates for England and Wales

The specific objectives of Module A are:

1. Undertake a literature review of marginal and nett economic values of fishing rights, (encompassing work undertaken in other countries).
2. Identify and compare current market value of fishing rights for riverine (migratory salmonid, trout and coarse) stillwater (migratory salmonid, trout and coarse) and canal fisheries (coarse).
3. Identify the various factors, which determine the value of fishing rights (categorised as above), the way in which these factors affect the value of fishing rights and how these values respond to changes in the influencing factors
4. Evaluate historic trends in the value of fishing rights (categorised by type of water and species type) and indicate rate of change in value with a view to establishing a frequency for reviewing these values
5. Produce a workable paper-based model, which will enable Fisheries Managers to establish absolute value of fishing rights for the different categories of fisheries and be able to predict changes in these values.

Discussion with the Agency concluded that the estimation of relationships between fishery characteristics and the value of fishing rights (objective 3) was certainly a necessary condition for objective 5 and probably a sufficient condition. These two objectives were combined.

2 LITERATURE REVIEW: ECONOMIC EVALUATION OF FISHING RIGHTS

2.1 Introduction

From the Environment Agency's project specification document the general objective with respect to the literature review is *"to* review *the literature on the economic value of all fishery types over which the Environment Agency has jurisdiction."* The specific remit for the literature review for Module A is *"to undertake a literature review of marginal and net economic evaluation of fishing rights. This review should not be restricted to England and Wales, but encompass work undertaken in other countries"*

This particular review is therefore restricted to the economic evaluation of fishing *rights ("of all fishery types over which the Environment Agency has jurisdiction").* A critical review needs to nest the literature it addresses within an appropriate theoretical context. In the interests of clarity, theory and application are presented separately. Section 2.2 explores the theoretical relevance of the market value of fishing rights and considers why changes in market values might generally be regarded as important performance indicators in the management of inland water space. Section 2.3 reviews all the applied economic evaluations of UK recreational fishing rights.

2.2 Economic Evaluation of Fishing Rights: The Theoretical Background

The Agency may be aware that, as they strive to improve fisheries, their activities may produce an increase in the market value of fishing rights. In assessing its performance the Agency may consider this effect to be of little importance; especially since the Agency is not usually the owner of these rights and does not benefit from the wealth effects it helps to create. It is clear from the project specification that the Agency is seeking to use Economic Value (EV) in its decision making. Given this, if the market value of fishing rights is systematically related to EV, then changes in market value may have prescriptive significance in resource allocation decisions. This link between EV and market values needs to be established and subtleties explored to ensure that results, analysis and literature discussed here are not subsequently used out of context, either innocently or culpably.

2.2.1 Economic Value, Willingness to Pay and Social Welfare

In economics, EV is generally, though not always, related to the willingness to pay (WTP) for goods or services. In seeking to use EV as an input into resource allocation decisions, managers in the Agency should be alert and sensitive to the ethical issues and consequences associated with the use of such values. In particular, the primary concern of EV is with the importance that individuals themselves attach to the relevant goods or activities. Monetary values such as WTP are introduced largely through a desire to measure the strength of individuals' preferences rather than through any obsession with money. The anthropocentrism of economic evaluation is clearly consistent with the value judgements that underpin both democracy and a market system. It follows that in using economic values the Agency's activities are compatible with society's current rules and moral judgements since the primary data are the subjective valuations of every member of 'society', whatever their individual tastes, motivations or status.

All assessments of EV involve the comparison or ranking of two or more states, (i.e. a specific change) with one of these states usually being the situation as it exists now. Unfortunately, most changes involve some individuals being made better off and others worse off. It is therefore necessary to have rules for evaluating these gains and losses. For example, the WTP of birdwatchers for a restriction of the activities of, say, water skiing may exceed the WTP of skiers to preserve their activity. Net economic value may be increased as a result of restricting water skiing - but there are still gainers and losers and a conflict of interests remains.

Against this background of conflict between gainers and losers, economic evaluation seeks to assess whether *society as a whole* has been made better or worse off as a result of some change. We need some method for aggregating the WTP of the different interest groups. Compensation tests are used to justify the balancing of gains and losses[1]. These tests require that with a beneficial change it should be possible for those who are made better off to compensate fully those who believe that they would be made worse off. If the gainers compensate the losers, then everyone is made better off. An economic evaluation may conclude that a change passes the compensation test and would, if implemented increase net economic value. As far as economic evaluations are concerned, there is however no requirement that compensation actually be paid; it is sufficient that there is the potential for everyone to be better off. Clearly, changes in the allocation of water resources that offer this potential are worthy of further consideration and one should think very carefully about alternative policies that do not.

It is not the function of the economic practitioner to make judgements on the merits of the case for compensation. The task is, rather, to identify the gainers and losers and their WTP. Economists undertaking economic evaluations are not obliged to have a view on whether it is desirable that owners of fishing rights are better off as a consequence of the Agency's activities. It is the function of the Agency or the political process to make explicit distributional judgements in deciding who is to benefit from any proposed change. There may be a temptation for the Agency to ignore distributional consequences and propose a change in the allocation of surface water resources, on the grounds that there may be an improvement in 'efficiency' as measured by an increase in net economic value. Unfortunately, any change in resource allocation, however 'efficient', has distributional consequences, and in the final analysis an explicit or implicit distributional judgement has to be made by someone.

One further complication is that WTP is dependent on ability to pay. Given this, a change in the distribution of income between groups will change WTP relatively and decision makers should appreciate that their decisions might be sensitive to the distribution of income. This raises the question of whether the existing distribution of income is an acceptable basis for decision making[2]. This is a serious issue when a proposed change in allocation might affect identifiable groups who have widely different income levels. Is the WTP for salmon angling greater than the WTP for coarse angling only because salmon anglers feel more intensely about their particular form of angling; or do the salmon anglers' higher income levels explain some of the differences in WTP?

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[1] See Mishan (1981) chapters 41-45 for an overview of compensation tests and their use.
[2] See Pearce and Nash (1981) for a discussion.

2.2.2 Economic Value and Non-Priced Fisheries

For non-priced fisheries such as sea angling in the UK Society's **Gross** Economic (Use) Value is simply the aggregation of individual anglers' willingness to pay (WTP) for their sport.

From society's perspective, anglers pursuing their sporting consume scarce resources, which others in society could have used (e.g. petrol, accommodation services etc). In estimating the **Net** Economic (Use) Value to society, allowance has therefore to be made for the opportunity cost of the resources that anglers consume. The general presumption is that in obtaining these resources anglers have to outbid other potential users in competitive markets. Thus, angler expenditure is at least equal to society's WTP for these resources (i.e. the opportunity cost of the physical resources anglers use). Consequently, net economic value is the difference between anglers' WTP and their expenditure on bait, petrol etc.

The difference between anglers' WTP and actual expenditure is **Consumers' Surplus**. Those charged with the task of estimating the net economic value of free-access fisheries have no real alternative but to attempt to calculate consumers' surplus since this is the net economic (use) value of the fishery. To estimate anglers consumers' surplus it is generally necessary to employ techniques such as Travel Cost Method, Contingent Valuation or Discrete Choice models.

2.2.3 Economic Value, Priced Fisheries and Economic Rent

For priced fisheries such as UK and Ireland inland fisheries, anglers have an additional item of expenditure because owners of fishing rights extract permit charges from anglers. In effect owners are capturing some of the consumers surplus that would exist if these fisheries were open access. Arguably, the essential requirements for angling (stretches of water, fish) which the angler obtains through permits are free 'gifts of nature' which may have few, if any, alternative uses. If so, permit charges, unlike expenditure on travel, tackle and accommodation are not required to attract and or retain resources for angling. As a consequence there is no opportunity cost associated with access charges, they are simply transfers of income from anglers to owners. Whereas in free access fisheries all the net economic value manifests itself in consumers' surplus, in privately owned fisheries net economics value will be reflected in the both the remaining consumers' surplus and the payments extracted by owners. In keeping with the avoidance of distributional judgements no comment is offered about how the net economic value should be distributed, the primary concern here is how the totality might be estimated[3].

The term **economic rent** is useful here: economic rent exists when payments to owners of the resources used in production exceed opportunity costs[4]. If the opportunity costs of the resources fishery owners control are negligible then the owner's revenue is economic rent. Net Economic Value could thus be estimated by summing economic rents and the remaining consumers surplus. This could be convenient, but the crucial assumption is that that all payments to owners are economic rent (i.e. that the opportunity costs are zero of the resources fishing right owners control). Some facets of this assumption are considered explicitly below:

[3] Some such as Cauvin (1980) would argue that the totality of net economic value would be greater under private ownership.

[4]A survey article by Currie, Murphy and Schmitz (1971) provides a comprehensive and readable background to the whole question of the concepts of economic rent and consumers surplus and their use in economic analysis

- Owners who fish themselves have an opportunity cost in that they forego the income they could have obtained from letting the fishing that they retain, from society's point of view the use of resources has not altered; it is simply the user who has changed. These opportunity costs are therefore not a cost from society's point of view.

- In providing fishing, owners may use resources such as materials, energy and labour which do have an opportunity cost. In similar vein, on stillwaters owners may incur significant expenses in stocking their waters. In other words some of the payments anglers make are required to attract and retain resources which do have an opportunity cost. The implication is that one should subtract the owners costs and simply focus on owners' net income. One exception might be labour (e.g. ghillies and attendants) that would otherwise be unemployed.

- Anglers and fishery owners secure the rights of access to certain natural resources, namely fish and the water space. These natural resources themselves may have other uses. Similarly, the management and protection of these resources by public agencies may consume resources, which have alternative uses. Some of these are considered below.

- Anadramous fish stocks: Anglers consume part of the potential spawning stock. Provided that spawning escapement remains 'sufficient', it can be argued that since the fish have already passed through the commercial net fisheries, from society's point of view nothing is foregone. At least in the short term, therefore, the opportunity costs of anglers' catches are zero.

- River and Stillwater Management Costs: The Agency seeks to improve water quality for its own sake, as well as for angling and other uses. The relevant question is whether the Agency's water management costs would be less if there were no angling. If water management costs are not sensitive to the presence of angling then angling itself is not consuming resources that have alternative uses. Similar reasoning applies to fish stocks management. Fish stocks may be managed for their own sake; it is however likely that such costs would be reduced if there was no angling.

- Angling Management Costs: A variety of specific costs are incurred directly because of angling (in rod licensing, collation of catch statistics, enforcement of bylaws etc); although anglers pay toward these costs through licence fees. Any excess of costs over licence revenue would indicate that the licence charges to anglers underestimate society's opportunity costs of the resources devoted to the management of angling. If fisheries managers consider the relevant costs (net of income) to be significant, they should be deducted from the estimates of net economic value. Most studies do not deduct these costs.

- Other Recreational Activity: To a greater or lesser extent angling may impinge on or even preclude other activities such as canoeing and swimming. Such interactions will vary with the nature of the water space. Most studies assume that the net economic value of other activities precluded by angling is negligible and that the opportunity cost was therefore effectively zero. This is probably a reasonable assumption since much of the 'conflict' between anglers and other activities is one way with angling having little impact on canoeist, walkers etc.

From the above discussion the working assumption is that the owners' **net** income flow is an approximation to economic rent.

2.2.4 Economic Rent and the Market Value of Fishing Rights

Since fishing rights are transferable, economic rent can in principle be estimated from market data. Owners of fishing rights receive (at least potentially) a net income flow (payments from anglers in excess of fishery operating and maintenance costs) and they can sell the right to this flow. In theory, the market value of fishing rights will be such that the annual net income flow from fishing right ownership is broadly equivalent to the return expected from other forms of wealth holding. (For example: if the market rate of interest is 10% then a fishery which yields £100 per annum will sell for about £1,000.) In short, the market value of fishing rights represents a capitalisation of the net income flow, and as argued above this net flow is a good approximation to economic rent.

In practice, most fisheries probably sell for more than the capitalisation of their actual net income flow would suggest. There are two reasons for this. Firstly, fishing right ownership also provides a flow of 'amenity value' to owners who may also be anglers. Indeed angling may be the primary motive for owning fishing rights (e.g. syndicates and angling clubs) The market value thus reflects both the income flow obtained from paying anglers and the flow of amenity value enjoyed by the owner (and is 'paid for' in forgone income). In other words, the market value of fishing rights reflects the **capitalised potential net income flow** from those rights. In addition, ownership of fishing rights may, in some cases, confer some 'status value' which will be reflected in the total capital value and result in an apparent discrepancy between a fishery’s potential net income flow and its capitalised value.

In conclusion, it is held that economic rent in private inland recreational fisheries *can in theory* be estimated from market data on the capital value of fisheries. This also implies, not unreasonably, that changes in market value are measures of change in economic rent. Indeed, if one were to consider all of the possible causes of a change in market value they could be categorised as impacting on anglers' WTP or a change in the value of the real resources used. The one possible exception is an increase in the status value of fishery ownership, independent of any change in the quality of fishing or the resources used.

2.2.5 Market Values of Fishing Rights as Performance Indicators

Economic rent relates meaningfully to a recognised and explicit concept of 'economic value' that embraces willingness to pay and the opportunity costs of resource use. Economic rent estimated from market data is in many ways comparable with similar values derived for other marketed activities that may compete, directly or indirectly, with angling for resources[5].

Although the concept of net economic value, as reflected in economic rent, relates primarily to the welfare of society as a whole, it does have a regional significance. If fishery owners are resident in the region then their economic rent is arguably a component of regional community wealth. Changes in economic rent therefore provide a yardstick for assessing how a particular group within the community (individual owners and angling club members) is affected by changes in the status of regional fisheries. Specifically, if economic rent for a region is observed to increase in real terms it is reasonable to conclude that (regional) willingness to pay has increased. It may then be concluded that anglers' valuation of the regional fisheries has increased. Indeed, regional economic rent may be a better measure of the overall quality of angling within a region than regional catch data or attendance figures.

[5] See Fedwic (1987) for a discussion of market values and resource allocation for outdoor recreation.

With respect to individual fisheries, changes in market values provide a measure of the relative 'performance' of individual rivers as 'suppliers of angling'.

An interesting question is the relative size of economic rent and consumers' surplus. If economic rent is relatively large, market data can therefore be used to derive a reasonable approximation to the net economic use value of fisheries. Some authors have argued that most of the net economic value of privately owned recreational fisheries comprises economic rent. Copes and Knetsch (1981) consider that with private ownership anglers' consumers' surplus will be insignificant. They argue that in private fisheries anglers surrender some of their consumers' surplus in the form of access fees, and that consumers' surplus is then further eroded "insofar as each additional participant will add to crowding and diminish the catch per fishermen". In their view, these congestion and fish stock costs that anglers impose on each other "are not of concern to the private owner". The combined effects of access fees, congestion and fish stock externalities lead these authors to conclude that "only incidental amounts" of consumers' surplus will be realised in fisheries under private ownership.

If Copes and Knetsch are correct, then arguably one would not need to attempt to quantify consumers' surplus at all. While this would be helpful, observation and logic would suggest that private owners in England and Wales will not ignore the congestion and fish stock externalities suffered by their paying customers. These externalities will reduce the quality of the angling experience, anglers' WTP and thus access fees that can be charged. In short, changes in the quality of the angling experience shift the demand curve for angling and profit maximisers will not be indifferent to shifts in the demand for their product. A similar argument applies to angling clubs. As a generalisation, clubs seek to maximise the average consumers' surplus of their membership[6]. In considering additional members the club will compare the incremental club revenue plus any positive externalities[7] with the stock and congestion externalities associated with additional members. If restricted membership is practised this would be indicative of an attempt to manage these externalities. It would however be wrong to infer that a club is not sensitive to externalities simply because it does not restrict membership; the club membership may not have reached a level where restriction is required.

2.2.6 Estimation of Marginal Changes in the Value of Fishing Rights

Data on the market value of fisheries and their characteristics can be used to estimate <u>marginal values</u> i.e. the likely <u>changes</u> in net economic value that would follow changes in the status of fisheries.

Fisheries are differentiated from each other by the characteristics considered (average catches, the number of named pools and so on), and each fishery therefore represents a particular combination of characteristics. With a sufficient number of owners' estimates of market value and details of the accompanying combinations of characteristics, an '*implicit price function'* can be estimated.

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[6] See Ng (1974) on the economic theory of clubs.

[7] e.g. social interaction.

Formally, if C_1 ...C_n represent observable characteristics of fisheries and P_f is the market price, and assuming for simplicity that the relationship is linear (in practice it may not be), then we can estimate the implicit price function as:

$$P_f = b_0 + b_1C_1 + b_2C_2 + b_3C_3 + b_4C_4 + b_5C_5$$

where b_0 is a constant and b_1 ...b_n are coefficients.

Given an estimated implicit price function, the market value of any fishery can theoretically be predicted from knowledge of its characteristics. More importantly, this relationship can be used to predict how the total market value of fisheries (i.e. capitalised economic rent) would vary with overall changes in individual characteristics. The most important variable to consider is undoubtedly catch, not only because this probably accounts for most of the value of a fishery, but because catch is the main variable which owners and management authorities seek (at least indirectly) to influence

2.3 Applied Evaluations of Fishing Rights[8]

2.3.1 Introduction

There is a surprisingly large body of literature on the economic evaluation of recreational fisheries. The volume of literature is partly explained by environmental economists using sport fisheries as test beds in the development and refinement of techniques for estimating the economic value of non-priced recreational and amenity assets. A sizeable proportion of the apparent sport fisheries literature is thus about technique rather than fisheries *per se*.

Another feature of the literature is that it almost all relates to the estimation of consumers' surplus in non-priced fisheries, with very little published on private markets for recreational fisheries. This is because most of the literature is North American and, with a few exceptions, North American fisheries are non-priced or open access. The early settlers in North America faced low human population densities and an abundant supply of inland fish stocks and surface water space. In such circumstances, there would be no gain or incentive to overturn the default regime of open access to fish stocks. Whatever the explanation for the current prevalence of open access, the general point is that in North America, anglers generally do not face user/entry charges determined by supply and demand interactions in the market place. Whilst, State or the Federal Authorities may license angling or issue day or weekly permits, this is not the same as a profit maximising owner charging for angling at specific angling sites. For example, Bedi (1987) reports that the level of licence fees in both Canada and the United States represent nearly open access[9]. Licensing is also widely practised in Europe with the following countries having some form of angler licensing: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Netherlands, Poland, Slovakia, Spain and the United Kingdom. Countries without angler licensing are Bulgaria, Cyprus, Italy, Norway, Portugal, Romania, Sweden and Switzerland.

The literature addressed here is restricted to studies seeking to quantify *the market value of fishing rights.* It follows that this type of work will be restricted to those countries or regions

[8] All values have been converted to current prices 1999-2000 using the HM Treasury deflator series. Values in other currencies have been translated to Sterling using the Inland Revenue average annual foreign exchange rates.
[9] Indeed, it is probably because of licensing and the ease of contacting users, that sport fishing has been used by practitioners seeking to refine techniques for estimating the value of non-priced activity.

that have angler user charges and legal title to fisheries that can be bought and sold. For instance, very few North American studies have examined market values simply because few of these fisheries exist in private markets. The exception is Canada which has some priced sport river fisheries. Tuomi (1980) reports that only the freshwater fisheries of New Brunswick and Quebec are within the market system. The other three provinces, Nova Scotia, Prince Edward Island and Newfoundland are "exempt from the discipline and outside the direct measurement of the market."

In contrast, European fishing rights are generally privately owned by the riparian landowner. There are some exceptions. Most of the former Eastern Bloc countries' water bodies are owned by the State. In Finland, most of the coastal and inland water bodies have traditionally been privately owned, in conjunction with riparian land ownership. Whilst there is private ownership, there is also a general public right to fish with rod and line and ice fishing (jigging), irrespective of the ownership of water and therefore no extensive market in fishing rights. In Portugal, most surface waters and their fisheries are publicly owned. Springs belong to the owner of the land, as do streams, but as soon as they pass to land owned by another person they become public water until they arrive at the sea. In eight counties of Austria the right to fish can be bought and sold, and anglers must purchase a licence as well as a permit from the fishery owner. The exception is Burgenland where the local government is the owner of fishing rights of running waters. Elsewhere, such as in Denmark, Germany, Italy, Belgium and Sweden, the right to fish in lakes and streams can belong to the riparian landowner. An added complication is that, irrespective of whether fishing rights are publicly or privately owned, in some countries or states, riparian land owners may be legally entitled to extract charges for access to or use of the banks of surface water bodies.

The existence of private fisheries is no guarantee of a literature on the market for fishing rights. Indeed, in European recreational fisheries management there have been very few economic studies of any kind. The exception is the United Kingdom. With respect to the UK, whilst there are many assessments of anglers' consumers' surplus through application of contingent valuation or the travel cost method, there are however also relatively few studies of market values. This is surprising, because if Copes and Knetsch (op cit) are correct then there is very little consumers' surplus associated with UK inland fisheries and attention should be focussed on economic rent and market values. The views of Tuomi on New Brunswick fisheries readily apply to the UK and Europe "the New Brunswick Fishery is an empirical dream world for economists…surprisingly little has, however, been written by economists about the market-established value of fisheries involved"

In addressing the existing body of empiricism a distinction is drawn between those studies quantifying total market value of fishing rights and those which have examined marginal changes in the value of fishing rights.

2.3.2 Total Value of Fishing Rights

The earliest UK study was by Radford (1982) which sought to estimate the total net economic value of salmon angling on the River Wye. Estate agents were used to estimate the market value of fishing rights. A rule of thumb is that the value of a fishery in any current year is the product of the average catch over the previous five years and a value per fish. Theoretically, each fishery would have a per salmon value that reflected the particular characteristics of the fishery such as scenic quality, access etc. Three estate agents agreed to provide minimum, mean and the maximum per salmon values for the River Wye. All agents gave £3,603[10] as the mean value per salmon on the River Wye. The five-year average catch for the Wye was 5525 fish yielding a probable market value for river's entire salmon fishery of £19.91m. The associated maximum and minimum estimates were £22.54m and £5.31m, respectively.

This study also estimated consumers' surplus using the Travel Cost Method. The primary data set was obtained through a postal survey of Wye anglers that yielded 716 responses. Consumers' surplus per trip was estimated at £21.97 or £397 per angler per year. For the population of 3,827 Wye anglers annual consumers' surplus was £1,527,000 which has a capitalised value £17,187,000, this using a discount rate of 8% and a 30year-time horizon[11].

The estimated net economic values of the Wye salmon fishery was £37.1m from which £1.1m should be deducted for every £100,000 at current prices of the net angling costs incurred by the (then) Welsh Water Authority. No attempt was made to examine marginal values or to estimate non-use values associated with the fishery.

Radford (1984) extended the Wye analysis to the Mawddach, Tamar and Lune. Six estate agents were approached to determine per salmon values appropriate to each of these rivers. Unfortunately transactions in fishing rights on these rivers are not as common as on the River Wye. Estate agents were understandably reluctant to generalise from their personal experience of a few isolated transactions to yield a per salmon value appropriate to an entire river. In contrast, the River Wye is not only the pre-eminent salmon river in England and Wales but has so many fisheries that some are traded every year. Estate agents were able to suggest per salmon values, which they felt, reflected conditions generally in England and Wales. It was assumed that the true per salmon values for the Mawddach, Tamar and Lune were not substantially different from the general per salmon values for England and Wales. Most agents suggested a range of values within which most transactions would be found. £960, £1200, £1560[12] were used as low, medium and high per salmon values for these rivers. The recorded catch data for these rivers is less reliable than for the river Wye and after making adjustment for under-recording of the salmon rod catch the following market values were estimated:

Table 2-1 Market Values for the Mawddach, Tamar and Lune

Per Salmon Value	River Mawddach	River Tamar	River Lune
£960	£550,538	£783,052	£991,545
£1,200	£688,173	£978,815	£1,239,432
£1,560	£894,624	£1,272,459	£1,611,262

Consumers' Surplus was again also estimated using the travel cost method. The earlier estimates for the River Wye were refined in the 1984 study. The previous estimation procedure had ignored travel time in the specification of the distance decay function for the River Wye. This produces an under estimation of consumers' surplus. With the inclusion of travel time, consumers' surplus for the River Wye re-estimated at £71.45 per trip (compared with £21.95) and £1,306 per angler per season (up from £397). These estimates appear reasonable. The consumer surplus estimates for all four rivers are given below.

[10] £1,500 at 1981 prices

[11] The context in which resource allocation decisions are being made determines which time horizon and discount rate to use.

[12] £400, £500 and £650 at 1981 prices.

Table 2-2 Consumer Surplus for the Wye Mawddach, Tamar and Lune

River	Consumer Surplus per Angler	Consumer Surplus per Trip	Annual Consumer Surplus
Wye	£1,306	£71	£4,603,500
Mawddach	£1,214	£108	£1,548,450
Tamar	£12,224	£1,381	£5,398,650
Lune	£4,457	£108	N.a.

No site estimate for the River Lune was produced because of bias in the sample of users. Only anglers who submitted returns to the North Water Water Authority could be contacted. Moreover the total population of Lune anglers could not be determined from Water Authority records. It was therefore not appropriate to produce a site estimate by scaling the sample.

Using a discount rate of 10% and a time horizon of 10 years Consumers' Surplus was capitalised and added to Economic Rent to generate estimates of Total Net Economic Value. The estimates are given below:

Table 2-3 Net Economic Value for the Wye, Mawddach, Tamar and Lune

River	Capitalised Consumers' Surplus	Economic Rent	Net Economic Value
Wye	£28,288,507	£19,906,575	£48.2m
Mawddach	£ 9,515,225	£ 688,173	£10.2m
Tamar	£33,174,704	£ 979,815	£34.2m
Lune[13]	£ 3,101,075	£ 1,239,432	£4.3m

These results, if reliable, do not lend support for the Copes and Knetsch view that only incidental amounts of consumers' surplus will be realised in privately owned fisheries.

Radford et al (1991) in a study for the Ministry of Agriculture Fisheries and Food sought to estimate the market value of GB salmon fisheries and more importantly the sensitivity of market values to changes in the characteristics of fisheries. With respect to the market value of fishing rights in England and Wales owners themselves (rather than estate agents) were asked to estimate the market value of their own fisheries. Rod fishery owners were identified through riparian owners' and fishery owners' associations, lists held by the NRA, regional angling guides, tourist publications, magazine advertisements and angling guides In addition to the potential sale value of each beat, owners were asked about the characteristics of each beat. Beats were described in terms of length; whether single or double bank; the number of named pools; rod limits; 5-year average salmon and sea trout catches.

Economic Rent was estimated for each of the principal rivers in England and Wales[14] for which 3 or more valid responses were obtained from owners. This was done by the using the sample data on the market values and salmon catch to estimate a per salmon value for each river. The sample per salmon values were then scaled using the river's recorded five-year average salmon catch derived from MAFF data. Unfortunately, for some rivers the recorded five-year average catch for the entire river was less than total catch from those owners returning a questionnaire.

[13] Based on sample, no scaling.

[14] Defined as rivers with more than 30 salmon caught per season

This was a particular problem in the North West Region and for this region some estimates of total value would have been excessively inaccurate and are not produced.

Table 2-4 Estimated Market Values for Individual Rivers in England & Wales

NRA Region	River System	River 5 yr avg. catch	Estimated value [15]
Northumbrian	Tyne	869	£2,688,000
NorthWest	Derwent	902	£2,936,000
	BorderEsk	188	n.a
	Lune	758	n.a.
	Ribble	469	£1,086,000
Severn-Trent	Severn	1,126	£1,215,000
SouthWest	Exe	705	£3,198,000
	Fowey	299	£2,099,000
	Lyn	97	£488,000
	Tamar	669	£5,181,000
	Taw	165	£1,124,000
	Teign	181	£873,000
	Torridge	60	£1,701,000
Welsh	Dee	627	£3,507,000
	Teifi	962	£2,156,000
	Tywi	864	£3,070,000
	Usk	652	£5,256,000
	Wye	3,666	£28,894,000
Wessex	Hamp.Avon	752	£4,091,000

Statistical analysis of the per salmon market values (values per unit of average salmon catch) calculated for the survey records revealed that within each region tested there were no significant differences between the mean per salmon values for each river for which data were available. This was a surprising result particularly for Wales where the Wye was felt to be characterised by better quality fisheries and higher per salmon values generally. Certainly in a previous study (Radford 1984) estate agents felt fisheries on the Wye commanded a premium. This finding suggests that within each region the wide range of per salmon values observed (£230-£40,700 in the Welsh region, for example) reflects a variety of attributes such as the level of catches, scenic beauty, accessibility etc, acting largely independently of the 'name' of the river. The regional mean per salmon values calculated from the sample data are given below

Table 2-5 Observed Regional Mean Per Salmon Fishery Values in England & Wales

NRARegion	Respondents	Mean per salmon value
Northumbrian	8	£5,495
NorthWest	25	£7,663
Severn-Trent	4	£1,083
Southern	2	£16,070
SouthWest	50	£10,495
Welsh	83	£9,199
Wessex	7	£5,265
Yorkshire	1	£15,833
All	**180**	**£8,960**

[15] At current prices. All original estimates of value were at 1988 prices and not the year of publication

Regional estimates of total market value were made by scaling up the aggregated sample data on value (not the mean per salmon value) for the region by the total reported 5-year average salmon catch for all the principal rivers in the region (calculated from MAFF statistics for 1984-1988). For example; 83 survey records were obtained for the Welsh region, giving an aggregate estimated market value of £15,666,091 and a total 5-year average salmon catch of 2,833. The reported 5-year average for all the principal rivers over the same period was 8,759 salmon, therefore the estimated total market value of salmon fisheries in the Welsh region in 1988 was 8,759/2,833 x £15,666,091 = £48,436,035[16]. The regional estimates are given below with the number of respondents per region in brackets

Table 2-6 Estimated Market Values of Regional Salmon Fisheries in England & Wales

NRA Region	Regional 5-yr avg.	Estimated value
Northumbrian (8)	1,406	£8,190,000
North West	3,627	£19,800,000
Severn-Trent (4)	1,126	£1,215,000
Southern	989	£9,827,000
South West	3,032	£23,680,000
Welsh	8,759	£48,436,000
Wessex	1,067	£5,152,000
Yorkshire	65	£1,029,000
Total (180)		**£117,329,000**

Based on the rod catch between 1984 and 1988, the estimated 1988 total market value of the rod fisheries in England and Wales at current prices is **£117,329,000.** This represents the estimated total capitalized economic rent in the recreational fisheries in England and Wales and hence an approximation to their total capitalised economic rent.

With respect to market values in Scotland, Radford et al used anonymised data on Scottish rod fisheries provided by Mackay Consultants (Mackay 1990). Mackay Consultants had distributed questionnaires to a stratified random sample of rod fishery proprietors and managers. They obtained 95 responses, which they took to be representative of rod fisheries throughout Scotland. Of the 95 responses, 40 gave both an estimated value and the 5-year average salmon catch. The mean per salmon value calculated from these survey responses was £5,571. That this figure is lower than the equivalent mean for England and Wales would be expected given the higher levels of catches in Scotland (i.e. the value per fish should decline with greater abundance).

An estimate of the total market value of rod fisheries throughout Scotland was made by scaling up the aggregate data on value by the total reported 5-year average salmon catch for the whole of Scotland (calculated from DAFS statistics for 1984-1988). The 40 survey responses gave an aggregate estimated market value of £47,282,000 and a total 5-year average salmon catch of 8,602. The reported 5-year average rod catch for the whole of Scotland over the same period was 75,512 salmon, therefore the estimated total market value of the rod fisheries in Scotland in 1988 was 75,512/8,602 x £47,282,000 = £415,061,000.

[16] At current prices

Assuming that the survey data were representative and that the published catch figures were accurate, the total capitalized economic rent in the recreational fisheries in Scotland, in 1988, was estimated to be **£415,061,000**.

Ecotec (1994) in a study for the Department of the Environment suggested that for brown trout fisheries in upland areas conservative estimates of capital value might be £11,700 per Km for river fisheries and £3,500 per hectare for stillwater fisheries. These estimates were derived from essentially anecdotal information. They also tackled the question of Economic rent from examining the permit expenditure of anglers. They estimated an average expenditure per angler per year of £120 on trout fishing permits. For the UK as a whole, the annual market value was £58.6 million with fisheries in upland areas accounting for £32.8million per annum.

With respect to non-UK studies, Toumi (op cit), using angler expenditure on permits estimated the market value of New Brunswick Atlantic salmon sport fishery at $484,511,000.

2.4 Marginal Value of Fishing Rights

Since the 1880's the Government of New Brunswick in Canada has been auctioning off various stretches of the Miramichi and Restigouche salmon rivers for sport fishing. Gillen and McGaw (1984) estimated marginal values using these lease bids and available lease characteristics such as mileage, maximum number of rods per day, maximum number of rod-days per season, maximum number of rods per season, actual number of rod days, total catch of salmon and grilse. Some variables, such as the length of the stretch of river and the maximum number of rod-days mileage, had no significant impact on the value of the leases. They found that a 10% increase in average catch per day would increase lease values by 4.65%. They noted some differences between the two rivers. A 10% increase in catch increased lease values on the Restigouches by only 2% whereas Miramichi values would increase by 6%. Catches on the Restigouches are 30% greater than on the Miramichi and these differences are consistent with economic theory, which would predict a higher marginal WTP on the Miramichi.

Radford et al (1991) examined the sensitivity of market values to changes in the overall 5-year average salmon catch. Cross sectional data for individual beats was used in a multiple regression analysis. The dependent variable was the capital value of the beat, while the following independent variables were considered: five-year average salmon catch, 5-year average sea trout catch, rod limit, number of named pools, and dummy variables for single or double bank beats. The 5-year salmon average was the variable of principal interest and its statistical significance was an important consideration in selecting between estimated relationships.

Both linear and non-linear relationships were examined and goodness of fit was assessed by inspection of the residuals plots. A double-log functional form was considered to be theoretically preferable to a linear form; moreover, the double-log form gave normally distributed residuals, which the linear form did not. Non-significant variables were eliminated in a stepwise procedure to arrive at a final multiplicative regression equation which included the 5-year salmon average and the number of pools as independent variables and 'double bank' as the dummy. The regression parameters are listed below.

Table 2-7 Model for Valuation of Salmon Beats

Variable	b	se b	T	sig T
log salmon average	0.547	0.062	8.82	0
log no. pools	0.423	0.096	4.424	0
double bank dummy	0.337	0.138	2.445	0.016
(constant)	1.55	0.173	8.963	0
adjusted R2 = 0.564, standard error = 0.811				
F = 70.39, sig F = 0.000, (n = 162)				

Source: Radford (1991)

It is possible to seek to derive either an estimate of the ratio of the percentage change in total value to a percentage change in average catch (i.e.. the elasticity of value with respect to catches), or the absolute change in value that would result from a unit change in average catch (i.e. a marginal value per fish).

For clarity of exposition and interpretation it is preferable where possible to concentrate on the former, since in non-linear relationships the marginal value per fish depends on the size of the average catch. The above non-linear functional form that best fitted the data has the considerable advantage that the responsiveness of market values to changes in catch is a constant (equal to b). On the other hand, the estimated relationship suggests that the marginal value per fish varies with the level of the catch (and the magnitude of other variables in the equation) and would need to be evaluated at the mean values for the variables in question. The results suggest that a 10% increase in the five year salmon average would increase market values by 5.47%.

MacMillan and Ferrier (1994) developed a bioeconomic model for estimating the benefits of acid rain abatement to salmon angling in Galloway, Scotland. By combining outputs from MAGIC (a model for predicting future water chemistry) and market data they predict the economic benefits of acid rain abatement to the rod fishery. They assume that all the gains from improved catches will be captured by owners (i.e. consumers' surplus will be unaffected in the long run). Using the estimated elasticity of value with respect to catch of 0.547 (as estimated by Radford, above) they are able to predict percentages changes and convert these into absolute values for Scotland using the Mackay per salmon value of £5,571. They ran the model with three acid rain deposition scenarios: Constant 1988 levels, 60% reduction by 2003 and a 90% reduction by 2008. Their model predicts relative modest changes in market values, simply because acidified waters make little contribution to the total Galloway salmon fishery catch.

Gibb Ltd (1999) in a study for the Environment Agency assessed the economic impact of a change in the Net Limitation Order for the Lune. A Gibb survey of owners identified a per salmon value of £5,500 and this yielded a capital value of £6.6m on the basis of an average catch of 1,200 salmon. By annualising the capital value, the annual flow of economic rent is estimated to lie between £300,000 and £500,000. Contingent Valuation was used in estimating a mean consumers' surplus of £10 per trip. Given 14,000 fishing days, total annual consumers' surplus was between £70,000 and £210,000.

3 SAMPLING AND SCALING

3.1 Introduction

The remit suggests the following categories of fishings:
- Riverine migratory salmonid
- Riverine trout
- Riverine coarse
- Stillwater migratory salmonid
- Stillwater trout
- Stillwater coarse
- Coarse canal fisheries

Whilst there are substantial difference between these fisheries it is still possible to generalise about how to approach the problem of estimating aggregate values for England and for Wales. It is our view that there were a number of potentially worthwhile approaches and these are essentially complementary.

Option 1 Indicative market values may be obtained through systematic monitoring of transactions in fishing rights as reported in the angling and other specialised press. In addition, some estate and sporting agents may be willing to provide details of past transactions in which they have been involved. With a sufficiently large number of observations, extra sample data (such as catch, bank length, and number of rods) would then be used to produce estimates at the required level of aggregation (e.g. individual rivers, stillwaters, canals or regions such as England and Wales). Unfortunately, rod fisheries are very heterogeneous and, within any given time period, there are few transactions relative to the extent of heterogeneity. Summative sample statistics (e.g. mean value per fish) would have unacceptably high standard deviations and particular categories of fishings and/or regions would almost certainly be under-represented. Information could be collected on contemporary market transactions but only for the purpose of supplementing other data and testing the predictive ability of functional relationships produced for Objectives 3 and 5 above

Option 2 A second approach is to employ estate agents to estimate the expected market value of a carefully selected sample of fisheries. River/regional estimates can then be produced by scaling with appropriate extra sample data. The reliability of this approach depends on the professional competence and experience of individual agents, a dimension over which we have neither control nor independent observation. Individual agents may only have experience of local or particular categories of fishings and a substantial number might be required to generate sufficient coverage of all categories of fishings. Many agents would be required to ensure that all categories of fishings were adequately represented.

Option 3 A third option is to carry out a large sample of owners inviting them to estimate the market value of their own fisheries**.** Subject to a satisfactory response rate, this may provide a good coverage of the required strata (types of water, species type, and geographical area). In the same way that house owners are generally aware of the re-sale value of their own property, fishing owners, clubs, syndicates, associations are probably capable of providing acceptable estimates of current market values.

The preferred option is the large sample of owners. However, in common with the first and second options, the requirement to produce aggregate estimates (e.g. separate estimates for

England and for Wales and for types of water and types of species) introduces a scaling problem. The implications of this are briefly considered in Section 3.3 below.

3.2 Sampling and Processing

3.2.1 Introduction

A key element in the project is sampling. The sample data generated for the purpose of satisfying objective 2 should enable the estimation of implicit price functions. It was important therefore to establish the characteristics that should appear in the implicit function and collect the appropriate data. If data on an important variable were not collected the reliability of the estimated function could be compromised. An added complication is that the study requires implicit price functions for separate categories of water type and species type. A prior knowledge of the determinants of the price of fishing rights for each category (as defined in the proposal) is thus required before a questionnaire can be constructed and piloted. It was therefore necessary to use estate agents, angling and owners associations to ensure that the relevant data for each category were collected.

3.2.2 Questionnaire Designs

The requirement to produce estimates of the value of fishing rights and to identify the determinants of value for a range of fishery types (Riverine migratory salmonid, trout, coarse, stillwater migratory salmonid, trout and coarse, and canal coarse fisheries) requires a large number of responses appropriately distributed across the fishery strata. Ignoring canal fisheries, and anticipating a response rate of 30% (after reminder), the target distribution of questionnaires was as follows:

Table 3-1 Target Distribution of Questionnaires

River Fisheries	Mainly salmon and/or sea trout fisheries	350
	Mainly trout fisheries	350
	Mainly coarse fisheries	350
	Total	1,050
Small Stillwater Fisheries	Coarse	500
(up to 2h.a.)	Trout	200
	Total	700
Large Stillwater and Lake Fisheries	Coarse	500
	Trout	200
	Total	700

Some work has been undertaken in enumerating and classifying inland fisheries. (See Hillary, Fitzgerald, and Aprahamian, 1998) With respect to rivers, the Agency has published information on river lengths, fishable lengths and the type of fishing undertaken. Similar data exists for stillwater fisheries such as the number of stillwaters and proportion fished. This information is also available disaggregated to the level of the individual regions. We were not however interested in sampling explicitly to control for regional differences.

The above distribution of questionnaires, or indeed random or any form of sampling, is readily achievable if one has a database of fishery characteristics and the names and addresses of owners. Moreover, with prior knowledge of the characteristics of fisheries, separate questionnaires can be produced for each type of fishery. This simplifies questionnaire structure by reducing the filtering required to guide respondents to questions relevant to their fishery. Such a database does not exist, though the Environment Agency has some lists of fishery owners, particularly owners of riverine fisheries. In the past, the Agency has been able to provide researchers with owners contact addresses. It became clear however that the Data Protection Act and its revisions now preclude the Agency from assisting in this way.

It was necessary to assemble a data base from a variety of sources, purchasing information where necessary, such as, Orton's "Where to Fish", Agency Guides to local fisheries, Stillwater Fisheries Associations, lists of Angling Clubs and Associations. Inevitably, this introduces a bias of some sort in the sample, since fisheries that are not advertised have no chance of being included in the sample. It is thus possible that very exclusive and very poor fisheries are excluded and we suspect that proportionately more poor fisheries are excluded. A database constructed in this way also has variable information about the characteristics of fisheries. The only characteristic that could be used to partition the database was whether the fishery was riverine or stillwater. We therefore produced separate riverine and stillwater questionnaires.

Whilst compiling the database of owners, it was learned that HCC Publishing were also compiling a directory of several thousand fisheries in England and Wales. HCC were about to mail a final mail shot to fisheries in their database confirming the details they had previously supplied to HCC. Owners have a strong incentive to provide detailed and accurate information about their fisheries. Whilst the directory had no information about the market value of fisheries it contained very detailed information about fishery characteristics, and it was agreed that (for a fee) HCC would include some supplementary questions on market value in their mailing to contributors. (See Appendix 3.1 for copies of the HCC questionnaire with supplementary questions). We would then have access to the HCC fishery characteristics data matched to the market value data. The HCC questionnaire with supplementary questions was piloted on 12 owners and adjustments made. HCC then mailed the questionnaire to several thousand fisheries addresses held on their database. Unfortunately, it later transpired that an unknown yet probably significant proportion of HCC questionnaire were wrongly addressed and did not reach the intended fishery owners. This misdirection may help to explain why only 232 owners responded. Unfortunately owners were reluctant to answer the questions on the value of fishing right and of the 232 that responded only 123 provided useable information on the value of fishing rights.

Additional survey work on both riverine and stillwater fisheries was undertaken to supplement the first set of responses obtained. Two questionnaires were devised embracing stillwater coarse, trout and migratory salmonid fisheries and riverine coarse, trout and migratory salmonid fisheries (see Appendices 3.2 and 3.3). These were mailed to a total of 1606 fisheries, being sent the appropriate questionnaire type where it was possible to identify their type. Questionnaires were mailed with a FREEPOST return-addressed envelope and also a reminder letter was sent out to non-respondents. In total 189 responses for individual fisheries to the stillwater questionnaire were obtained along with 149 responses to the riverine questionnaire. These 337 individual responses were sent by 219 separate fishery owners or leasees.

The combination of HCC data and the later surveys produced the following useable responses with market values; however even then there were problems of missing values in key fields such as length/area or catch. Thus the models estimated do not necessarily involve all the useable responses. The total useable responses are given below with number of HCC useable responses in brackets.

Table 3-2 Total Usable Responses

Riverine		Stillwater	
Coarse	38 (4)	Coarse	140 (69)
Migratory salmonid	58 (9)	Migratory salmonid	2 (2)
Trout	31 (5)	Trout	65 (21)

3.2.3 Survey of Canal Fisheries

British Waterways (BW) control virtually all the canal fisheries in England and Wales. They set their fishing rentals at competitive rates working on a ratio of market capital value to annual rental of 12. With the cooperation of BW the intention was to use secondary data held by BW to derive total and marginal values. BW provided angling schedules, however their database had insufficient detail on the physical characteristics of canal lets. A telephone survey was initiated to determine characteristics. During the initial stages of the telephone survey it became apparent that this activity was now in breach of the Data Protection Act.

In conjunction with a BW annual Customer Feedback Survey of leasees, a questionnaire was mailed to 430 angling clubs and 219 responses relating to separate fisheries from 195 individual leasees received (see Appendix 3.4 for a copy of the questionnaire**)**. Questionnaires were mailed with a FREEPOST return-addressed envelope and a reminder letter was sent out to non-respondents.

3.2.4 Questionnaire Processing

Data from the four surveys was entered using Microsoft (MS) Access to create four basic databases; The HCC Survey; the River Fishery Survey; The Stillwater Survey and The Canal Survey. These were then transferred from MS Access to MS Excel for further processing.

3.2.5 Supplementary Data

After the transfer to MS Excel, the completed data in the Access databases was supplemented by information on the market size i.e. the population in the area of the fishery. For each fishery grid references were established. This was achieved either by using a postzone/grid reference conversion programme (The Central Postcode Directory (1998)), the GIS package Autoroute (NextBase(1993)) or, when both methods failed, OS maps. The Small Area Census program (Census 1991 on CD Rom) was then utilised to establish populations within 5km, 20km and 50km of the fishery. The procedure followed is detailed in Appendix 3.5. The data quality is slightly impaired by census age but in general, the derived data is both excellent and unique. The time cost was, however, substantial.

3.2.6 Supplementary Data from Telephone Canvas

During the modelling phase of the trout fisheries it became clear that some of the near significant variables were actually acting as proxies for the fish quality. After some debate it was decided to try to quickly supplement the data set by telephone and data on number and weight of fish was added to 13 returns. The telephone canvas also provided an opportunity to confirm valuations. Worryingly this suggested that a substantial number of returns may contain significant errors and consequently, that further work should probably be carried out at a later date.

3.2.7 Final Data Files

The final data processing stage required the incorporation of the relevant river data from the HCC survey into the River Fishery database and the stillwater data into the stillwater database. Because the questions asked varied this required selection of data items. It should be noted that some data, regarded as potentially important, was not available from the mixed survey. In these cases Missing Value identifiers were simply added.

On the basis of the responses in the questionnaires the combined databases were then split by species type to form the following 6 data sets:

1 Migratory salmonid
2 Riverine trout
3 Riverine coarse
4 Stillwater trout
5 Stillwater coarse
6 Coarse canal fisheries

These six MS Excel data files were then read into SPSS and saved in SPSS format for the modelling stage. SPSS was chosen because of its excellent routines for dealing with missing values, although MicroFit also later supplemented it for tests between non-nested specifications.

3.3 Scaling Sample Data

3.3.1 Scaling for Migratory Salmonid Fisheries

Estate agents calculate the potential market value of a salmon fishery by multiplying the 5 or 10 year average salmon catch for a given fishery by a value per fish. The per salmon value for a given fishery is adjusted to reflect all the features of that fishery.

If mean per salmon values derived from sample observations have acceptable standard deviations, the value of migratory salmonid fisheries for any given region/river/water space is simply the product of the appropriate mean per salmon value and the relevant recorded catch. In addition, from sample data other summary statistics such as value per fish caught/per rod/ per rod day can be calculated and scaled using other extra-sample data as are available.

3.3.2 Scaling for Trout and Coarse River Fisheries

Estate agents occasionally value trout fisheries on the basis of £x per metre of riverbank. Regional/river values may be obtained by multiplying the average £x by the total bank length. Other summary statistics such as value per fish caught/per rod/ per rod day can be calculated and scaled using extra-sample data. Using value per fish facilitates comparison with salmon fisheries; however national data are not available on trout and coarse fish catches

3.3.3 Scaling for Trout and Coarse Stillwater Fisheries

There are no rules of thumb for valuing coarse fisheries. Sample data can be used to calculate value per fish caught/per rod/ per rod day, which can be scaled, using such extra-sample data as is available. Alternatively, if the area of the fishery is found to be a better estimate of the value of a fishery then that can be used. Value per fish has the advantage that it facilitates comparison with other categories of fisheries. As with river fisheries, the quality of extra sample data is an important determinant of the reliability of scaled estimates of value. In 1998 a survey of fishing waters was conducted by the Environment Agency (Hillary et al (1998)) and we gained access to the original data. Despite our very major concerns on accuracy this did at least provide an indication of the length of rivers fished by type of fish and area of still waters fished by size by region of England and Wales. It does not however distinguish between trout and coarse stillwaters.

A major problem is the value per acre decreases significantly as the size of the stillwater increases. Our sample is predominately small commercial fisheries which will have a relatively high value per acre compared to the value per acre of large lakes such as Windemere or Bala Lake. The value of a fishery is, at least in part, a function of the number of anglers it can accommodate. Because "on water" density (from boat) is very small, the key factor is bank length, which is a factor of the root of the area[17]. In addition because irregularities on the bank (inlets and peninsulas) have a proportionately greater effect on small areas it is clear that scaling by total acreage for England and Wales might well seriously overestimate the value.

The procedure adopted in Section 5.3 for stillwater was as follows:

1. The value per acre was calculated for each of the defined size categories by fishing type (coarse or trout).
2. The ratio of number of coarse to trout fisheries by size category was calculated.
3. The number of coarse and trout fisheries was estimated by size category for England and Wales separately using this ratio.
4. The total value by size category by fishing type was estimated for England and Wales. It should be noted that the number of observations for Wales for type and size category was not adequate to provide reasonable estimates of mean values per acre.
5. The values by size category were aggregated to give estimates of the total value of each type of stillwater fishery in England and Wales.

3.3.4 Scaling for Canals

The Waterways Board rents bank lengths to clubs by the metre, with rents determined by what the market will bear. Fished lengths were available from the Environment Agency. The market value was obtained for the total rents by multiplying by a factor of 12 implying that the Waterways Board is just meeting the Government's target rate of return of 8% for commercial activity.

[17] For a circle Radius = Sq. root(Area/π)and circumference = 2π*radius

4 DETERMINANTS OF THE VALUE OF FISHING RIGHTS

4.1 Introduction

The core of this research is the relationship between the economic rent derived from an inland water resource (river or stillwater) and the characteristics of that resource such as size, location, amenities and catch. With sufficient sample data on market values and/or rents associated with the characteristics of a fishery an 'implicit price function' can be estimated

$P_f = f(C_1, C_2, C_3, C_4, C_5, \ldots\ldots, C_n, v)$ where:

P_f is the market price
$C_1 \ldots C_n$ represent observable characteristics of fisheries

and v is a term that represents the effect of unspecified, possibly unique, features of a site.

From theory and the literature depending on the quality of the sample data, implicit price functions can be estimated for the various categories of fisheries. In a linear form such as the equation above, the change in market value due to a given change in any of the characteristics would be the value of the relevant coefficient itself. If one of the variables was catch per angler day (in lbs) and the coefficient was 3000 then an increase of 2lbs would increase the market value by £6,000. In contrast, the ratio of percentage change in market value to the percentage change in catch (the elasticity of value with respect to catch) depends on the levels of average catch and value.

Our expectation is that the law of diminishing marginal returns operates with successive increases in independent variables (eg catch) resulting in progressively smaller increases in value. This suggests that the relationship between fishery values and characteristics is non-linear with marginal values depending on the magnitude of the independent variables. Marginal values will thus vary from fishery to fishery and for a given fishery over time as its average catch changes. Economic theory would thus predict that non-linear functional forms producing constant elasticity and variable marginal values would probably better fit the data than linear forms that have constant marginal values and variable elasticity. The exact form of the function will be discussed later but it should be noted that there is no *a priori* reason that specifications for the different kind of fisheries will be identical.

The parameter coefficients of the resulting models provide estimates of the sensitivity of price to changes in the characteristics. Provided the “national” values of these factors are known then “national” fishery values can be estimated. As importantly, it may be possible to estimate the effect changes in the value of the national resource under different policy options. For example amongst the characteristics it is assumed that a catch variable will be significant since catch is the main characteristic which owners and management authorities seek (at least indirectly) to influence. If we can assume that the benefits in the economic value arising from such changes at a site level are reflected in equivalent changes in the aggregate then benefits can be matched against the cost of implementing the policy option. However if the demand for “fishing” as a national recreation is independent of the fish catch then any effects at site level will simply be transfers of value from other sites. Thus if salmon catch on one river increases then that may well reflect an increase in value of these fisheries but at the expense of the value of its competitors on other rivers. This could well imply a zero or minimal impact in value at the national level.

4.2 Modelling Methodology

4.2.1 Demand Factors

The factor that is to be explained by the model is in the first 5 cases (Migratory salmonid, Trout Rivers, Coarse Rivers, Trout Stillwater and Coarse Stillwater) the Value of the site as estimated by the respondent. In the case of canals the dependent variable is the annual rent. The factors that were thought to determine these values can be classified into 4 general types, Physical characteristics, Fishing Quality, Amenities Provided and Economic Factors. Within these four types there are a number of characteristics which typically are as follows:

- Physical: Length, Width (Area), Depth, number of "spots" (pegs, pools, swims), Urban/ Rural, both banks
- Fishing: Average Number Caught, Average Weight Caught, Maxima, Species, Methods Allowed (fly, bait, spinner), Keep policy (e.g limits)
- Amenities: Parking, Walking distance to "Spot", Shelter, Boats, Ghillies, Refreshments, Other Activities (Could be negative effect e.g canoeists)
- Economic: Prices, Adjacent Population (<5km), Population within 30 mins (<20km), Population within 1 hour (50km).

In some cases the data also includes information on numbers fishing (which gives revenues) and costs. Since the marginal cost of an angler is zero it is assumed that the price has been adjusted to maximise revenue and that the "spots" represents the long term optimal numbers for that fishery. Similarly it is assumed that the costs are manifest in the amenities of the site and the quality of the fishing. Neither angler numbers nor costs therefore enter our models directly. In addition, there are no variables capturing the influence of alternative sites. It is certainly the case that all river and canal fisheries will have alternatives, in close proximity and possibly even adjacent. The theoretical influence of the proximity of an alternatives site on market values is somewhat uncertain. The broad generalisation is that higher market values would be associated with assets that have few alternatives. On the other hand, a highly valued river fishery may increase rather than decrease the values of adjacent fisheries. Similarly, if anglers spread their risks by moving between fisheries during their trips, the proximity of other stillwater fisheries may increase market values. One could seek to construct an independent variable based on the number of similar sites of comparable quality within a specified radius. Whilst seemingly precise, even this variable would not capture the location of alternative sites in relation to population centres. In effect it would be a major exercise to calculate what would be a very rough index that has no clear *a priori* impact on values. Consideration was given to constructing a variable based on owners' perception of alternative sites; however it was felt this would compromise the response rate of the owners' survey.

4.2.2 Selection of Characteristics

Clearly no useable model can contain 20 or 30 independent variables and equally not all these characteristics are in practice going to have a significant role in the valuation. The normal procedure, and that allowed here, is to look for variables that we are nearly 100% sure affect that valuation. Technically we are looking for instances where the true value of the coefficient is zero less than 1 time in 10 .

There is however a problem known as Pre-test Bias. Because the estimation procedure makes the prior assumption that excluded variables have no effect and that the stochastic term is small, if the model is estimated with a factor in, there is a bias towards inclusion whilst if it is estimated without a factor then there is a bias towards exclusion. This effect is heightened if there is collinearity amongst the regressors, for example where the Number of Pegs are related to Bank Length. The major effect is to make selection procedures based solely on statistical criteria (such as stepwise) subject to some doubt. In practice both prior views based on economic reasoning coupled and the "t" statistics were used to select the factors in the final models.

4.2.3 Selection of Functional Form

The simplest function to estimate is the linear:

$P_f = b_0+b_1C_1 +b_2C_2 +b_3C_3 +b_4C_4 +....+ v$ where:

P_f is the market price of fishing rights (dependent variable)
$C_1 ...C_n$ represent observable characteristics of fisheries (independent variables)
b_0 is a constant
$b_1 .... b_n$ represent the independent variable coefficients, and
v is an error term

This form assumes that the effects of each characteristic are additive. Thus, for example, the addition of an amenity such as a café is assumed to add £Xk, wherever and whatever the

$$elast_i = b_i * \frac{\bar{C}_i}{\bar{P}_f}$$

values elsewhere. As stated above, an important additional consideration is the elasticity. This will vary upon the particular values of independents (characteristics), the resultant value of the dependent and the parameter coefficient. By convention we report at mean values:

where:

b_i is an estimated coefficient

$\bar{C}_i$ is the mean value of characteristics of fisheries (independent variables), and

$\bar{P}_f$ is the mean value of the market price of fishing rights (dependent variable)

Economic theory however suggests that another café at the same location would have a smaller effect (the law of diminishing marginal utility) and observation might equally suggest that the larger, more valuable the site the more valuable the café. Similarly psychological research suggest that elasticities are fairly constant over a range of different values. All these features can be captured in a multiplicative model of the form:

$P_f = \exp b_0 * C_1^{b1} * C_2^{b2} * C_3^{b3} * .... * v$

which by taking logs becomes:

$$Ln^{18}(P_f) = b_0+b_1Ln(C_1)+ b_2Ln(C_2)+ b_3Ln(C_3)+ b_4Ln(C_4)+ \ldots+v$$

In this case the elasticity is given by the coefficient b_i.

Collinearity is a major problem in hedonic price studies. Factors and amenities are often closely linked making it difficult to obtain an unbiased estimate of the effect of one alone. As an example the number of "pegs" (locations on a canal bank) will increase linearly with the length of the bank. If we model both together then the standard error of the estimate for both coefficients will be high and there is a strong likelihood of bias creeping into the coefficient estimates. It can be shown, however, that unless the correlation between the two is of the order of 0.97, deleting either variable will lead to greater bias. This was both another reason why we did not rely solely on t-statistics but also examined a third specification. This specification tried to explain the value per metre and is of the form:

$$(P_f /C_1)= \exp b_0 * C_2^{\,b2} * C_3^{\,b3} * \ldots * v$$

where C_1 is the length of the site in metres. It is not difficult to see that this amounts to imposing the restriction b1 = -1 on the more general multiplicative function and consequently assuming unit elasticity.

If one can assume this relationship then an easily estimable form is:

$$Ln(P_f /C_1) = b_0 + b_2LnC_2 + b_3LnC_3 + b_4LnC_4 +\ldots+v$$

4.2.4 Estimation of Functional Form

The estimation procedure adopted depends upon the assumptions made about the stochastic term v. The "normal" assumption is that the term is zero mean, normally distributed and that the most likely estimates are when its variance is minimised (i.e. when the distribution of the estimates of the dependent is similar to the distribution of the actuals). If the function to be estimated is linear then the Ordinary Least Squares procedure can be employed.

The assumption of normality is sometimes rather suspect. For example if we linearise a multiplicative function and make the normal assumptions about the stochastic term we are making the heroic assumption that the term in the original function is a unit mean exponential. Errors that will arise are likely to be small but the validity of resulting test procedures is brought into question. Ideally we should always test the estimated stochastic term for normality but the tests are both weak and suffer from pre-test bias. In these circumstances we have utilised the normal (simplest) methodology coupled with a strong regard to the underlying economics of fishing.

4.2.5 Testing Functional Forms

Assuming residual normality the standard approach to assessing the adequacy of a model is based on the size of the residual (or explained) variance compared to the overall variance. The

[18] Ln = natural logs or base e

usual measures are the Adjusted R-Squared or the F-Test. When we are considering models that are nested (i.e. that one model is a simpler version of another) then an increase in these measures is taken to imply a better fit and a more valid model. Alternatively we can utilise Wald tests to examine the change in fit for groups of variables or simple t-tests for single variables. The evidence (see Maddalla (1998)) suggests however that this approach tends to over-specify functions and that tighter criteria such as Schwartz's Bayesian Information Criterion should be utilised.

Models that are not nested and have different dependents (e.g P and Ln(P)) present particular difficulties. The normal approach involves incorporating the fitted values from one model into the other to see if the fitted values (the other model) adds any significant information. Appendix 4.1 provides an example of a test between a log-log and linear model of the values of the canal coarse fisheries.

4.3 Estimated Models

4.3.1 Migratory Salmonid

The literature review suggests that, if salmon are present in a migratory salmonid fishery then the key factor that determines the value of a salmon fishery is the number of salmon caught. Table 4-1 gives the mean and variance of the value per salmon (5 year annual average). The mean and range is almost identical to those given in Table 2-5 of this report, which were estimated from a different sample.

Appendix 4.2 provides details of the numerous models examined. The final model presented in Table 4-2 represents our views on the "best" as the mix of statistical explanation and economic knowledge discussed earlier.

Table 4-1 Mean and Standard Deviation of the Value per Salmon (VPS)

	N	Minimum	Maximum	Mean	Std Deviation
VPS	46	333.3	40,000	3401.2283	8687.6579
Valid N	46				

Table 4-2 The Model for Migratory Salmonid

	Unstandardized Coefficients Beta	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	6.896	1.483		4.652	0
Ln5S	0.598	0.125	0.558	4.781	0
PARK	0.52	0.347	0.175	1.498	0.142
LnP20	0.21	0.133	0.185	1.579	0.122

a Dependent Variable: LnVAL

The key variable is the 5 year average annual salmon catch [5S] This captures both the size of the site and the fishing quality and is the key determinant. The coefficient is consistent with the earlier study by Radford (1991) of 0.54. The key amenity variable is the ability to park close to the actual spot (PARK). This is consistent with leisure studies which have repeatedly shown the unwillingness of people to move any distance from their cars. The coefficient implies that running a road along the bank could increase the value of the site by 70%.

The population variable, P20 (population within 20 kilometres may stand as a proxy for property prices. However population pressure (density) and income in themselves, determine property prices. Because there were no returns from salmon fisheries in the South East this factor may well be less significant than in other models.

Table 4-3 provides the key statistics for the model overall.

Table 4-3 Migratory Salmonid Model Statistics

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.674	0.454	0.415	0.9117

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	29.07	3	9.69	11.657	0
Residual	34.912	42	0.831		
Total	63.982	45			

a Predictors: (Constant), LnP20, PARK, Ln5S
b Dependent Variable: LnVAL

The model only explains some 45% of the variance in property values. Although this is disappointing it is not out of line with Radford (1991) and Wattage et al (1997) who also found substantial unexplained variance. The reasons for this are discussed later.

4.3.2 Riverine Trout

The normal view is that the key determinant of the value of a trout river fishery is the size (length in metres). Table 4-4 gives the mean and variance of the value per metre.

Table 4-4 The Value per Metre (£PM) of River Trout Fisheries

	N	Minimum	Maximum	Mean	Std. Deviation
£PM	28	0.16	223.21	32.643	53.2273

Whilst the mean value is in line with newspaper reports of selling prices, it is on the low side. In part this reflects our decision to define any river on which there are both salmon and trout as a salmon river. This has a particular effect in Wales where the rivers classified as trout tend to be small and of relatively little value.

Once again a particularly noticeable feature is the range. Appendix 4.3 gives further details of the models for riverine trout examined. In this case our final model was chosen largely on the basis of economic knowledge; our feel and understanding of the market. In the initial models, based on the questionnaire data we were simply not producing reasonable models that explained more than a minimal amount of the variance. The modelling procedure did, however, expose the major omission of data on catches. As discussed in Section 3 it was decided, for this model, to supplement the basic data set with information on catches obtained from telephone interviews. It should also be noted that it was difficult to obtain sensible significant relationships with length and it was decided to try to explain value per metre. Table 4-5 gives details of the resulting model.

Table 4-5 Determinants of the Price per Metre of Trout River Fisheries

	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	-2.767	3.111		-0.889	0.408
LnFISHWT	1.561	0.632	0.55	2.469	0.049
LnWIDTH	1.289	0.507	0.621	2.542	0.044
LnWILDB	0.779	0.503	0.322	1.549	0.172

a Dependent Variable: LnVPM

As can be seen the weight of fish caught per angler day (FISHWT in lbs) is significant along with the width of the river in metres (WIDTH). The percentage of wild brown trout in the total trout catch (WILDB) is less significant.

Table 4-6 gives the key statistics for this model.

Table 4-6 Statistics for the Value per Metre of Trout River Fishery Model

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.915	0.837	0.756	0.834

ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	21.439	3	7.146	10.274	0.009
Residual	4.174	6	0.696		
Total	25.613	9			

a Predictors: (Constant), LnWILDB, LnFISHWT, LnWIDTH
b Dependent Variable: LnVPM

The explanation at over 75% is the highest of the models although this cannot be directly compared as the specification is different. We include the proportion of wild stock despite its lack of statistical significance for economic reasons. Naturally sustained rivers are cheaper to run and hence *ceteris paribus* more valuable.

4.3.3 Riverine Coarse

The key determinant of the value of a coarse river fishery was assumed to be the length (in metres). Table 4-7 shows the mean and variation of the value per metre (£PM) of this type of fishery compared to the equivalent measure for salmon and trout.

Table 4-7 Values per Metre for Coarse and Salmon Fisheries

	N	Minimum	Maximum	Mean	Std. Deviation
Coarse	34	1	227.27	45.4918	60.576
Salmonid	56	0.5	484.38	66.2995	84.2546
£PM	28	0.16	223.21	32.643	53.2273

These results suggest that, surprisingly, coarse fisheries are actually more valuable than trout.

Appendix 4.4 details many of the specifications tried in order to explain the value of a coarse fishery. The final model includes the key size variable, a "fishing quality" variable, the weight per angler day, and an amenity variable, adjacent parking. Table 4-8 gives the coefficients.

Table 4-8 Determinants of the Value of Coarse Fisheries

	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	1.867	1.632		1.144	0.266
LnLEN	0.637	0.211	0.42	3.018	0.007
LnWPAD	0.345	0.194	0.253	1.777	0.091
LnWIDTH	0.79	0.259	0.416	3.052	0.006
PARKING	0.964	0.493	0.29	1.955	0.065

a Dependent Variable: LnVAL

LEN is length in metres, WPAD is weight of fish caught per angler day (lbs) and WIDTH is width in metres. In this model all the coefficients are significant at the 10% level. It appears that both coarse and trout anglers place quite high value on fishing big rivers and, particularly noticeable is the value placed on being able to park close to the actual fishing. This figure implies parking more than doubles the value of a site (262%). Table 4-9 provides the key statistics.

Table 4-9 Key Statistics for Model of Coarse River Fisheries

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.811	0.658	0.59	1.0414

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	41.779	4	10.445	9.63	0
Residual	21.692	20	1.085		
Total	63.472	24			

a Predictors: (Constant), PARKING, LnWIDTH, LnEN, LnWPAD
b Dependent Variable: LnVAL

In this model we are explaining over 65% of the variance in values and we are confident that this is a real representative result.

4.3.4 Stillwater Trout

The key determinant in stillwater fisheries is likely to be simply the size. Table 4-10 gives the values per acre of the trout stillwater fisheries in England and Wales.

Table 4-10 Value per Acre of Stillwater Trout Fisheries

	N	Minimum	Maximum	Mean	Std. Deviation
Valuepacre (£s)	65	29	181,250	23,002.71	31,893.69

The mean is just under £23,000. Once again there is a high level of variance, with the coefficient of variation at about 1.4.

Appendix 4.5 provides details of many of the models tried. The model finally selected is given in Table 4-11 and utilises factors for the number of swims (SWIMS) and the weight of fish caught per angler per day (in lbs) WT

Table 4-11 Determinants of the Value of Stillwater Trout Fisheries

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	8.134	0.768		10.594	0
LnWT	0.662	0.262	0.383	2.528	0.018
LnSWIMS	0.608	0.17	0.541	3.566	0.001

a Dependent Variable: LnVAL

There is a high degree of collinearity between swims and size and the addition of size does not significantly increase explanation. The management of a stillwater by the creation of fishing areas will be significant in raising the value of the fishery. Table 4-12 provide the key statistics.

Table 4-12 Key Statistics for Model of Trout Stillwater

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.623	0.388	0.343	1.2167

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	25.374	2	12.687	8.57	0.001
Residual	39.97	27	1.48		
Total	65.344	29			

a Predictors: (Constant), LSWIMS, LWT
b Dependent Variable: LVAL

Once again the explanation is relatively low. The introduction of amenity variables such as ease of fishing, easy access to site, availability of boats, hard car-parking etc failed to improve the model. Population also failed to add anything to the model.

4.3.5 Stillwater Coarse

As with the trout the key variable is taken to be size. Table 4-13 provides information on the value per acre of coarse stillwater fisheries.

Table 4-13 Value per Acre of Coarse Stillwater Fisheries

	N	Minimum	Maximum	Mean	Std. Deviation
Valuepacre (£s)	130	26	750,000	62,928.47	121,122.39

The figures in this table encompass an extraordinary range from an incredibly low £26 per acre to an equally remarkable £750,000. It is not unreasonable to query if the respondents were able to accurately assess the value of their holding.

Appendix 4.6 gives details of the models tested. The model developed to fit this extraordinary range is given in

Table 4-14.

Table 4-14 Model of the Value of Coarse Stillwater Fisheries

	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	T	Sig.
(Constant)	8.124	0.532		15.276	0
LnSWIMS	0.853	0.14	0.505	6.109	0

a Dependent Variable: LVAL

In this model the only significant variable that could be found was the number of swims. The weight and/or number of fish, the amenities and the size of the stillwater all proved unimportant. The only other factor that showed any, albeit insignificant, effect was the local population size.

As might be expected the explanation from this model which is shown in Table 4-15 is relatively poor.

Table 4-15 Key Statistics in Coarse Stillwater Model

R	R Square	Adjusted R Square	Std. Error of the Estimate		
0.505	0.255	0.248	1.2001		
ANOVA					
	Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Regression	53.753	1	53.753	37.323	0
Residual	156.981	109	1.44		
Total	210.733	110			

a Predictors: (Constant), LnSWIMS
b Dependent Variable: LnVAL

Although the model is statistically very significant the explanation is very low at just 25%.

4.3.6 Stillwater Salmon

One respondent also offered salmon fishing along with trout. For the record the fishery had only 5 swims and was valued at £42,500 or £8,500 per swim. The mean for coarse fishing is £4,500 per swim.

4.3.7 Canal Fishing

Canal fisheries differ from river and stillwater in being in the ownership of the single organisation and rented to clubs. These rents are determined by full time professional staff and one might expect *a priori* less randomness. The dependent variable is rent per annum (as opposed to value) and Table 4-16 gives details on the mean and deviation of the rent/metre.

Table 4-16 Mean and Variance in Canal Fisheries Rent per Metre

	N	Minimum	Maximum	Mean	Std. Deviation
RENTPM (£s/m)	187	0.03	16.67	0.7298	1.556

This table shows a remarkable variance with a range from 3p per metre to £16.67 and a coefficient of variation of over 2. Appendix 4.7 gives details of the models tested. The model developed to explain this variance is given in Table 4-17. LEN is length in metres and PEGS is the number of pegs.

Table 4-17 Model for the Rent of Canal Fisheries

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.509	0.336		7.473	0
LnLEN	0.237	0.074	0.279	3.206	0.002
LnPEGS	0.514	0.094	0.476	5.458	0

a Dependent Variable: LnRENT

The key statistics of the model are given in Table 4-18.

Table 4-18 Key Statistics Canal Fishery Model

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.716	0.512	0.507	0.759

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	101.11	2	50.555	87.768	0
Residual	96.193	167	0.576		
Total	197.304	169			

An alternative linear specification which seems to explain more of the variation is given in Table 4-19 and Table 4-20.

Table 4-19 An Alternative Linear Model of Canal Rents

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
POP50	7.56E-05	0	0.167	3.32	0.001
LENGTH	0.315	0.022	0.737	14.624	0

a Dependent Variable: RENT
b Linear Regression through the Origin

Table 4-20 Key Statistics of the Alternative

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.832	0.691	0.688	1113.8

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	444,886,992.9	2	222,443,496.4	179.306	0
Residual	198,492,348.5	160	1,240,577.2		
Total	643,379,341.4	162			

To test which specification is better the data was imported into Microfit and the tests for non nested models with different LHS variables employed. The associated output is given in

Appendix 4.1. This clearly shows that the log-log model is the preferred specification despite its lower explanatory power.

A noticeable feature is the significant difference in coefficient values between the Microfit estimates and the SPSS estimates. This arises because for a number of sites the data on populations and/or pegs was missing and joint estimation required a common data set i.e. restricted to that data where both pegs and population data was available. The joint models were thus estimated from 157 observations.[19] Because of high collinearity between length and pegs the elimination of only 12 observations can significantly affect estimated values. It should be noted that increasing observations in the presence of collinearity will increase the accuracy of estimates.

The model estimated from the full set does not include any fishing, economic or amenity variables. This is both surprising and disappointing but may well reflect the surveyor rather than the demand. Pegs and Length are obviously closely correlated and the coefficients may well be biased. It is important therefore to ensure that both variables are included in any assessment of change (such as increasing re-opening canals).

4.4 Limitations and Validity of Results

Table 4-21 gives a summary of the models generated in the previous sections.

Table 4-21 Summary of the Models Generated

	Dependent Variable	Independents	Explanation
Salmonid	Value	Constant 5-yr average annual salmon catch Parking Local Population within 20km	45.4%
Riverine Trout	Value per metre	Constant Weight (lbs)of fish per angler Width (metres) Percentage of wild brown trout in catch	83.7%
Riverine Coarse	Value	Constant Length in metres Width Parking Weight per angler day (lbs)	65.8%
Stillwater Trout	Value	Constant Number of swims Weight per angle day (lbs)	38.8%
Stillwater Coarse	Value	Constant Number of swims	25.5%
Canals	Rent per annum	Constant Length (metres) Number of pegs	51.2%

The functional form, in every case, was log-log and in almost every case we were disappointed with the degree of explanation achieved. Hedonic models are traditionally very successful in explaining variations in the price of goods. Typically for a product like cars and housing we might expect around 75% to 80% of the variation to be explained by the characteristics. However, despite a large number of characteristics and an extensive model search, we were rarely able to explain much more than half of the variation in fishery values.

[19] Stepwise routines also work with a restricted data set and are thus less satisfactory.

Sadly most of the factors we had been informed were important proved to have an insignificant effect. Thus we had been told that sites relatively close to large populations would have higher value than those in remote areas, and, as a result, proceeded to build, at considerable cost, an extensive database of the populations around each site. The results, however suggest that the effects are at best marginal and in some cases local population size may actually cause a slight fall in value.

These results obviously require to be explained. In our view there are two linked problems. The first is that fishing is not about purchasing a product but rather about purchasing an experience. The characteristics of this experience are environmental factors such as quiet and scenery. Traffic on a canal, canoeists on a river or traffic on an adjacent road will have an effect as will surface vegetation at a canal watershed, or on the positive side, wonderful mountain air. Many of these are best found away from population centres and none of these can be easily captured in a database.

As an example we believe that fisheries have more in common with golf courses than houses. It is virtually impossible to explain the value of a golf course by measurable factors. All have 18 holes, sand bunkers, long holes, cut grass and clubhouses and yet some, often remote, courses have values 1000 times the value of others. The important factors are history and reputation, difficult if not impossible to capture in data form. In these circumstances it may be thought that to explain half the variance might be perfectly satisfactory.

The second linked problem is the valuations provided. If each site is unique, its value on the market is extremely difficult to ascertain. In these circumstances owners will base their valuations on only one or two auction values that may well be atypical. Part of our stochastic variance must therefore also be associated with errors in the valuation of the agents.

The third problem, which was clearly identified in the post questionnaire telephone survey, was simply serious errors in completion.

Given these uncertainties and the extent of collinearity we do not believe that our models are very robust or hugely reliable. In this work we have learnt that the factors which agents confidently believed determined value had little or no effect. This knowledge is in itself valuable. However we believe that the models do provide the best estimate of value that can be used to inform decision making. Examples of their use follow .

4.5 Use of Models

Table 4-22 provides estimates of the values for the different fisheries for a range of different values of the key factors. The final row gives the results from the mean values of these factors. These values are not identical to the means reported elsewhere because the models were estimated only from those observations where there was relevant data on the factors.

Table 4-22 Examples of Estimated Site Values from Alternative Factor Values

Species	v1	v2	v3	v4	Value £
Salmon	5yr catch	Park	Pop 20 mi		
Value	10	TRUE	100000		£73,914
	10	FALSE	50000		£37,991
	40	FALSE	250000		£122,038
	40	TRUE	20000		£120,775
	6	TRUE	200000		£62,991
Mean Value	*27.2*	*TRUE*	*144618*		*£145,294*
River Trout	WPAD lb	Width m	%wild	Length m	
Value	1.8	30	50	500	£132,820
	0.44	20	20	10000	£85,559
	0.18	4	100	5000	£4,665
	0.8	10	100	2000	£62,382
Mean Value	*0.383*	*14.82*	*63.6*	*7678*	*£88,521*
Coarse River	length m	wpad lb	width m	park	
Value	5000	2	10	TRUE	£30,171
	500	4	20	TRUE	£15,285
	1000	4	10	TRUE	£13,747
	2500	2	3	FALSE	£2,858
	250	8	2	TRUE	£2,025
	1000	8	10	TRUE	£17,460
Mean Value	*2578*	*7.78*	*24.03*	*TRUE*	*£63,191*
Trout Still	weight lb	swims			
Value	4	24			£58,923
	2	24			£37,239
	4	10			£34,603
	4	24			£58,923
	1	5			£9,068
	1	100			£56,047
Mean Value	*8.34*	*61*			*£168,983*
Coarse Still	swims				
Value	25				£52,559
	12				£28,103
	35				£70,032
	4				£11,009
	100				£171,478
Mean Value	*61*				*£112,485*
Canals	length m	pegs			
Rent p.a.	1000	100			£674
	500	500			£1,308
	5000	100			£987
	1000	50			£472
	100	10			£120
Mean Value	2000	100			£794
	3323	*135*			*£1,045*

A spreadsheet for use with the models is given in Appendix 4.8

5 TOTAL VALUE OF FISHERIES IN ENGLAND AND WALES

5.1 Introduction

In this section we attempt to assess the total value of fisheries in both England and Wales. The procedure we have adopted is to identify the value by the most important variable (catch or size) in England and Wales separately, and thence use key data on catch or acreage or river length to aggregate to all fisheries. This procedure relies on a number of assumptions, some more realistic than others. These may be summarised as follows:

1 The sampled fisheries are typical of all the fisheries.

As discussed in Section 3.1 questionnaires were sent to commercial fisheries and clubs and any private individuals offering fishing to the general public. This excludes private individuals who do not wish to advertise access to their fisheries. We believe that the range of values represented in the sample actually covers the values of this group, but it may also be hypothesised that this group of fisheries will have on average lower values (which would make the return from hire less than the inconvenience cost).

2 The whole length of a fishable river or stillwater as defined, is fished.

If significant stretches are unfished then the "value" is prospective not actual. If catches are important then expanding to the whole river will decrease the values of the other fisheries.

For stillwater, large lakes potentially offer very large areas for fishing. Particularly in remote areas, such as mid-Wales only a small proportion close to road access will in reality be utilised. Thus again the valuation here is "prospective" rather than actual, and the implication is that the actual values may be substantially smaller.

3 The mean value of the other factors in the sample is similar to the mean value of those factors in the population as a whole.

If a factor such as close parking is valuable then the proportion of sites in the sample with this characteristic must be typical of the population at large. It could however be hypothesised that a track to a fishing spot is more likely in commercial fisheries, and that consequently the sample may overvalue fisheries.

In general we worry that our respondents may, on average, represent the better well developed and consequently more valuable fisheries and that overall the procedure adopted here may well slightly overvalue inland fisheries.

5.2 Partition of England and Wales

To establish average values the data was partitioned. Because rivers often form the border and the border meanders (and in one case is isolated) we simply took mean values for Wales from sites within a defined grid box which consisted of well over 90% of Wales and less than 2% of England. This box was defined by Easting < 34000 and Northing between 17000 and 38000.

5.3 Value of Stillwater Fishing

As discussed in Section 3, the scaling up process required identification of value by size, type and country. The data underpinning these estimates is given in Table 5-1 to Table 5-5 with full details in Appendix 5.

Table 5-1 Value per Acre for Different Size Categories by Fishing Type

	Trout (£/acre)	Coarse (£/acre)
Ponds < 1ha (2.37 acres)	26,375	92,771
Small 1-2 ha	41,226	61,561
Medium 2-10 ha	21,743	35,502
Large > 10 ha	3,975	6,102

Table 5-2 Estimated Percentage of Trout 'v' Coarse Fisheries in England and Wales

		Trout	Coarse
Ponds	England	23%	77%
	Wales	33%	67%
Small	England	26%	74%
	Wales	60%	40%
Medium	England	31%	69%
	Wales	44%	56%
Large	England	63%	27%
	Wales	50%	50%

Table 5-3 Estimated Acreage in England and Wales by Size Category

		England		Wales	
Size category	Estimated Avg. Acres	Number	Acres	Number	Acres
Ponds	0.7	6,347	4,443	75	53
Small	3.5	3,930	13,755	125	438
Medium	12.0	1,675	20,094	23	276
Large	40.0	756	30,240	13	520
Total			**68,532**		**1,286**

Initial Source: Environment Agency

Table 5-4 Estimated Acreage by Type by Category in England and Wales

	England		Wales	
Water type	Trout	Coarse	Trout	Coarse
Ponds	1,022	3,421	18	35
Small	3,521	10,234	263	175
Medium	6,149	13,945	123	154
Large	19,112	11,128	260	260
Total	**29,804**	**38,728**	**663**	**624**

Table 5-5 Total Value of Stillwater Fishing by Type in England and Wales

	England		Wales	
Stillwater water type	Trout (£m)	Coarse (£m)	Trout (£m)	Coarse (£m)
Ponds	27.0	317.4	0.5	3.2
Small	145.2	630.0	10.8	10.8
Medium	133.7	495.1	2.7	5.5
Large	76.0	67.9	1.0	1.6
Total	**381.9**	**1,510.4**	**15.0**	**21.1**

5.4 Values for Moving Water and Canals

Table 5-6 gives the mean values for England and Wales for the 4 defined fishery types

Table 5-6 Mean Values for England and Wales by type

Type	Measure	England	Wales	Total
Salmonid	Value per salmon	£7,790.88	£9,950.58	**£8,401.23**
River Trout	Value per metre	£41.21	£21.22	**£32.64**
River Coarse	Value per metre	£49.64	£29.46	**£45.49**
Canals	Annual rent per metre	£0.73	£0.37*	**£0.73**

*Only one observation for Wales. Canals in general assumed to be similar to England

Table 5-7 provides key statistics on the total size of the national fishery

Table 5-7 Total Size of the Moving Water and Canal National Fisheries

Type	Measure	England	Wales	Total
Salmonid	Number of Fish	11,036	4,186	**15,222**
River Trout	Fishable Length (km)	4,425	2,258	**6,683**
River Coarse	Fishable Length (km)	13,820	690	**14,510**
Canals	Fished Length (km)	4,413	125	**4,538**

Source: Environment Agency

Table 5-8 provides estimates of the total value of these fisheries, based on the sum of estimates from the countries.

Table 5-8 Total Value of Moving Water and Canal Fisheries by Type

Type	Measure	England	Wales	Total
Salmonid	Value £m	86.0	41.6	**127.6**
River Trout	Value £m	182.0	47.9	**229.9**
River Coarse	Value £m	686.0	20.3	**706.3**
Canals*	Value £m	38.7	1.1	**39.8**
Total	**Value £m**	**992.7**	**110.9**	**1,103.6**

*Capitalised values are the rental value multiplied by a factor of 12.

5.5 Total Value of Fishing in England and Wales

Table 5-9 and Table 5-10 provides a summary of the estimated market capital value of fishing in England and Wales broken down by surface water type and by fishery type.

Table 5-9 Total Value of Fisheries in England and Wales by Surface Water

Surface Water		England	Wales	Total
Stillwater	£m	1,892.3	36.1	1,928.4
Moving Water and Canals	£m	992.7	110.9	1,103.6
Total	**£m**	**2,885.0**	**147.0**	**3,032.0**

Table 5-10 Total Value of Fisheries in England and Wales by Fishery Type

Fishery type		England	Wales	Total
Migratory Salmonid	£m	86.0	41.6	127.6
Coarse	£m	2235.1	42.5	2277.6
Trout	£m	563.9	62.9	626.8
Total	**£m**	**2,885.0**	**147.0**	**3,032.0**

The grand total is just over £3bn of which nearly £1.9bn (62.4%) is found in stillwater fisheries in England. Coarse fisheries account for 75% of the total value of fisheries in England and Wales. NOP (1994) suggested that there are some 2.3m coarse anglers who spent on average £45 per year on permits. Allowing for inflation this provides an estimate of permit spend of £123.6m. Our estimate of the value of coarse fisheries (river, stillwater and canals) is £2277.6 giving a rate of return of 5.4%, a figure quite comparable with the return on assets of comparable risk. Similarly our valuation of salmon fisheries is not out of line with Radford (1991) after allowance for declining salmon catches. Overall therefore we believe that these estimates are a reasonable approximation of real values in circumstances where owners have only a poor idea of the value of their own property.

6 HISTORIC TRENDS IN THE VALUE OF FISHING RIGHTS

6.1 Introduction

A declared aim of Module A is to evaluate the trends in the value of fishing rights, and to indicate the rate of change of values with a view to establishing a frequency for reviewing these values. Ideally, in examining temporal changes in the value of fisheries, or anything, one would wish contemporaneously to track the value of selected cases every few years. Of course, this option is not available and only an *ex post* examination is possible.

There are a number of *ex post* options. One could select a few individual examples of each type of fishery (e.g. a few trout river fisheries, a few coarse stillwater fisheries) and record historic market values at, say, two or five yearly intervals. This requires that the selected fisheries had been bought and sold every year or so, and that records of sale prices are available somewhere. Unfortunately, few *individual* durable items of any sort are bought and sold sufficiently regularly that values of individual items can be tracked over time.

Although individual items cannot be tracked, within a general product category there is often sufficient homogeneity that individual items can be grouped into a class or marque comprising almost perfect substitutes. For instance, cars, and leisure-craft and to a lesser extent, houses can be classified into such marques. In addition to being easily classified, every year at least some exemplars from each marque will be traded yielding market prices that can be used to generalise about trends in the class or marque. Moreover, within the general product category one can compare rates of price change between marques.

Fisheries are not traded regularly and historic data on selected *individual* fisheries are not available. One therefore has to think about forming groups of reasonably good substitutes, to be able to generalise. It follows that with a heterogeneous product category, such as recreational fisheries, the requirement is to establish many small marques to ensure sufficient substitutability within any given marque. Unfortunately, the smaller the marque the lower is the probability of an exemplar from that marque being traded in any particular time period. Moreover, one needs to collect, over time, market values for more groups. An additional problem is that, in any event, prices may not be systematically recorded in any form. If we are dealing with a heterogeneous product we need to have transactions being regularly undertaken and recorded. Fisheries are not regularly bought and sold and there is little to be gained by grouping fisheries into small classes or marques - historic observations are not available.

Increasing the size of the marques increases the probability of a transaction in an exemplar having occurred and finding some trace of it. Unfortunately, heterogeneity within the group increases with size reducing the reliability of generalisations drawn from observing changes in the value of the exemplars. The number of transactions being undertaken in fisheries cannot support subdivisions beyond the groups specified in the original remit: riverine coarse, riverine trout, riverine migratory salmonid, stillwater coarse, stillwater trout, stillwater migratory salmonid and canal fisheries.

Unfortunately, the heterogeneity within each of the groups above is so great that one cannot draw any reliable inferences about the group from an examination of the historical market values of a few exemplars. For example the knowledge that a good salmon fishery in Wales sold for £x reveals limited insights about the value of a second good salmon fishery elsewhere in England or Wales. In contrast, if we were told that a good two year old Rover car sold for £x we could generalise about other two year old Rovers in good condition. Because the two fisheries are essentially unique, additional information about the characteristics of the two fisheries (salmon catches, sea trout catch, scenic quality, management of the fishery, ease of parking, ease of fishing, timing of runs etc.) is required to draw inferences about their relative market values.

It is the degree of heterogeneity relative to the number of transactions taking place and being recorded that is the fundamental problem in evaluating past trends in the market value of fisheries. As we have seen, our cross-sectional analysis has generated sample means with very high coefficients of variation and market values that are hard to explain. This is why it is a major exercise to calculate the total value of salmon fisheries in say, Wales. If fisheries were more homogeneous and were regularly bought and sold one could easily estimate such total values and there would be no need for many elements of this study.

Because of the heterogeneity and the relatively few transaction, some commentators refer to rules of thumb rather than the value of individual fisheries. These rules of thumb, relate the value of the fishery to *one* of its characteristics. In the case of salmon, reference is made to the value per fish, or for some trout fisheries we refer to the value per metre. This is analogous to describing boats in terms of value per square metre of sail area, or cars in terms of value per foot in length. For commercial stillwater coarse fisheries there are not even crude rules of thumb with the value being determined by the accounts and the market potential.

In examining historical trends of fisheries one option is to focus on the rules of thumb and not individual fisheries, subject to such historic information being available. Even if good quality historic data were available on value per fish/per length of bank, we would however urge caution in using these ratios and offer the following observations. The relationships we have estimated from our cross-sectional data are non-linear. The implication of a 10% increase in catches producing a 5% increase in the value of the fishery is that the per salmon value declines. This is consistent with economic theory and is the reason why we observe lower per salmon values in Scotland and very high values in the South East and Southern Areas.

One might be tempted to infer that observed increases in per salmon values are indicative of a decline in fish stock abundance. On the other hand, we also have to consider the effects of the demand side. Other things being equal, an increase in the popularity of angling would increase per salmon values and vice-versa for a decrease in popularity. The actual change in value will depend on the interaction of both demand and supply side effects.

An added complication is that the demand for angling is not independent of supply conditions since the quality of fishing is a shifter of the demand for fishing. For instance, whilst a decrease in catches should increase per salmon values, the knowledge and experience of the declining quality of angling may induce a decrease in demand such that the per salmon value declines. In other words, by themselves, changes in ratios need to be discussed in the context of some knowledge of changes in underlying conditions. Theoretically, per salmon values can remain relatively constant even in the face of quite fundamental change in supply and demand characteristics.

6.2 Salmon and Trout

We decided initially to examine the available information of salmon and trout fisheries. We examined and recorded the salmon fishing prices as advertised in "Salmon and Trout" and the "Field" and picked up details on 53 fisheries between April 1990 and January 1999 (see Appendix 6). We also examined, below, some anecdotal commentary in articles about fisheries sales[20].

April 1993: A sample suggested £41 per kilometre for a canal coarse fishery to £248 per kilometre for a big salmon river.

March 1997: Estimates of per salmon values are:

1984 - £1176 - £3920 per fish
1988 - up to £65160
1990 - maximum £19,936 (average £11392 - £14,240)
1997 – up to £8,700

April 1997: In 1997 the value of a good trout river varied between £2.2 up to £6.8 per inch of riverbank.

May 1998: Values for Salmon fishing sold through Strutt & Parker over the past two years have ranged from £2,753 to £14,825 per fish.

Radford (1984) and Radford *et al* (1991) and this study have produced comparative historical data on per salmon values. We calculated a per salmon value for England and Wales of £8,400 and this was very similar to the Radford (1991) estimate of £8,960. We have to be careful in drawing conclusions based on this evidence alone. Looking back to the early 1980's, Radford (1984) reported much lower per salmon of £960, £1200, £1560, £3603. These were of the same order of magnitude as the values quoted above in *Salmon and Trout*, March 1997 for 1984.

Evidence would suggest that between 1980 and 1990 there was a substantial jump in per salmon values and little change between 1990 and 1999. The purpose of examining the trends in value is to indicate a frequency for reviewing these values in the future, and not to explain why they have changed in the past. This implicitly suggests that past changes in values can be a guide to future change. Of course, history may not repeat itself. The available evidence from per salmon values suggests values do change but the rate of change will vary over time. These conclusions were derived largely from comparisons of three cross-sectional studies of market values (1984, 1991, 2000). The available historic market data was inadequate (see Appendix 6) and it was concluded that little would be gained repeating this type of exercise for the other categories of fisheries.

[20] Values converted to 1999-2000 prices using the HM Treasury deflator series.

6.3 Monitoring Future Market Values

It is believed that market data can be an important indicator of economic costs and benefits. It is our view that the Agency might be unwise to devote resources to collecting and analysing actual transaction in individual fisheries. Our experience is that asking owners to value their own fisheries generates the large numbers of observations necessary to estimate the elasticity of values with respect to fishery characteristics. Indeed, this seems to be the only way that large numbers of observations on market values can be obtained. In housing research, contact with owners can be avoided because there are many market observations in the press and, there are a sufficient number of estate agents that could be surveyed to generate the number of observations required to estimate coefficients and elasticities. In recreational fisheries we do not have these options.

Generating these observations from owners can be problematic. First the Data Protection Act effectively precludes the Agency from supplying complete or stratified lists of owners and it is necessary to identify populations of owners from published sources. This inevitably creates a bias since compendia of fisheries usually only contain those fisheries that wish to attract visiting anglers. Very poor and very good fisheries are probably excluded, as well as fisheries retained for the exclusive use of syndicates, clubs, and individual owners. Second, our experience suggests that a postal survey may not be the most appropriate survey instrument to determine market values. Given the non-response rate and the relatively large number of 'unusual' market values, we suspected that many respondents were confused by the concept of current market value. Our suspicions were confirmed by many subsequent telephone conversations with owners, particularly trout fishery owners and secretaries of clubs renting canal fisheries. It was re-assuring to note that after a dialogue they were fully able to appreciate our requirements. We conclude that consideration should be given to using telephone surveys to generate large numbers of observations on market values.

Large numbers of observations on market values are required to estimate elasticities; however, elasticity coefficients appear relatively stable over time. For example, the estimated elasticity value for salmon catches in this study was very similar to the values estimated by Radford (1991). Given this and the problems of generating and analysing the required data, it may be appropriate to estimate elasticities only at 5-10 yearly intervals.

In our view, effort perhaps should be directed to regularly confirming *average* values such as value per salmon/ per metre of river/ per acre of stillwater. This is a task which specialist estate agents are best placed to perform. The agency should consider requesting that specialist agents and fishery consultants should (for a fee) submit an annual return on a range of average values for different classes of fisheries. It may also be appropriate to request a short commentary on their understanding of the causes of any notable changes.

It is beyond the scope of this study to consider the operational detail of such a scheme, though we strongly recommend that the Agency undertake a critical evaluation of this proposal.

7 CONCLUSION AND LESSONS LEARNED

There is an extensive, and largely North American, literature on the economic evaluation of fishery resources, but virtually all of this relates to the calculation of consumers' surplus in unpriced recreational fisheries. Almost all the inland fisheries of England and Wales are in private ownership and, apart from salmon fisheries, very little economic analysis has been directed towards these kinds of inland fisheries.

There is no reason to doubt the basic approach of asking owners to value their fisheries and to provide information on its characteristics. Indeed we believe that there is no alternative if large numbers of observations have to be generated. The decision to piggy-back on the HCC survey was, in retrospect, a mistake since many questionnaires were misdirected, whilst the opportunity to combine our surveys with the annual British Waterways Customer Feedback Survey was successful in generating a good response rate from those fisheries. The variability and doubtful quality of some of the survey data was a concern with some owners clearly having difficulty in providing current market values of their fisheries. It is our view that a short dialogue with owners is necessary and this is best achieved through a telephone survey.

Compared with the few previous studies that had been undertaken, most of the estimated models explained far less of the value than expected. We had anticipated certain independent variables, specifically proximity to centres of population, to be of the utmost importance and considerable effort was devoted to calculating population densities around individual fisheries. Unfortunately the population density variables had a generally insignificant effect in explaining values. Despite the extensive range of independent variables employed, other excluded variables are having an effect, but these variables are difficult to incorporate analytically. In practice, evaluating some fisheries is akin to evaluating golf course where such variables as history, tradition, reputation, quietness and views are important but difficult to quantify.

As expected salmon catch was an important explanatory variable for migratory salmonid fisheries as well as parking access and the local population density. Indeed, the catch variable was important for all river fisheries and stillwater trout fisheries and EA efforts that increase catch rates in these fisheries should translate to increases in their market value. Surprisingly, catch was not significant for stillwater coarse fisheries and for these fisheries the exploitation of the physical characteristics (improved access, more swims) would appear to be the best way to maximise value

It has been established that the inland fisheries of England and Wales are extremely valuable economic assets with a combined value of £3,032m with only 4.8% of this attributed to Welsh fisheries. Coarse fisheries are undoubtedly the most valuable category of fishery type and we were surprised that coarse fisheries accounted for over 75% of the total market value of all inland fisheries.

We remain convinced that market data are a potentially important source of useful performance indicators. Our experience suggests that the Agency might be unwise to devote resources to collecting and analysing actual transactions in individual fisheries. On the other hand, the Agency should consider requesting that specialist agents and fishery consultants submit an annual return on a range of average values for different types of fisheries (values per acre, per metre of bank, per salmon etc). Elasticity coefficients are probably relatively stable over time, and given that large numbers of observations on individual fisheries are required to estimate them, it may be appropriate to estimate elasticities at 5 or 10 yearly intervals.

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APPENDICES

Appendix 3.1 Original HCC Questionnaire plus Supplementary Questionnaire

Tell 2.5 million anglers about your fishery Free of charge

UK Fisheries Directory

1998-99

1st Edition

This is the first National Fisheries Directory ever to be produced which will allow the reader to search for information by the key features of a fishery, such as:-

- ☐ **Type of fishery**
- ☐ **Accessibility to the swims**
- ☐ **Facilities available to anglers**
- ☐ **Price**
- ☐ **Fishing allowances**
- ☐ **Quality and quantity of fish caught in the most recent 12 months**
- ☐ **How to get there and where to stay**

This new exciting

"essential angler's companion"

for the dedicated modern fisherman will be published later in 1998.

Detailed information has already been collected from over 4000 UK and Irish Fisheries and will be made available to more than 2.5 million anglers as a hardcopy directory, on CD-ROM and the Internet.

Your Entry in UK Fisheries Directory is **FREE OF ANY CHARGE**. So, please use this ***easy to complete*** entry form to update our current information. This will ensure that your business is accurately represented and successfully promoted to potential new anglers to your fishery.

Please complete one questionnaire for each **Named** fishery and not for different waters within the same Fishery. If you have more than one Fishery please contact our telephone hotline and we will send you more free entry forms. Don't forget you can have as many entries as you like.

Send the completed form in the reply paid envelope as soon as possible to the following address:

UK Fisheries Directory
Hastings Road
Hawkhurst
Kent, TN18 4RT

Telephone 01580 752200
Facsimile 01580 754182

A. Profile of Fishery

Full Name of Fishery:	
Type of Fishing at Fishery (Circle the categories):	Coarse Game Sea
Total area of the water surface at fishery (acres)	Total area of the Fishery including whole site (acres)
Name(s) of the Owner(s) of Fishery:	
Key Contact Name(s):	Contact Name for Matches:
Full Address of Fishery:	
	Town:
County:	Postcode
Telephone	Fax
Situated on which Road:	Nearest Main Road:
Closest Railway Station:	Local Bus Route numbers:
Name & Address of nearest Hotel:	
Name & Address of nearest B & B:	
Closest Major Town or City:	What is the distance in miles from this Town or City
Name & Address of nearest Tackle Shop :	
Dates closed for Coarse Fishing:	Dates closed for Game Fishing:
Weekday opening time:	Weekday closing time:
Weekend opening time:	Weekend closing time:
Is fishery open on Bank Holidays? Yes........ No.........	Do swims need to be booked in advance? Yes...... No.........
What Fishing license is required?	
Name & address of Affiliated Angling Club:	
Address where tickets purchased if different from above:	
List any angling records held at this Fishery:	

B. Type of Fishery

- **If Fishery has "Stillwaters" then complete this section**

Type of stillwater	Lake(s)	Pond(s)	Reservoir(s)	Gravel Pit(s)	Canal(s)
Enter the number of stillwaters by type at the Fishery?					
How many are used for Coarse fishing?					
How many are used for Game Fishing?					
Ease of fishing? Rate 1 to 4 "1 = Easy" & "4 = Hard"					
What is the largest size in acres?					
What is the smallest size in acres?					
What is depth of the deepest in feet?					
How many islands in each type of stillwater?					
How many swims in each type of stillwater?					
How many beginner or junior stillwaters are there?					
Tick if any stillwaters are fed by moving water?					
How many of the stillwaters are for members only?					

ALL ENTRIES ARE FREE

- **If Fishery has "Moving Water" then complete the next section**

Type of moving water	Stream	River	Estuary
What are the names of the moving water(s)?			
Tick if there is Coarse fishing?			
Tick if there is Game Fishing?			
Ease of fishing? Rate 1 to 4 "1 = Easy" & "4 = Hard"			
What is the total length of the moving water in metres?			
What is the maximum width of the moving water in metres?			
What is depth of the deepest part in feet?			
How many islands in the moving water?			
How many swims in each type of moving water?			
Are there beginner or junior facilities for fishing?			
What is the speed of the water? Enter Fast, Medium or Slow			
How much of the water is reserved for members only in metres?			

C. What are the facilities at the Fishery

- **Tick boxes if "Yes"**

Male Toilets		Hard-core parking	
Female Toilets		Easy access to swims	
Disabled Toilets		Disabled access to swims	
Disabled facilities (ramps, wide doors etc.)		Public telephone	
Cafe		Restaurant	
Hot meals		Other refreshments	
Tackle Hire		Sell Bait	
Night fishing		Half day fishing	
Spectators allowed		Dogs allowed	
Is the fishery sheltered by trees		Are Boats available for fishing	
Match Competitions (Adults)		Rare wildlife	
Match Competitions (Junior)		Rare birdlife	
Hard standing swims		Grassy swims	

D. How much does it cost to fish at the Fishery?

- **Please complete prices in pounds -£**

Adult day- from £ to £		Junior day- from £ to £	
Adult night- from £ to £		Junior night- from £ to £	
Half day	£	Cost of parking	£
Season Ticket valid for (enter number of days):		% OAP Discounts	%
Cost of this Season Ticket	£	% Junior Discount	%
Cost of membership to the fishery	£	% Disabled concession	%

E. What fishing allowances are given at the Fishery?

- **Tick boxes if any of these allowances are permitted** **(* Tick if obligatory)**

Boilies		Spinners		Keep nets		Particle Baits		Unhooking mats *	
Barbed Hooks		Floats		More than 1 rod		Dry Fly		Electric bait boats	
Floater Fish		Live bait		Ledgers		Wet Fly		Can remove fish	

Telephone 01580 752200

F. Which fishing magazine or journal do you regularly read?

- **Tick boxes if "Yes" to reading frequently**

Anglers Mail		Carp Talk		Fly Fishing & Tying		List others below:
Angling Times		Angling		Coarse Fisherman		
Carp World		Salmon & Trout		Coarse Angling		

What fish can be caught at the Fishery?

Type of Fish to be caught at this Fishery	Number in Fishery (if known)	Weight of Largest fish ever caught at this fishery	Weight of Largest fish caught in last 12 months	Most successful bait or lure used to attract fish in the last 3 months
Barbel				
Bass				
Bleak				
Bream				
Carp Crucian				
Carp Grass				
Carp Common				
Carp Mirror				
Catfish				
Charr				
Chub				
Dace				
Eel				
Flounder				
Grayling				
Gudgeon				
Minnow				
Mullet				
Pike				
Perch				
Plaice				
Pope				
Roach				
Rudd				
Ruffe				
Salmon				
Sole				
Sturgeon				
Tench				
Trout, Brown				
Trout, Lake				
Trout, Rainbow				
Trout, Sea				
Zander				

Please describe additional details of your fishery on separate paper and incorporate any additional information that will encourage anglers to visit your fishery. If possible also include a map of the fishery, any promotional material, directions of its location and photographs where relevant.

Tick here to receive an advertising rate card ☐ **ALL CONVENTIONAL ENTRIES ARE FREE**

HCC Supplementary Questionnaire

Thank you for validating your Free Entry in the UK Fisheries Directory "Hooked". I would also appreciate if you could just complete the following section and return it in the FREEPOST envelope provided. None of this information you are about to provide will be published in "Hooked". It will only be used in conjunction with responses from other fisheries to produce an overview report. If you would like to see a summary of these responses and how your fishery "fits in" then tick this box and I will send you a brief report ❑

This study is being carried out by **MacAlister Elliott & Partners (fisheries consultants)** in association with **Glasgow Caledonian University (Economics Department)** as part of a research contract to determine the value and characteristics of fishing rights. Responses to this questionnaire will be analysed along with the information already provided for the UK Fisheries Directory "Hooked". The results will be presented to the **Environment Agency** in a summary format and so it will not be possible to identify individual fisheries or responses. All these responses are private and confidential. The **summary results** will be used by the Agency to determine the loss of value to fisheries when pollution incidents occur and also to ensure that the value of all fisheries is fully recognised, particularly when it is being compared to other Agency sectors (water, air, energy) and management funds are being allocated.

All information obtained by this survey will be treated anonymously. Further to this, under the Data Protection Act we are legally bound to only use the information for the intended purpose that we have outlined above, i.e. research and presentation of summary results to the Agency. If you would like to contact us before completing the questionnaire please telephone HCC publishing (01580) 752200 or MacAlister Elliott & Partners (01590) 679016.

Thank you for your time and effort in helping to complete this study.

Please complete one questionnaire for each named fishery.

- Name of your fishery (as given in the UK Fisheries Directory) ?

  ……………………………………………………………

1. Please enter in this box or tick the approximate number of angler days sold by your fishery in the last 12 months. ☐ Actual number of angler days sold

❑ less than 100	❑ 2001 to 3000	❑ 15001 to 17500	❑ 60001 to 70000
❑ 101 to 250	❑ 3001 to 4000	❑ 17501 to 20000	❑ 70001 to 80000
❑ 251 to 500	❑ 4001 to 5000	❑ 20001 to 25000	❑ 80001 to 90000
❑ 501 to 750	❑ 5001 to 7500	❑ 25001 to 30000	❑ 90001 to 100000
❑ 751 to 1000	❑ 7501 to 10000	❑ 30001 to 40000	❑ Greater than 100000
❑ 1001 to 1500	❑ 10001 to 12500	❑ 40001 to 50000	
❑ 1501 to 2000	❑ 12501 to 15000	❑ 50001 to 60000	

2. How many people are employed on this fishery ?

Full-time permanent staff	Part-time permanent staff	Full-time seasonal staff	Part-time seasonal staff
❑ None	❑ None	❑ None	❑ None
❑ 1 to 3	❑ 1 to 3	❑ 1 to 3	❑ 1 to 3
❑ 4 to 8	❑ 4 to 8	❑ 4 to 8	❑ 4 to 8
❑ 9 to 13	❑ 9 to 13	❑ 9 to 13	❑ 9 to 13
❑ 14 to 20	❑ 14 to 20	❑ 14 to 20	❑ 14 to 20
❑ greater than 20	❑ greater than 20	❑ greater than 20	❑ greater than 20
☐ Actual	☐ Actual	☐ Actual	☐ Actual

3. As an approximation please tick which of the following best represents the total annual upkeep, management and staff costs of this fishery (in the box provided you can put your actual approximation)

Actual costs £ ____

❑ Less than £1000	❑ £30000 to £40000	❑ £100k to £125k	❑ £400k to £500k
❑ £1000 to £5000	❑ £40000 to £50000	❑ £125k to £150k	❑ £500k to £600k
❑ £5000 to £10000	❑ £50000 to £60000	❑ £150k to £175k	❑ £600k to £700k
❑ £10000 to £15000	❑ £60000 to £70000	❑ £175k to £200k	❑ £700k to £800k
❑ £15000 to £20000	❑ £70000 to £80000	❑ £200k to £250k	❑ £800k to £900k
❑ £20000 to £25000	❑ £80000 to £90000	❑ £250k to £300k	❑ £900k to £1m
❑ £25000 to £30000	❑ £90000 to £100000	❑ £300k to £400k	❑ Greater than £1m

4. What proportion of these costs are your total staff costs on this fishery

Proportion of which are staff costs ____ %

5. In order to quantify the total market value of all fisheries in England and Wales we require an estimate of the current freehold market value of this fishery. It would be most helpful if you could enter your estimation in this box provided or tick the closest suggestion listed below.

Please only estimate the value of your fishery and assets which are part of your fishery, e.g. land for access or toilet blocks for fishermen. Please do not include an estimate of the value of your assets not directly related to the fishery, e.g. domestic residences or extra land not used by the fishery.

Estimated market freehold value £ ____

Less than £2,500	❑ £40k to £45k	❑ £175k to £200k	❑ £650k to £700k
❑ £2.5k to £5k	❑ £45k to £50k	❑ £200k to £225k	❑ £700k to £750k
❑ £5k to £7.5k	❑ £50k to £55k	❑ £225k to £250k	❑ £750k to £800k
❑ £7.5k to £10k	❑ £55k to £60k	❑ £250k to £275k	❑ £800k to £850k
❑ £10k to £12.5k	❑ £60k to £65k	❑ £275k to £300k	❑ £850k to £900k
❑ £12.5k to £15k	❑ £65k to £70k	❑ £300k to £325k	❑ £900k to £950k
❑ £15k to £17.5k	❑ £70k to £75k	❑ £325k to £350k	❑ £950k to £1.0m
❑ £17.5k to £20k	❑ £75k to £80k	❑ £350k to £375k	❑ £1.0m to £1.5m
❑ £20k to £22.5k	❑ £80k to £85k	❑ £375k to £400k	❑ £1.5m to £2.0m
❑ £22.5k to £25k	❑ £85k to £90k	❑ £400k to £425k	❑ £2.0m to £3.0m
❑ £25k to £27.5k	❑ £90k to £95k	❑ £425k to £450k	❑ £3.0m to £5.0m
❑ £27.5k to £30k	❑ £95k to £100k	❑ £450k to £500k	❑ £5.0m to £10.0m
❑ £30k to £32.5k	❑ £100k to £125k	❑ £500k to £550k	❑ £10.0m to £15.0m
❑ £32.5k to £35k	❑ £125k to £150k	❑ £550k to £600k	❑ £15.0m to £20.0m
❑ £35k to £40k	❑ £150k to £175k	❑ £600k to £650k	❑ Greater than £20m

Under no circumstances will this additional information be circulated, supplied or presented to any third party. All information will be combined with other responses and summarised without any identification of this or any fishery. Absolutely no information on individual fisheries will be submitted to the Environment Agency.

Appendix 3.2 Stillwater Fisheries Questionnaire

MacAlister
Elliott and
Partners Ltd

56 HIGH STREET, LYMINGTON
HAMPSHIRE S041 9AH ENGLAND
TELEPHONE: +44 1590 679016
FACSIMILE: +44 1590 671573
E-MAIL: mep@macell.demon.co.uk
WEBSITE: www.macalister-elliott.com

Name
Position
Address
Address
Postcode

date

Dear

VALUE OF *STILLWATER* FISHING RIGHTS

This study is being carried out by **MacAlister Elliott & Partners (fisheries consultants)** in association with **Glasgow Caledonian University (Economics Department)** as part of a research contract to determine the value and characteristics of fishing rights. The results will be presented to the **Environment Agency** in a summary format and so it will not be possible to identify individual fisheries or responses. All these responses are private and confidential.

The **summary results** will be used by the Agency to determine the loss of value to fisheries when pollution incidents occur and also to ensure that the value of all fisheries is fully recognised, particularly when it is the being compared to other Agency sectors (water, air, energy) and management funds are being allocated.

We have enclosed three identical questionnaires with this letter. Please complete one for each stillwater (i.e. lake, pond or reservoir) with an identifiable market value. If you would like to provide information about more than three of your stillwaters please photocopy one of the enclosed questionnaires. Return all completed questionnaires to the FREEPOST address using the attached address label by Friday 28th January 2000. (MacAlister Elliott and Partners Ltd, FREEPOST (SCE7483), LYMINGTON, HANTS SO41 9ZP).

❑ This is an important national survey and requires a good response rate to give the results credibility. To receive an informative summary of our study results and see how your fishery fits into the overall picture please tick this box and return the completed questionnaires.

All information obtained by this survey will be treated anonymously. Further to this, under the Data Protection Act we are legally bound to only use the information for the intended purpose that we have outlined above, i.e. research and presentation of only summary results to the Agency. If you would like to contact us before completing the questionnaire please telephone MacAlister Elliott & Partners (01590) 679 016.

Thank you for your time and effort in helping to complete this study.

Yours sincerely,

Tom Schlesinger

1 Name of Fishery or Moving Water …………………………………………………………
2 Address of Fishery ………………………………………………………… ………………………………………………………… …………………………………………………………
3 Full Postal Code of Fishery …………………………………………………………

4 Ease of fishing ? Rate 1 to 4	❑1 ❑2 ❑3 ❑4
5 Maximum number of swims available ?	……………..……. Number
6 Total acreage of the surface water ?	……………..……… Acres
7 Full day adult ticket price ?	£………..………... / day
8 Which of the following are allowed ?	❑ spinners ❑ wet fly ❑ live bait . ❑ dry fly
9 Do you operate a catch and release policy ? (delete as appropriate)	Yes / No
10 What is the bag limit if any ?	……..…………...… Fish
11 Is there hard-core parking ?	Yes / No
12 Are boats available for fishing ?	Yes / No
13 Is there easy access to swims ?	Yes / No

14 Please give brief details, if the activities of other users of the lake, reservoir or pond regularly affect the quality of the angling experience, i.e. canoeists, boaters, joggers.

15 Please enter in this box or tick the approximate number of angler days sold by your fishery in the last 12 months.

[ ] Actual number of angler days sold

❑ less than 100	❑ 2,001 to 3,000	❑ 15,001 to 17,500	❑ 60,001 to 70,000
❑ 101 to 250	❑ 3,001 to 4,000	❑ 17,501 to 20,000	❑ 70,001 to 80,000
❑ 251 to 500	❑ 4,001 to 5,000	❑ 20,001 to 25,000	❑ 80,001 to 90,000
❑ 501 to 750	❑ 5,001 to 7,500	❑ 25,001 to 30,000	❑ 90,001 to 100,000
❑ 751 to 1000	❑ 7,501 to 10,000	❑ 30,001 to 40,000	❑ Greater than 100,000
❑ 1,001 to 1,500	❑ 10,001 to 12,500	❑ 40,001 to 50,000	
❑ 1,501 to 2,000	❑ 12,501 to 15,000	❑ 50,001 to 60,000	

16 As an approximation please tick which of the following best represents the total annual upkeep, management and staff costs of this fishery (in the box provided you can put your actual approximation)

£ ☐ Actual costs

❑ Less than £1,000	❑ £30,000 to £40,000	❑ £100k to £125k	❑ £400k to £500k
❑ £1,000 to £5,000	❑ £40,000 to £50,000	❑ £125k to £150k	❑ £500k to £600k
❑ £5,000 to £10,000	❑ £50,000 to £60,000	❑ £150k to £175k	❑ £600k to £700k
❑ £10,000 to £15,000	❑ £60,000 to £70,000	❑ £175k to £200k	❑ £700k to £800k
❑ £15,000 to £20,000	❑ £70,000 to £80,000	❑ £200k to £250k	❑ £800k to £900k
❑ £20,000 to £25,000	❑ £80,000 to £90,000	❑ £250k to £300k	❑ £900k to £1m
❑ £25,000 to £30,000	❑ £90,000 to £100,000	❑ £300k to £400k	❑ Greater than £1m

17 What proportion of these costs are your total staff costs on this fishery

% Proportion which are staff costs

18 In order to quantify the total market value of all fisheries in England and Wales we require an estimate of the current freehold market value of this fishery. It would be most helpful if you could enter your estimation in this box provided or tick the closest suggestion listed below.

Please only estimate the value of your fishery and assets which are part of your fishery, e.g. land for access or toilet blocks for fishermen. Please do not include an estimate of the value of your assets not directly related to the fishery, e.g. domestic residences or extra land not used by the fishery.

£ Estimated market freehold value

Less than £2,500	❑ £40k to £45k	❑ £175k to £200k	❑ £650k to £700k
❑ £2.5k to £5k	❑ £45k to £50k	❑ £200k to £225k	❑ £700k to £750k
❑ £5k to £7.5k	❑ £50k to £55k	❑ £225k to £250k	❑ £750k to £800k
❑ £7.5k to £10k	❑ £55k to £60k	❑ £250k to £275k	❑ £800k to £850k
❑ £10k to £12.5k	❑ £60k to £65k	❑ £275k to £300k	❑ £850k to £900k
❑ £12.5k to £15k	❑ £65k to £70k	❑ £300k to £325k	❑ £900k to £950k
❑ £15k to £17.5k	❑ £70k to £75k	❑ £325k to £350k	❑ £950k to £1.0m
❑ £17.5k to £20k	❑ £75k to £80k	❑ £350k to £375k	❑ £1.0m to £1.5m
❑ £20k to £22.5k	❑ £80k to £85k	❑ £375k to £400k	❑ £1.5m to £2.0m
❑ £22.5k to £25k	❑ £85k to £90k	❑ £400k to £425k	❑ £2.0m to £3.0m
❑ £25k to £27.5k	❑ £90k to £95k	❑ £425k to £450k	❑ £3.0m to £5.0m
❑ £27.5k to £30k	❑ £95k to £100k	❑ £450k to £500k	❑ £5.0m to £10.0m
❑ £30k to £32.5k	❑ £100k to £125k	❑ £500k to £550k	❑ £10.0m to £15.0m
❑ £32.5k to £35k	❑ £125k to £150k	❑ £550k to £600k	❑ £15.0m to £20.0m
❑ £35k to £40k	❑ £150k to £175k	❑ £600k to £650k	❑ Greater than £20m

19 How many people are employed on this fishery ?

Full-time Permanent staff	Part-time permanent staff	Full-time seasonal staff	Part-time seasonal staff
❑ None	❑ None	❑ None	❑ None
❑ 1 to 3	❑ 1 to 3	❑ 1 to 3	❑ 1 to 3
❑ 4 to 8	❑ 4 to 8	❑ 4 to 8	❑ 4 to 8
❑ 9 to 13	❑ 9 to 13	❑ 9 to 13	❑ 9 to 13
❑ 14 to 20	❑ 14 to 20	❑ 14 to 20	❑ 14 to 20
❑ greater than 20	❑ greater than 20	❑ greater than 20	❑ greater than 20
Actual	Actual	Actual	Actual

20 What fish can be caught at the fishery ?

Type of fish	Number in fishery	Weight of largest fish ever caught at fishery	Weight of largest fish caught in last 12 months
Barbel			
Bleak			
Bream			
Carp Crucian			
Carp Grass			
Carp Common			
Carp Mirror			
Catfish			
Charr			
Chub			
Dace			
Eel			
Grayling			
Gudgeon			
Minnow			
Mullet			
Pike			
Perch			
Pope			
Roach			
Rudd			
Ruffe			
Salmon			
Strugeon			
Tench			
Trout, brown			
Trout, lake			
Trout, rainbow			
Trout, sea			
Zander			

21 What is the average number of fish caught per angler day ? ……..……..………….. number

22 What is the average weight of fish caught per angler day ? ……..………… kgs/lbs (delete)

23 Please list (in order of importance) the five most important species in your fishery

1) ………………………. 2) ……………………… 3) ………………………

4) ……………………… 5) ………………………

Under no circumstances will any of this information be circulated, supplied or presented to any third party. All information will be combined with other responses and summarised without any identification of this or any fishery. Absolutely no information on individual fisheries will be submitted to the Environment Agency.

Appendix 3.3 Riverine Fisheries Questionnaire

MACALISTER
ELLIOTT AND
PARTNERS LTD

56 HIGH STREET, LYMINGTON
HAMPSHIRE S041 9AH ENGLAND
TELEPHONE: +44 1590 679016
FACSIMILE: +44 1590 671573
E-MAIL: mep@macell.demon.co.uk
WEBSITE: www.macalister-elliott.com

Name
Position
Address
Address
Postcode

date

Dear

VALUE OF *RIVERINE* FISHING RIGHTS

This study is being carried out by **MacAlister Elliott & Partners (fisheries consultants)** in association with **Glasgow Caledonian University (Economics Department)** as part of a research contract to determine the value and characteristics of fishing rights. The results will be presented to the **Environment Agency** in a summary format and so it will not be possible to identify individual fisheries or responses. All these responses are private and confidential.

The **summary results** will be used by the Agency to determine the loss of value to fisheries when pollution incidents occur and also to ensure that the value of all fisheries is fully recognised, particularly when it is the being compared to other Agency sectors (water, air, energy) and management funds are being allocated.

We have attached three identical questionnaires with this letter. Please complete one for each identifiable fishery (i.e. stretch of water or beat). If you would like to provide information about more than three fisheries please photocopy one of the enclosed questionnaires. Return all completed questionnaires to the FREEPOST address using the address label by the Friday 28th January 2000. (MacAlister Elliott and Partners Ltd, FREEPOST (SCE7483), LYMINGTON, HANTS SO41 9ZP).

- ☐ This is an important national survey and requires a good response rate to give the results credibility. To receive an informative summary of our study results and see how your fishery fits into the overall picture please tick this box and return the completed questionnaires.

All information obtained by this survey will be treated anonymously. Further to this, under the Data Protection Act we are legally bound to only use the information for the intended purpose that we have outlined above, i.e. research and presentation of only summary results to the Agency. If you would like to contact us before completing the questionnaire please telephone MacAlister Elliott & Partners (01590) 679 016.

Thank you for your time and effort in helping to complete this study.

Yours sincerely,

Tom Schlesinger

1 Name of Fishery or Moving Water …………………………………………………………   2 Address of Fishery ……………………………………………………………………   ……………………………………………………………………   3 Full Postal Code of Fishery …………………………………………………………

4 Is the fishery single or double bank ?	Single / Double
5 What is the length of the moving water ?	……………… Metres
6 What is the average width of the moving water ?	….…………… Metres
7 Maximum number of rods or swims ?	….…… Rods / Swims
8 Ease of fishing ? Rate 1 to 4	❑1 ❑2 ❑3 ❑4
9 How would you describe the average speed of the moving water ?	❑Fast ❑Medium ❑Slow
10 Full day adult ticket price ?	£……………..…… / day
11 Weekly adult permit price ?	£...…………..… / week
12 Which of the following are allowed ?	❑ Dry fly ❑ Wet fly ❑ Lures ❑ Live bait
13 Do you operate a catch and release policy ?	Yes / No
14 What is the bag limit if any ?	……... no. of fish
15 Is there parking close to the river bank ?	Yes / No
16 Are boats available for fishing ?	Yes / No
17 Are ghillies available ?	Yes / No

18 Please give brief details, if the activities of other users of the river or the bank regularly affect the quality of the angling experience, i.e. canoeists, boaters, joggers.

19 Which category most closely describes the fishery ? (please tick)

The fishery is mainly for salmon and/or sea trout	(go to Question 20)	❑
The fishery is mainly for trout	(go to Question 23)	❑
The fishery is mainly a coarse fishery	(go to Question 26)	❑

Salmon and Sea-Trout Fisheries:

20 What is the five-year average salmon catch?	..…..…… Avg number
21 What is the five year sea-trout catch?	..…..…… Avg number
22 For what percentage of the season would you describe the quality of salmon and/or sea-trout fishing to be below average to poor ?	..………… %

Trout Fisheries:

23 What proportion of the trout catch is wild brown trout ? ..…………. %

24 What proportion of the trout catch is stocked brown trout ? ..…………. %

25 What proportion of the trout catch is rainbows ? ..………..... %

Coarse Fisheries*:*

26 What is the average number of fish caught per angler day ? …...…………… number

27 What is the average weight of fish caught per angler day ? ………... kgs/lbs (delete)

28 Please list (in order of importance) the five most important species in your fishery

1) …………………….. 2) ……………………… 3) …………………………

4) ……………………… 5) …………………………

29 Please enter in this box or tick the approximate number of angler days sold or let by your fishery in the last 12 months.

☐ Actual number of angler days sold

❑ less than 100	❑ 2,001 to 3,000	❑ 15,001 to 17,500	❑ 60,001 to 70,000
❑ 101 to 250	❑ 3,001 to 4,000	❑ 17,501 to 20,000	❑ 70,001 to 80,000
❑ 251 to 500	❑ 4,001 to 5,000	❑ 20,001 to 25,000	❑ 80,001 to 90,000
❑ 501 to 750	❑ 5,001 to 7,500	❑ 25,001 to 30,000	❑ 90,001 to 100,000
❑ 751 to 1,000	❑ 7,501 to 10,000	❑ 30,001 to 40,000	❑ Greater than 100,000
❑ 1,001 to 1,500	❑ 10,001 to 12,500	❑ 40,001 to 50,000	
❑ 1,501 to 2,000	❑ 12,501 to 15,000	❑ 50,001 to 60,000	

30 How many people are employed on this fishery ?

Full-time permanent staff	Part-time permanent staff	Full-time seasonal staff	Part-time seasonal staff
❑ None	❑ None	❑ None	❑ None
❑ 1 to 3	❑ 1 to 3	❑ 1 to 3	❑ 1 to 3
❑ 4 to 8	❑ 4 to 8	❑ 4 to 8	❑ 4 to 8
❑ 9 to 13	❑ 9 to 13	❑ 9 to 13	❑ 9 to 13
❑ 14 to 20	❑ 14 to 20	❑ 14 to 20	❑ 14 to 20
❑ greater than 20	❑ greater than 20	❑ greater than 20	❑ greater than 20
☐ Actual	☐ Actual	☐ Actual	☐ Actual

31 As an approximation please tick which of the following best represents the total annual upkeep, management and staff costs of this fishery (in the box provided you can put your actual approximation)

£ [ ] Actual costs

❑ Less than £1,000	❑ £30,000 to £40,000	❑ £100k to £125k	❑ £400k to £500k
❑ £1,000 to £5,000	❑ £40,000 to £50,000	❑ £125k to £150k	❑ £500k to £600k
❑ £5,000 to £10,000	❑ £50,000 to £60,000	❑ £150k to £175k	❑ £600k to £700k
❑ £10,000 to £15,000	❑ £60,000 to £70,000	❑ £175k to £200k	❑ £700k to £800k
❑ £15,000 to £20,000	❑ £70,000 to £80,000	❑ £200k to £250k	❑ £800k to £900k
❑ £20,000 to £25,000	❑ £80,000 to £90,000	❑ £250k to £300k	❑ £900k to £1m
❑ £25,000 to £30,000	❑ £90,000 to £100,000	❑ £300k to £400k	❑ Greater than £1m

32 What proportion of these costs are your total staff costs on this fishery

[ ] % Proportion which are staff costs

33 In order to quantify the total market value of all fisheries in England and Wales we require an estimate of the current freehold market value of this fishery. It would be most helpful if you could enter your estimation in this box provided or tick the closest suggestion listed below.

Please only estimate the value of your fishery and assets which are part of your fishery, e.g. land for access or huts for fishermen. Please do not include an estimate of the value of your assets not directly related to the fishery, e.g. domestic residences or extra land not used by the fishery.

£ [ ] Estimated market freehold value

Less than £2,500	❑ £40k to £45k	❑ £175k to £200k	❑ £650k to £700k
❑ £2.5k to £5k	❑ £45k to £50k	❑ £200k to £225k	❑ £700k to £750k
❑ £5k to £7.5k	❑ £50k to £55k	❑ £225k to £250k	❑ £750k to £800k
❑ £7.5k to £10k	❑ £55k to £60k	❑ £250k to £275k	❑ £800k to £850k
❑ £10k to £12.5k	❑ £60k to £65k	❑ £275k to £300k	❑ £850k to £900k
❑ £12.5k to £15k	❑ £65k to £70k	❑ £300k to £325k	❑ £900k to £950k
❑ £15k to £17.5k	❑ £70k to £75k	❑ £325k to £350k	❑ £950k to £1.0m
❑ £17.5k to £20k	❑ £75k to £80k	❑ £350k to £375k	❑ £1.0m to £1.5m
❑ £20k to £22.5k	❑ £80k to £85k	❑ £375k to £400k	❑ £1.5m to £2.0m
❑ £22.5k to £25k	❑ £85k to £90k	❑ £400k to £425k	❑ £2.0m to £3.0m
❑ £25k to £27.5k	❑ £90k to £95k	❑ £425k to £450k	❑ £3.0m to £5.0m
❑ £27.5k to £30k	❑ £95k to £100k	❑ £450k to £500k	❑ £5.0m to £10.0m
❑ £30k to £32.5k	❑ £100k to £125k	❑ £500k to £550k	❑ £10.0m to £15.0m
❑ £32.5k to £35k	❑ £125k to £150k	❑ £550k to £600k	❑ £15.0m to £20.0m
❑ £35k to £40k	❑ £150k to £175k	❑ £600k to £650k	❑ Greater than £20m

Under no circumstances will any of this information be circulated, supplied or presented to any third party. All information will be combined with other responses and summarised without any identification of this or any fishery. Absolutely no information on individual fisheries will be submitted to the Environment Agency.

Appendix 3.4 Canal Fisheries Questionnaire

British Waterways

Survey of Angling Clubs, Summer 2000

Please complete this questionnaire on behalf of your Club. If possible, please consult with other Club officials before completing it. Then post it in the enclosed FREEPOST envelope to **MacAlister Elliott and Partners Ltd, FREEPOST (SCE7483), LYMINGTON, HANTS SO41 9ZP by 8 September.** No stamp is needed if posted in the UK. All forms received by this date will be entered into a prize draw with the chance of winning £100 for your club. If you need more space for any answers, please use a separate sheet of paper.

PART 1: ECONOMIC VALUE OF CANAL FISHERIES.

Please complete a separate copy of this part for <u>each</u> canal fishery that you licence from British Waterways. Some extra copies of this page are enclosed. If you need more, please let us know or make your own copies.

1. What is the name of your club?* ____________________

2 What is the name of the canal fishery? ____________________

3 What is its exact location?

Ideally we would like to know the Ordnance Survey grid reference for its mid-point ______

…… or if the grid ref. is not available, what is the postal code around its mid-point? ______

…… or if postal code is not available, what is the nearest town? ____________

4 What is the approximate length of your fishery ? _________ metres

5 What is your estimate of its average depth at the mid point of the channel ? _________ metres

6 What is the average width of your fishery ? _________ metres

7 Does fishing only take place from the towpath ? ☐ Yes ☐ No

7a If 'no' does fishing take place ☐ from the opposite bank? ☐ from aboard moored craft?

☐ other (please explain) ____________________

8 What is the average distance to convenient car parking ? ____________ metres

Is the greater part of your canal fishery located in an urban or rural setting ?

☐ Urban ☐ Rural

10 How many pegs are there ? ____________

11 How many species of fish can you catch in the fishery ? ____________

12 What is your estimate of the average number of fish caught, of any species, per angler per 3-5 hour session? ____________fish

13 What is your estimate of the average total weight of fish caught during these trips ? ___lbs ___ozs

14 Do the activities of other users interfere with angling in your fishery? ☐ Yes ☐ No

14a If 'yes', what activities on the bank or on the water regularly detract from anglers' enjoyment?

____

15 What other factors affect angling on the canal? (e.g. overhead electricity pylons, pollution, etc.)

____

16 What is the annual rental payment made to BW for this fishery? £____________ per year

---

* If you prefer your Part 2 responses to be reported to British Waterways anonymously, please tick this box ☐

Appendix 3.5 Procedure for Establishing Populations

The package *Census91 on CdRom* (Space-Time Research and Chadwyk-Healey (1994)) is designed so that 1991 census data at enumeration district level can be easily extracted and presented. It consists of 3 basic elements. Firstly it is necessary to define the units that make up the area of study. Secondly data has to be extracted for each of these units. Thirdly the data has to be presented in either analytical or, more usually, graphical (map) form. In this study this resulted in the following steps <u>for each fishery:</u>

1. Start a new study.
2. Select an area based on Radius.
3. Select the smallest unit available (Enumeration Area).
4. Insert the grid reference of the fishery.
5. Insert a zero inner radius and a 5 km outer radius.
6. Check the number of units to extract. If there are less than 1000 you can then add these to the list. If there are more then you must enlarge the size of the basic unit to Ward size.
7. Select Add Data from the data menu.
8. Choose the data required (number of individuals).
9. Insert the identified CDRoms (normally only 1 for 5km radii but up to 4 on 50km radii).
10. Select Statistics from the data menu and record the value of "total".
11. Return to the Select Area menu and reselect the radius option.
12. Retype the grid refs and then an inner radii of 5 and an outer of 25.
13. Check the number of units and add to the list.
14. Repeat steps 6 to 10.
15. Return to the Select Area menu and reselect the radius option.
16. Retype the grid refs and then an inner radii of 25 and an outer of 50.
17. Check and Add Units to list.
18. Repeat steps 6 to 10.
19. Start again for a new fishery.

Appendix 4.1 Non-Nested Tests for Models of Canal Fisheries

```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is RENT
 157 observations used for estimation from    1 to  157
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      175.6921            86.8523              2.0229[.045]
 LENGTH                     .19616            .028924              6.7820[.000]
 NOPEGS                     3.8241             .48845              7.8290[.000]
*******************************************************************************
 R-Squared                      .71517   R-Bar-Squared                   .71147
 S.E. of Regression           883.3431   F-stat.    F(  2, 154)  193.3351[.000]
 Mean of Dependent Variable     1120.5   S.D. of Dependent Variable      1644.5
 Residual Sum of Squares      1.20E+08   Equation Log-likelihood        -1286.3
 Akaike Info. Criterion        -1289.3   Schwarz Bayesian Criterion     -1293.9
 DW-statistic                   1.7958
*******************************************************************************
```

```
                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version
*******************************************************************************
*                     *                          *
* A:Serial Correlation*CHSQ(   1)=   1.6413[.200]*F(   1, 153)=   1.6164[.206]
*                     *                          *
* B:Functional Form   *CHSQ(   1)=   3.6689[.055]*F(   1, 153)=   3.6610[.058]
*                     *                          *
* C:Normality         *CHSQ(   2)= 520.8387[.000]*       Not applicable
*                     *                          *
* D:Heteroscedasticity*CHSQ(   1)=   3.8032[.051]*F(   1, 155)=   3.8480[.052]
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LRENT
 157 observations used for estimation from    1 to  157
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                       -.61465             2.1164             -.29042[.772]
 LLENGTH                    .63979            .057649             11.0980[.000]
 LPOP                       .15890             .13535              1.1740[.242]
*******************************************************************************
 R-Squared                      .44477   R-Bar-Squared                   .43756
 S.E. of Regression             .81568   F-stat.    F(  2, 154)   61.6814[.000]
 Mean of Dependent Variable     6.3871   S.D. of Dependent Variable      1.0876
 Residual Sum of Squares      102.4614   Equation Log-likelihood      -189.2728
 Akaike Info. Criterion      -192.2728   Schwarz Bayesian Criterion   -196.8571
 DW-statistic                   2.0862
*******************************************************************************
```

```
                            Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version
*******************************************************************************
*                     *                          *
* A:Serial Correlation*CHSQ(   1)=   .31342[.576]*F(   1, 153)=   .30604[.581]
*                     *                          *
* B:Functional Form   *CHSQ(   1)=  24.5498[.000]*F(   1, 153)=  28.3587[.000]
*                     *                          *
* C:Normality         *CHSQ(   2)=  12.2847[.002]*       Not applicable
*                     *                          *
* D:Heteroscedasticity*CHSQ(   1)=   .40481[.525]*F(   1, 155)=   .40069[.528]
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values



                      Non-Nested Tests by Simulation
*******************************************************************************
 Dependent variable in model M1 is LOG(RENT)
 Dependent variable in model M2 is RENT
 157 observations used from    1 to  157. Number of replications 10
*******************************************************************************
   Estimates of parameters of M1            Estimates of parameters of M2
                 Under M1  Under M2                        Under M2  Under M1
 CON              -.27260    *NONE*       LENGTH             .19748    .21495
 LLENGTH           .59173    *NONE*       NOPEGS             3.7535    .81020
 LPEGS            .069681    *NONE*       POP50            .4987E-4  .9139E-4
 LPOP              .14030    *NONE*
 Standard Error    .81510    *NONE*       Standard Error  874.0690    1175.1
 Adjusted Log-L   -1191.5    *NONE*       Adjusted Log-L   -1284.7   -1321.7
*******************************************************************************



                 Non-Nested Test Statistics and Choice Criteria
*******************************************************************************
 Test Statistic                  M1 against M2                     M2 against M1
     S-Test   10 replications    -3.2262[.001]                      *NONE*
    PE-Test                       3.2726[.001]                      .28169[.778]
    BM-Test                       2.2507[.024]                     -1.5762[.115]
    DL-Test                       2.6729[.008]                      6.8338[.000]
 Sargan's Likelihood Criterion for M1 versus M2=  93.2090       favours M1
 Vuong's  Likelihood Criterion for M1 versus M2=  68.0502[.000] favours M1
*******************************************************************************
 S-Test is the SC_c test proposed by Pesaran and Pesaran (1995) and is
 the simple version of the simulated Cox test statistic.
 PE-Test is the PE test due to MacKinnon, White and Davidson.
 BM-Test is due to Bera and McAleer.
 DL-Test is the double-length regression test statistic due to Davidson
and MacKinnon.
```

Appendix 4.2 Results for Alternative Models for Salmon

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	5T, 5S[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: VALUE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.261[a]	.068	.018	259133.4

a. Predictors: (Constant), 5T, 5S

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.8E+11	2	9.1E+10	1.348	.272[a]
	Residual	2.5E+12	37	6.7E+10		
	Total	2.7E+12	39			

a. Predictors: (Constant), 5T, 5S

b. Dependent Variable: VALUE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	142278.7	55922.872		2.544	.015
	5S	553.511	1825.163	.071	.303	.763
	5T	356.034	408.827	.204	.871	.389

a. Dependent Variable: VALUE

Correlations

		VPS	VPT
VPS	Pearson Correlation	1.000	.308
	Sig. (2-tailed)	.	.054
	N	46	40
VPT	Pearson Correlation	.308	1.000
	Sig. (2-tailed)	.054	.
	N	40	41

Regression

Warnings

For models with dependent variable VALUE, the following variables are constants or have missing correlations: BOATS. They will be deleted from the analysis.

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	LENGTH	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: VALUE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.762[a]	.581	.542	286036.2

a. Predictors: (Constant), LENGTH

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.2E+12	1	1.2E+12	15.228	.002[a]
	Residual	9.0E+11	11	8.2E+10		
	Total	2.1E+12	12			

a. Predictors: (Constant), LENGTH

b. Dependent Variable: VALUE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-34504.6	116063.8		-.297	.772
	LENGTH	92.986	23.828	.762	3.902	.002

a. Dependent Variable: VALUE

Excluded Variables[b]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	5S	.230[a]	.913	.383	.277	.612
	5T	.356[a]	1.325	.215	.386	.494
	P5	.059[a]	.291	.777	.092	1.000
	P20	.138[a]	.687	.507	.212	.991
	P40	.191[a]	.977	.352	.295	.998
	SIDES	.076[a]	.335	.745	.105	.806
	WIDTH	-.052[a]	-.242	.813	-.076	.907
	SWIMS	.226[a]	1.108	.294	.331	.901
	EASE	-.014[a]	-.066	.949	-.021	.948
	PRICE	.082[a]	.332	.747	.104	.682
	GHILLIES	-.113[a]	-.394	.702	-.124	.503

a. Predictors in the Model: (Constant), LENGTH

b. Dependent Variable: VALUE

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	L5S	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.607[a]	.369	.352	1.0122

a. Predictors: (Constant), L5S

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.767	1	22.767	22.220	.000[a]
	Residual	38.936	38	1.025		
	Total	61.703	39			

a. Predictors: (Constant), L5S

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.437	.451		20.907	.000
	L5S	.685	.145	.607	4.714	.000

a. Dependent Variable: LVAL

Excluded Variables[b]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	L5T	-.135[a]	-.945	.351	-.153	.814
	LOGLEN	-.009[a]	-.060	.952	-.010	.777
	LOGPOP	.183[a]	1.414	.166	.226	.964
	LOGSIDES	.078[a]	.563	.577	.092	.885

a. Predictors in the Model: (Constant), L5S

b. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LOGSWIMS, L5S, LOGPOP[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.684[a]	.468	.418	.8513

a. Predictors: (Constant), LOGSWIMS, L5S, LOGPOP

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	20.362	3	6.787	9.366	.000[a]
	Residual	23.190	32	.725		
	Total	43.552	35			

a. Predictors: (Constant), LOGSWIMS, L5S, LOGPOP

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.299	1.626		4.489	.000
	L5S	.645	.137	.625	4.701	.000
	LOGPOP	.212	.134	.219	1.582	.123
	LOGSWIMS	-9.26E-02	.114	-.112	-.813	.422

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LOGP5, L5S, LOGPOP, LOGP20[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.652[a]	.425	.369	.9470

a. Predictors: (Constant), LOGP5, L5S, LOGPOP, LOGP20

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27.211	4	6.803	7.585	.000[a]
	Residual	36.771	41	.897		
	Total	63.982	45			

a. Predictors: (Constant), LOGP5, L5S, LOGPOP, LOGP20

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.942	1.708		4.064	.000
	L5S	.627	.135	.586	4.634	.000
	LOGPOP	-9.22E-03	.215	-.008	-.043	.966
	LOGP20	.254	.241	.223	1.054	.298
	LOGP5	-1.03E-02	.126	-.012	-.082	.935

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	LENGTH	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	5S	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.590[a]	.348	.324	.9786
2	.702[b]	.493	.454	.8799

a. Predictors: (Constant), LENGTH

b. Predictors: (Constant), LENGTH, 5S

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.815	1	13.815	14.425	.001[a]
	Residual	25.857	27	.958		
	Total	39.671	28			
2	Regression	19.543	2	9.771	12.621	.000[b]
	Residual	20.129	26	.774		
	Total	39.671	28			

a. Predictors: (Constant), LENGTH

b. Predictors: (Constant), LENGTH, 5S

c. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	10.960	.263		41.742	.000
	LENGTH	2.300E-04	.000	.590	3.798	.001
2	(Constant)	10.523	.286		36.850	.000
	LENGTH	1.694E-04	.000	.435	2.879	.008
	5S	2.380E-02	.009	.411	2.720	.011

a. Dependent Variable: LVAL

Excluded Variables[c]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	5S	.411[a]	2.720	.011	.471	.857
	5T	-.128[a]	-.717	.480	-.139	.767
	P5	.091[a]	.558	.582	.109	.932
	P20	.010[a]	.061	.952	.012	.880
	P40	.233[a]	1.536	.137	.288	.995
	SIDES	.205[a]	1.318	.199	.250	.970
	WIDTH	.072[a]	.455	.653	.089	.999
	SWIMS	-.188[a]	-1.128	.270	-.216	.860
2	5T	-.151[b]	-.943	.355	-.185	.765
	P5	.008[b]	.050	.960	.010	.889
	P20	.029[b]	.192	.849	.038	.878
	P40	.054[b]	.324	.749	.065	.738
	SIDES	.154[b]	1.075	.293	.210	.950
	WIDTH	-.013[b]	-.089	.930	-.018	.950
	SWIMS	-.141[b]	-.924	.364	-.182	.847

a. Predictors in the Model: (Constant), LENGTH

b. Predictors in the Model: (Constant), LENGTH, 5S

c. Dependent Variable: LVAL

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	LOGLEN	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: VALUE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.418[a]	.175	.146	271957.1

a. Predictors: (Constant), LOGLEN

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.4E+11	1	4.4E+11	5.943	.021[a]
	Residual	2.1E+12	28	7.4E+10		
	Total	2.5E+12	29			

a. Predictors: (Constant), LOGLEN

b. Dependent Variable: VALUE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-783606	413012.7		-1.897	.068
	LOGLEN	128992.4	52914.790	.418	2.438	.021

a. Dependent Variable: VALUE

Excluded Variables[b]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	LOGPOP	.245[a]	1.426	.165	.265	.961
	LOGSIDES	.122[a]	.671	.508	.128	.908
	LOGSWIMS	-.007[a]	-.034	.973	-.007	.703
	LOGP5	.187[a]	1.072	.293	.202	.965
	LOGP20	.216[a]	1.195	.243	.224	.890
	L5S	.262[a]	1.378	.180	.256	.791
	L5T	.059[a]	.306	.762	.059	.813

a. Predictors in the Model: (Constant), LOGLEN

b. Dependent Variable: VALUE

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	5S, LOGLEN[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.426[a]	.181	.143	1.1039

a. Predictors: (Constant), 5S, LOGLEN

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.585	2	5.792	4.753	.014[a]
	Residual	52.398	43	1.219		
	Total	63.982	45			

a. Predictors: (Constant), 5S, LOGLEN

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.771	1.303		7.499	.000
	LOGLEN	.162	.176	.144	.922	.362
	5S	1.257E-02	.006	.339	2.169	.036

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LENGTH, P40, 5S[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: VALUE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.296[a]	.088	.022	245314.4

a. Predictors: (Constant), LENGTH, P40, 5S

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.4E+11	3	8.1E+10	1.344	.273[a]
	Residual	2.5E+12	42	6.0E+10		
	Total	2.8E+12	45			

a. Predictors: (Constant), LENGTH, P40, 5S

b. Dependent Variable: VALUE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	93301.403	51419.365		1.815	.077
	5S	1749.271	1210.822	.226	1.445	.156
	P40	3.002E-02	.034	.136	.895	.376
	LENGTH	.781	3.400	.035	.230	.820

a. Dependent Variable: VALUE

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LOGPOP, L5S[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.639[a]	.408	.380	.9386

a. Predictors: (Constant), LOGPOP, L5S

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	26.100	2	13.050	14.813	.000[a]
	Residual	37.883	43	.881		
	Total	63.982	45			

a. Predictors: (Constant), LOGPOP, L5S

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.320	1.659		4.411	.000
	L5S	.634	.127	.592	4.978	.000
	LOGPOP	.179	.131	.162	1.364	.180

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LOGP20, L5S[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.652[a]	.425	.398	.9248

a. Predictors: (Constant), LOGP20, L5S

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27.204	2	13.602	15.903	.000[a]
	Residual	36.778	43	.855		
	Total	63.982	45			

a. Predictors: (Constant), LOGP20, L5S

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.914	1.504		4.598	.000
	L5S	.623	.126	.582	4.960	.000
	LOGP20	.239	.134	.210	1.791	.080

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	L5S, LOGPOP, LOGLEN[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.639[a]	.408	.366	.9496

a. Predictors: (Constant), L5S, LOGPOP, LOGLEN

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	26.107	3	8.702	9.650	.000[a]
	Residual	37.876	42	.902		
	Total	63.982	45			

a. Predictors: (Constant), L5S, LOGPOP, LOGLEN

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.411	1.979		3.744	.001
	LOGLEN	-1.35E-02	.155	-.012	-.087	.931
	LOGPOP	.178	.133	.162	1.345	.186
	L5S	.640	.150	.598	4.277	.000

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	PARK, LWIDTH, GHILLIES, L5T, LOGPOP, LEASE, SIDEDUMM, BOATS, L5S[a]	.	Enter
2	.	BOATS	Backward (criterion: Probability of F-to-remove >= .100).
3	.	L5T	Backward (criterion: Probability of F-to-remove >= .100).
4	.	SIDEDUMM	Backward (criterion: Probability of F-to-remove >= .100).
5	.	LEASE	Backward (criterion: Probability of F-to-remove >= .100).
6	.	LOGPOP	Backward (criterion: Probability of F-to-remove >= .100).
7	.	LWIDTH	Backward (criterion: Probability of F-to-remove >= .100).
8	.	GHILLIES	Backward (criterion: Probability of F-to-remove >= .100).

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.719[a]	.517	.367	1.0130
2	.719[b]	.517	.388	.9959
3	.718[c]	.515	.405	.9820
4	.713[d]	.508	.415	.9737
5	.707[e]	.500	.424	.9668
6	.701[f]	.491	.431	.9604
7	.688[g]	.473	.428	.9635
8	.663[h]	.439	.408	.9800

a. Predictors: (Constant), PARK, LWIDTH, GHILLIES, L5T, LOGPOP, LEASE, SIDEDUMM, BOATS, L5S

b. Predictors: (Constant), PARK, LWIDTH, GHILLIES, L5T, LOGPOP, LEASE, SIDEDUMM, L5S

c. Predictors: (Constant), PARK, LWIDTH, GHILLIES, LOGPOP, LEASE, SIDEDUMM, L5S

d. Predictors: (Constant), PARK, LWIDTH, GHILLIES, LOGPOP, LEASE, L5S

e. Predictors: (Constant), PARK, LWIDTH, GHILLIES, LOGPOP, L5S

f. Predictors: (Constant), PARK, LWIDTH, GHILLIES, L5S

g. Predictors: (Constant), PARK, GHILLIES, L5S

h. Predictors: (Constant), PARK, L5S

ANOVA[i]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	31.872	9	3.541	3.451	.005[a]
	Residual	29.756	29	1.026		
	Total	61.628	38			
2	Regression	31.872	8	3.984	4.017	.002[b]
	Residual	29.757	30	.992		
	Total	61.628	38			
3	Regression	31.734	7	4.533	4.701	.001[c]
	Residual	29.895	31	.964		
	Total	61.628	38			
4	Regression	31.291	6	5.215	5.501	.001[d]
	Residual	30.337	32	.948		
	Total	61.628	38			
5	Regression	30.784	5	6.157	6.587	.000[e]
	Residual	30.844	33	.935		
	Total	61.628	38			
6	Regression	30.265	4	7.566	8.202	.000[f]
	Residual	31.363	34	.922		
	Total	61.628	38			
7	Regression	29.138	3	9.713	10.463	.000[g]
	Residual	32.490	35	.928		
	Total	61.628	38			
8	Regression	27.056	2	13.528	14.086	.000[h]
	Residual	34.573	36	.960		
	Total	61.628	38			

a. Predictors: (Constant), PARK, LWIDTH, GHILLIES, L5T, LOGPOP, LEASE, SIDEDUMM, BOATS, L5S

b. Predictors: (Constant), PARK, LWIDTH, GHILLIES, L5T, LOGPOP, LEASE, SIDEDUMM, L5S

c. Predictors: (Constant), PARK, LWIDTH, GHILLIES, LOGPOP, LEASE, SIDEDUMM, L5S

d. Predictors: (Constant), PARK, LWIDTH, GHILLIES, LOGPOP, LEASE, L5S

e. Predictors: (Constant), PARK, LWIDTH, GHILLIES, LOGPOP, L5S

f. Predictors: (Constant), PARK, LWIDTH, GHILLIES, L5S

g. Predictors: (Constant), PARK, GHILLIES, L5S

h. Predictors: (Constant), PARK, L5S

i. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	6.835	2.210		3.093	.004
	LOGPOP	.153	.168	.131	.911	.370
	SIDEDUMM	.256	.394	.100	.650	.521
	LEASE	-.235	.482	-.077	-.488	.629
	LWIDTH	.241	.280	.136	.858	.398
	L5S	.534	.203	.470	2.625	.014
	L5T	-5.06E-02	.155	-.060	-.326	.747
	GHILLIES	.664	.477	.203	1.392	.175
	BOATS	-1.07E-02	.742	-.003	-.014	.989
	PARK	.570	.475	.174	1.201	.240
2	(Constant)	6.837	2.171		3.149	.004
	LOGPOP	.154	.163	.131	.940	.355
	SIDEDUMM	.256	.385	.100	.664	.512
	LEASE	-.238	.440	-.078	-.540	.593
	LWIDTH	.239	.247	.135	.967	.341
	L5S	.533	.191	.469	2.797	.009
	L5T	-4.95E-02	.133	-.059	-.373	.712
	GHILLIES	.662	.443	.202	1.493	.146
	PARK	.570	.466	.174	1.223	.231
3	(Constant)	6.835	2.141		3.193	.003
	LOGPOP	.147	.160	.125	.916	.366
	SIDEDUMM	.257	.380	.101	.677	.503
	LEASE	-.291	.410	-.095	-.710	.483
	LWIDTH	.249	.242	.141	1.029	.312
	L5S	.500	.166	.440	3.012	.005
	GHILLIES	.659	.437	.201	1.508	.142
	PARK	.609	.448	.186	1.362	.183
4	(Constant)	7.303	2.009		3.635	.001
	LOGPOP	.117	.153	.100	.768	.448
	LEASE	-.297	.407	-.097	-.731	.470
	LWIDTH	.201	.229	.114	.876	.388
	L5S	.541	.153	.476	3.541	.001
	GHILLIES	.679	.432	.207	1.570	.126
	PARK	.703	.422	.214	1.664	.106
5	(Constant)	6.979	1.946		3.587	.001
	LOGPOP	.113	.152	.096	.745	.461
	LWIDTH	.240	.222	.135	1.081	.288
	L5S	.558	.150	.491	3.714	.001
	GHILLIES	.610	.419	.186	1.456	.155
	PARK	.737	.417	.225	1.769	.086
6	(Constant)	8.315	.750		11.088	.000
	LWIDTH	.243	.220	.138	1.106	.277
	L5S	.575	.147	.506	3.903	.000
	GHILLIES	.648	.413	.198	1.569	.126
	PARK	.794	.407	.242	1.952	.059
7	(Constant)	8.929	.506		17.653	.000
	L5S	.604	.145	.532	4.153	.000
	GHILLIES	.619	.413	.189	1.498	.143
	PARK	.795	.408	.243	1.947	.060
8	(Constant)	8.894	.514		17.306	.000
	L5S	.654	.144	.576	4.542	.000
	PARK	.797	.415	.243	1.921	.063

a. Dependent Variable: LVAL

Excluded Variables[h]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
2	BOATS	-.003[a]	-.014	.989	-.003	.519
3	BOATS	.026[b]	.172	.864	.031	.690
	L5T	-.059[b]	-.373	.712	-.068	.647
4	BOATS	.036[c]	.239	.813	.043	.697
	L5T	-.060[c]	-.384	.704	-.069	.648
	SIDEDUMM	.101[c]	.677	.503	.121	.708
5	BOATS	.015[d]	.102	.920	.018	.721
	L5T	-.088[d]	-.605	.549	-.106	.725
	SIDEDUMM	.103[d]	.698	.490	.123	.709
	LEASE	-.097[d]	-.731	.470	-.128	.867
6	BOATS	-.008[e]	-.054	.957	-.009	.755
	L5T	-.073[e]	-.509	.614	-.088	.737
	SIDEDUMM	.067[e]	.473	.639	.082	.765
	LEASE	-.093[e]	-.706	.485	-.122	.868
	LOGPOP	.096[e]	.745	.461	.129	.905
7	BOATS	.049[f]	.375	.710	.064	.890
	L5T	-.099[f]	-.697	.491	-.119	.761
	SIDEDUMM	.018[f]	.135	.894	.023	.835
	LEASE	-.121[f]	-.941	.353	-.159	.916
	LOGPOP	.100[f]	.768	.448	.131	.905
	LWIDTH	.138[f]	1.106	.277	.186	.967
8	BOATS	.094[g]	.729	.471	.122	.951
	L5T	-.073[g]	-.510	.613	-.086	.771
	SIDEDUMM	.028[g]	.199	.843	.034	.837
	LEASE	-.071[g]	-.552	.584	-.093	.969
	LOGPOP	.122[g]	.932	.358	.156	.919
	LWIDTH	.125[g]	.988	.330	.165	.971
	GHILLIES	.189[g]	1.498	.143	.245	.946

a. Predictors in the Model: (Constant), PARK, LWIDTH, GHILLIES, L5T, LOGPOP, LEASE, SIDEDUMM, L5S

b. Predictors in the Model: (Constant), PARK, LWIDTH, GHILLIES, LOGPOP, LEASE, SIDEDUMM, L5S

c. Predictors in the Model: (Constant), PARK, LWIDTH, GHILLIES, LOGPOP, LEASE, L5S

d. Predictors in the Model: (Constant), PARK, LWIDTH, GHILLIES, LOGPOP, L5S

e. Predictors in the Model: (Constant), PARK, LWIDTH, GHILLIES, L5S

f. Predictors in the Model: (Constant), PARK, GHILLIES, L5S

g. Predictors in the Model: (Constant), PARK, L5S

h. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	PARK, GHILLIES, L5S, LOGPOP[a]	.	Enter
2	.	LOGPOP	Backward (criterion: Probability of F-to-remove >= .100).
3	.	GHILLIES	Backward (criterion: Probability of F-to-remove >= .100).

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.675[a]	.456	.403	.9213
2	.666[b]	.443	.403	.9212
3	.650[c]	.422	.395	.9274

a. Predictors: (Constant), PARK, GHILLIES, L5S, LOGPOP

b. Predictors: (Constant), PARK, GHILLIES, L5S

c. Predictors: (Constant), PARK, L5S

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.185	4	7.296	8.597	.000[a]
	Residual	34.797	41	.849		
	Total	63.982	45			
2	Regression	28.342	3	9.447	11.133	.000[b]
	Residual	35.641	42	.849		
	Total	63.982	45			
3	Regression	26.997	2	13.499	15.694	.000[c]
	Residual	36.985	43	.860		
	Total	63.982	45			

a. Predictors: (Constant), PARK, GHILLIES, L5S, LOGPOP

b. Predictors: (Constant), PARK, GHILLIES, L5S

c. Predictors: (Constant), PARK, L5S

d. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.500	1.631		4.597	.000
	LOGPOP	.131	.131	.119	.997	.325
	L5S	.586	.127	.548	4.600	.000
	GHILLIES	.376	.315	.140	1.192	.240
	PARK	.576	.356	.194	1.618	.113
2	(Constant)	9.068	.435		20.861	.000
	L5S	.602	.127	.562	4.756	.000
	GHILLIES	.396	.314	.147	1.259	.215
	PARK	.647	.349	.218	1.854	.071
3	(Constant)	9.139	.434		21.057	.000
	L5S	.627	.126	.586	4.986	.000
	PARK	.600	.349	.202	1.717	.093

a. Dependent Variable: LVAL

Excluded Variables[c]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
2	LOGPOP	.119[a]	.997	.325	.154	.933
3	LOGPOP	.128[b]	1.070	.291	.163	.937
	GHILLIES	.147[b]	1.259	.215	.191	.968

a. Predictors in the Model: (Constant), PARK, GHILLIES, L5S

b. Predictors in the Model: (Constant), PARK, L5S

c. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	PARK, L5S, LOGPOP[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.661[a]	.437	.397	.9259

a. Predictors: (Constant), PARK, L5S, LOGPOP

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27.979	3	9.326	10.880	.000[a]
	Residual	36.003	42	.857		
	Total	63.982	45			

a. Predictors: (Constant), PARK, L5S, LOGPOP

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.447	1.639		4.543	.000
	LOGPOP	.141	.132	.128	1.070	.291
	L5S	.609	.127	.569	4.809	.000
	PARK	.526	.355	.177	1.481	.146

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LOGP20, PARK, L5S[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.674[a]	.454	.415	.9117

a. Predictors: (Constant), LOGP20, PARK, L5S

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.070	3	9.690	11.657	.000[a]
	Residual	34.912	42	.831		
	Total	63.982	45			

a. Predictors: (Constant), LOGP20, PARK, L5S

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.896	1.483		4.652	.000
	L5S	.598	.125	.558	4.781	.000
	PARK	.520	.347	.175	1.498	.142
	LOGP20	.210	.133	.185	1.579	.122

a. Dependent Variable: LVAL

Appendix 4.3 Models for Evaluating Trout River Values

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LFISHWT, LFISH, LLENGTH, LWIDTH, LTOTFISH[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.911[a]	.831	.661	.8367

a. Predictors: (Constant), LFISHWT, LFISH, LLENGTH, LWIDTH, LTOTFISH

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.165	5	3.433	4.904	.053[a]
	Residual	3.500	5	.700		
	Total	20.665	10			

a. Predictors: (Constant), LFISHWT, LFISH, LLENGTH, LWIDTH, LTOTFISH

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.535	2.976		3.203	.024
	LTOTFISH	1.296E-02	4.314	.007	.003	.998
	LFISH	.757	4.805	.156	.158	.881
	LLENGTH	.317	.317	.246	1.000	.363
	LWIDTH	-5.15E-02	.526	-.028	-.098	.926
	LFISHWT	2.110	3.939	.910	.536	.615

a. Dependent Variable: LVAL

Regression

Warnings

For models with dependent variable LVAL, the following variables are constants or have missing correlations: DSPEED. They will be deleted from the analysis.

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LP20, LFISHWT, LLENGTH, LWILDB, LWIDTH, LP5[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.953[a]	.908	.724	.7694

a. Predictors: (Constant), LP20, LFISHWT, LLENGTH, LWILDB, LWIDTH, LP5

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.564	6	2.927	4.945	.109[a]
	Residual	1.776	3	.592		
	Total	19.340	9			

a. Predictors: (Constant), LP20, LFISHWT, LLENGTH, LWILDB, LWIDTH, LP5

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	14.134	11.964		1.181	.323
	LLENGTH	-.666	1.285	-.459	-.518	.640
	LWIDTH	-.488	1.633	-.270	-.299	.785
	LFISHWT	3.322	1.670	1.347	1.989	.141
	LWILDB	1.263	.802	.600	1.574	.213
	LP5	-.744	.898	-.946	-.828	.468
	LP20	.674	.998	.611	.676	.548

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LP40, LFISHWT, LLENGTH, LWILDB, LWIDTH, LP20, LP5[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.998[a]	.997	.984	.1830

a. Predictors: (Constant), LP40, LFISHWT, LLENGTH, LWILDB, LWIDTH, LP20, LP5

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.273	7	2.753	82.245	.012[a]
	Residual	6.695E-02	2	3.348E-02		
	Total	19.340	9			

a. Predictors: (Constant), LP40, LFISHWT, LLENGTH, LWILDB, LWIDTH, LP20, LP5

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.427	3.760		-.912	.458
	LLENGTH	-6.38E-02	.317	-.044	-.201	.859
	LWIDTH	.583	.416	.323	1.402	.296
	LFISHWT	1.931	.442	.783	4.367	.049
	LWILDB	1.161	.191	.552	6.071	.026
	LP5	-1.047	.218	-1.331	-4.806	.041
	LP20	-.263	.271	-.238	-.969	.435
	LP40	1.725	.241	1.290	7.145	.019

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LP40, LFISHWT, LLENGTH, LWILDB, LP20, LP5[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.997[a]	.993	.979	.2103

a. Predictors: (Constant), LP40, LFISHWT, LLENGTH, LWILDB, LP20, LP5

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.207	6	3.201	72.352	.002[a]
	Residual	.133	3	4.425E-02		
	Total	19.340	9			

a. Predictors: (Constant), LP40, LFISHWT, LLENGTH, LWILDB, LP20, LP5

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.299	1.913		.679	.546
	LLENGTH	-.471	.146	-.325	-3.232	.048
	LFISHWT	2.516	.168	1.020	15.013	.001
	LWILDB	1.209	.216	.574	5.585	.011
	LP5	-1.270	.171	-1.615	-7.426	.005
	LP20	8.976E-02	.117	.081	.770	.498
	LP40	1.603	.259	1.198	6.192	.008

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LP40, LFISHWT, LLENGTH, LWILDB[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.931[a]	.866	.760	.7188

a. Predictors: (Constant), LP40, LFISHWT, LLENGTH, LWILDB

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.757	4	4.189	8.109	.021[a]
	Residual	2.583	5	.517		
	Total	19.340	9			

a. Predictors: (Constant), LP40, LFISHWT, LLENGTH, LWILDB

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.095	5.570		1.274	.259
	LLENGTH	.255	.348	.176	.733	.496
	LFISHWT	2.425	.529	.983	4.587	.006
	LWILDB	.428	.627	.204	.683	.525
	LP40	.151	.368	.113	.411	.698

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LSWIMS, LWILDB, LLENGTH, LFISHWT[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.961[a]	.924	.824	.5655

a. Predictors: (Constant), LSWIMS, LWILDB, LLENGTH, LFISHWT

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.729	4	2.932	9.170	.050[a]
	Residual	.959	3	.320		
	Total	12.689	7			

a. Predictors: (Constant), LSWIMS, LWILDB, LLENGTH, LFISHWT

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.812	1.724		5.693	.011
	LLENGTH	.137	.201	.115	.680	.545
	LFISHWT	2.993	.597	1.185	5.014	.015
	LWILDB	.747	.347	.423	2.152	.120
	LSWIMS	-.252	.257	-.214	-.978	.400

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LWILDB, LLENGTH, LFISHWT[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.928[a]	.862	.793	.6671

a. Predictors: (Constant), LWILDB, LLENGTH, LFISHWT

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.670	3	5.557	12.485	.005[a]
	Residual	2.670	6	.445		
	Total	19.340	9			

a. Predictors: (Constant), LWILDB, LLENGTH, LFISHWT

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.209	1.987		4.634	.004
	LLENGTH	.155	.230	.107	.673	.526
	LFISHWT	2.531	.427	1.026	5.926	.001
	LWILDB	.624	.379	.297	1.646	.151

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LFISHWT, LLENGTH[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.901[a]	.811	.764	.6978

a. Predictors: (Constant), LFISHWT, LLENGTH

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.769	2	8.384	17.217	.001[a]
	Residual	3.896	8	.487		
	Total	20.665	10			

a. Predictors: (Constant), LFISHWT, LLENGTH

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.309	1.585		6.506	.000
	LLENGTH	.283	.206	.219	1.371	.208
	LFISHWT	2.170	.370	.936	5.863	.000

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LWIDTH, LFISHWT[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.876[a]	.768	.710	.7747

a. Predictors: (Constant), LWIDTH, LFISHWT

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.863	2	7.932	13.215	.003[a]
	Residual	4.802	8	.600		
	Total	20.665	10			

a. Predictors: (Constant), LWIDTH, LFISHWT

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.551	1.368		9.172	.000
	LFISHWT	2.064	.476	.890	4.335	.002
	LWIDTH	-4.81E-02	.381	-.026	-.126	.903

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LWIDTH, LFISHWT[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVPM

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.866[a]	.751	.688	1.0335

a. Predictors: (Constant), LWIDTH, LFISHWT

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.721	2	12.861	12.041	.004[a]
	Residual	8.544	8	1.068		
	Total	34.266	10			

a. Predictors: (Constant), LWIDTH, LFISHWT

b. Dependent Variable: LVPM

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.192	1.825		1.749	.118
	LFISHWT	2.139	.635	.717	3.368	.010
	LWIDTH	.550	.508	.230	1.082	.311

a. Dependent Variable: LVPM

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LWILDB, LFISHWT, LWIDTH[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVPM

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.915[a]	.837	.756	.8340

a. Predictors: (Constant), LWILDB, LFISHWT, LWIDTH

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.439	3	7.146	10.274	.009[a]
	Residual	4.174	6	.696		
	Total	25.613	9			

a. Predictors: (Constant), LWILDB, LFISHWT, LWIDTH

b. Dependent Variable: LVPM

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.767	3.111		-.889	.408
	LFISHWT	1.561	.632	.550	2.469	.049
	LWIDTH	1.289	.507	.621	2.542	.044
	LWILDB	.779	.503	.322	1.549	.172

a. Dependent Variable: LVPM

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LFISHWT[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVPM

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.845[a]	.714	.682	1.0432

a. Predictors: (Constant), LFISHWT

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24.472	1	24.472	22.488	.001[a]
	Residual	9.794	9	1.088		
	Total	34.266	10			

a. Predictors: (Constant), LFISHWT

b. Dependent Variable: LVPM

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.027	.681		7.387	.000
	LFISHWT	2.523	.532	.845	4.742	.001

a. Dependent Variable: LVPM

Appendix 4.4 Alternative Models of the Value of Coarse River Fishing

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Weightpad	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: VALUE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.857[a]	.734	.712	*********

a. Predictors: (Constant), Weightpad

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.3E+12	1	9.3E+12	33.172	.000[a]
	Residual	3.4E+12	12	2.8E+11		
	Total	1.3E+13	13			

a. Predictors: (Constant), Weightpad

b. Dependent Variable: VALUE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-612909	219815.5		-2.788	.016
	Weightpad	138153.3	23986.995	.857	5.760	.000

a. Dependent Variable: VALUE

Excluded Variables[b]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	CATCHPAD	-.123[a]	-.804	.439	-.236	.971
	AnglerDays	.238[a]	1.347	.205	.376	.662
	P5	.073[a]	.466	.650	.139	.976
	P20	-.055[a]	-.353	.730	-.106	.975
	P40	-.066[a]	-.431	.675	-.129	.999
	LENGTH	-.249[a]	-1.824	.095	-.482	.996
	WIDTH	.243[a]	1.768	.105	.470	.993
	SWIMS	-.234[a]	-1.651	.127	-.446	.960

a. Predictors in the Model: (Constant), Weightpad

b. Dependent Variable: VALUE

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LENGTH, Weightpad[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: VALUE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.611[a]	.373	.316	*********

a. Predictors: (Constant), LENGTH, Weightpad

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.0E+12	2	2.5E+12	6.536	.006[a]
	Residual	8.4E+12	22	3.8E+11		
	Total	1.3E+13	24			

a. Predictors: (Constant), LENGTH, Weightpad

b. Dependent Variable: VALUE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-221076	212215.7		-1.042	.309
	Weightpad	70410.655	19602.742	.614	3.592	.002
	LENGTH	-31.700	33.379	-.162	-.950	.353

a. Dependent Variable: VALUE

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	SWIMS, Weightpad[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: VALUE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.589[a]	.347	.288	*********

a. Predictors: (Constant), SWIMS, Weightpad

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.6E+12	2	2.3E+12	5.847	.009[a]
	Residual	8.7E+12	22	4.0E+11		
	Total	1.3E+13	24			

a. Predictors: (Constant), SWIMS, Weightpad

b. Dependent Variable: VALUE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-295701	226149.1		-1.308	.205
	Weightpad	67667.430	19815.729	.590	3.415	.002
	SWIMS	-60.124	1258.342	-.008	-.048	.962

a. Dependent Variable: VALUE

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	SIZE, Weightpad[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: VALUE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.602[a]	.362	.304	*********

a. Predictors: (Constant), SIZE, Weightpad

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.8E+12	2	2.4E+12	6.244	.007[a]
	Residual	8.5E+12	22	3.9E+11		
	Total	1.3E+13	24			

a. Predictors: (Constant), SIZE, Weightpad

b. Dependent Variable: VALUE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-247299	210057.0		-1.177	.252
	Weightpad	71252.894	20184.906	.621	3.530	.002
	SIZE	-1.146	1.588	-.127	-.722	.478

a. Dependent Variable: VALUE

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	BANKK, SIZE, Weightpad[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: VALUE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.602[a]	.362	.271	*********

a. Predictors: (Constant), BANKK, SIZE, Weightpad

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.8E+12	3	1.6E+12	3.978	.022[a]
	Residual	8.5E+12	21	4.0E+11		
	Total	1.3E+13	24			

a. Predictors: (Constant), BANKK, SIZE, Weightpad

b. Dependent Variable: VALUE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-219644	387142.2		-.567	.576
	Weightpad	71981.968	22332.446	.627	3.223	.004
	SIZE	-1.129	1.637	-.125	-.690	.498
	BANKK	-24672.1	287256.4	-.017	-.086	.932

a. Dependent Variable: VALUE

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LLWIDTH, LLEN, LWPAD[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.748[a]	.560	.497	1.3549

a. Predictors: (Constant), LLWIDTH, LLEN, LWPAD

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	49.027	3	16.342	8.902	.001[a]
	Residual	38.552	21	1.836		
	Total	87.579	24			

a. Predictors: (Constant), LLWIDTH, LLEN, LWPAD

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.819	2.099		.866	.396
	LWPAD	.423	.235	.264	1.796	.087
	LLEN	.566	.262	.318	2.163	.042
	LLWIDTH	1.227	.326	.550	3.765	.001

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LLEN, LWPAD[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.512[a]	.263	.196	1.7133

a. Predictors: (Constant), LLEN, LWPAD

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	23.000	2	11.500	3.918	.035[a]
	Residual	64.578	22	2.935		
	Total	87.579	24			

a. Predictors: (Constant), LLEN, LWPAD

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.639	2.480		1.870	.075
	LWPAD	.503	.296	.314	1.697	.104
	LLEN	.644	.330	.362	1.954	.064

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	LLWIDTH	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.593[a]	.352	.320	1.6009

a. Predictors: (Constant), LLWIDTH

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27.848	1	27.848	10.866	.004[a]
	Residual	51.256	20	2.563		
	Total	79.104	21			

a. Predictors: (Constant), LLWIDTH

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.704	1.176		5.703	.000
	LLWIDTH	1.282	.389	.593	3.296	.004

a. Dependent Variable: LVAL

Excluded Variables[b]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	LWPAD	.336[a]	1.992	.061	.416	.993
	LLEN	.342[a]	2.040	.056	.424	.996
	LLCPAD	-.084[a]	-.454	.655	-.104	.996
	LP5	.088[a]	.440	.665	.100	.845
	LP20	.110[a]	.592	.561	.134	.960
	LP40	-.247[a]	-1.281	.215	-.282	.847

a. Predictors in the Model: (Constant), LLWIDTH

b. Dependent Variable: LVAL

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
PPM	34	1.00	4,687.50	181.9808	798.4063
Valid N (listwise)	34				

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
VPM	56	.50	484.38	66.2995	84.2546
Valid N (listwise)	56				

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
PPM	34	1.00	227.27	45.4918	60.5760
Valid N (listwise)	34				

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LP40, LWPAD, LLEN, LLWIDTH[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.770[a]	.593	.512	1.1362

a. Predictors: (Constant), LP40, LWPAD, LLEN, LLWIDTH

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	37.652	4	9.413	7.291	.001[a]
	Residual	25.820	20	1.291		
	Total	63.472	24			

a. Predictors: (Constant), LP40, LWPAD, LLEN, LLWIDTH

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.657	6.759		.097	.924
	LLEN	.771	.230	.509	3.357	.003
	LWPAD	.211	.202	.155	1.047	.307
	LLWIDTH	.902	.309	.475	2.916	.009
	LP40	5.086E-02	.452	.019	.113	.912

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	speed dummy, LLEN, LLWIDTH, LWPAD, LP40[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.781[a]	.610	.507	1.1416

a. Predictors: (Constant), speed dummy, LLEN, LLWIDTH, LWPAD, LP40

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	38.712	5	7.742	5.941	.002[a]
	Residual	24.760	19	1.303		
	Total	63.472	24			

a. Predictors: (Constant), speed dummy, LLEN, LLWIDTH, LWPAD, LP40

b. Dependent Variable: LVAL

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	.801	6.792		.118	.907
	LLEN	.762	.231	.503	3.299	.004
	LWPAD	.283	.218	.207	1.300	.209
	LLWIDTH	.859	.314	.452	2.734	.013
	LP40	7.743E-02	.455	.029	.170	.867
	speed dummy	-.556	.616	-.139	-.902	.378

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LLWIDTH, LLEN, LWPAD[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.770[a]	.593	.535	1.1092

a. Predictors: (Constant), LLWIDTH, LLEN, LWPAD

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	37.635	3	12.545	10.197	.000[a]
	Residual	25.836	21	1.230		
	Total	63.472	24			

a. Predictors: (Constant), LLWIDTH, LLEN, LWPAD

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.391	1.719		.809	.427
	LLEN	.764	.214	.504	3.567	.002
	LWPAD	.207	.193	.151	1.072	.296
	LLWIDTH	.918	.267	.483	3.441	.002

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	PARKING, LLWIDTH, LLEN, LWPAD[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.811[a]	.658	.590	1.0414

a. Predictors: (Constant), PARKING, LLWIDTH, LLEN, LWPAD

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	41.779	4	10.445	9.630	.000[a]
	Residual	21.692	20	1.085		
	Total	63.472	24			

a. Predictors: (Constant), PARKING, LLWIDTH, LLEN, LWPAD

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.867	1.632		1.144	.266
	LLEN	.637	.211	.420	3.018	.007
	LWPAD	.345	.194	.253	1.777	.091
	LLWIDTH	.790	.259	.416	3.052	.006
	PARKING	.964	.493	.290	1.955	.065

a. Dependent Variable: LVAL

Appendix 4.5 Trout Stillwater

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LEASE, LPOP5, LWT, LSWIMS, LPOP25, LFISH, LSIZE[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.705[a]	.497	.311	1.0987

a. Predictors: (Constant), LEASE, LPOP5, LWT, LSWIMS, LPOP25, LFISH, LSIZE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.622	7	3.232	2.677	.042[a]
	Residual	22.935	19	1.207		
	Total	45.557	26			

a. Predictors: (Constant), LEASE, LPOP5, LWT, LSWIMS, LPOP25, LFISH, LSIZE

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	7.715	3.197		2.413	.026
	LSIZE	.122	.271	.176	.452	.657
	LPOP25	.308	.341	.247	.905	.377
	LPOP5	-.256	.309	-.205	-.828	.418
	LFISH	-.355	.389	-.233	-.912	.373
	LWT	.652	.396	.436	1.645	.116
	LSWIMS	.423	.328	.438	1.290	.213
	LEASE	-.467	.542	-.159	-.861	.400

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LSWIMS, LWT, LSIZE[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.621[a]	.385	.311	1.2609

a. Predictors: (Constant), LSWIMS, LWT, LSIZE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24.905	3	8.302	5.222	.006[a]
	Residual	39.745	25	1.590		
	Total	64.650	28			

a. Predictors: (Constant), LSWIMS, LWT, LSIZE

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.213	.974		8.428	.000
	LSIZE	6.033E-02	.228	.074	.265	.793
	LWT	.645	.285	.375	2.262	.033
	LSWIMS	.549	.322	.478	1.702	.101

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LSWIMS, LWT[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.623[a]	.388	.343	1.2167

a. Predictors: (Constant), LSWIMS, LWT

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.374	2	12.687	8.570	.001[a]
	Residual	39.970	27	1.480		
	Total	65.344	29			

a. Predictors: (Constant), LSWIMS, LWT

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.134	.768		10.594	.000
	LWT	.662	.262	.383	2.528	.018
	LSWIMS	.608	.170	.541	3.566	.001

a. Dependent Variable: LVAL

Appendix 4.6 Coarse Stillwater

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Valuepacre	130	26	750,000	62,928.47	*********
Valid N (listwise)	130				

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	EASYA, LSWIMS, LPOP5, LEASE, LWT, LFISH, LPOP25, LSIZE[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.519[a]	.269	.111	1.1116

a. Predictors: (Constant), EASYA, LSWIMS, LPOP5, LEASE, LWT, LFISH, LPOP25, LSIZE

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.861	8	2.108	1.706	.130[a]
	Residual	45.717	37	1.236		
	Total	62.578	45			

a. Predictors: (Constant), EASYA, LSWIMS, LPOP5, LEASE, LWT, LFISH, LPOP25, LSIZE

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	6.745	2.555		2.640	.012
	LWT	3.151E-02	.139	.037	.227	.821
	LSWIMS	.590	.344	.355	1.715	.095
	LFISH	8.538E-02	.185	.079	.462	.646
	LPOP25	3.873E-02	.210	.037	.184	.855
	LPOP5	.177	.168	.187	1.055	.298
	LSIZE	.197	.253	.175	.780	.440
	LEASE	-1.28E-02	.471	-.005	-.027	.979
	EASYA	-.598	.788	-.127	-.759	.453

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LSIZE, LFISH, LPOP5, LSWIMS[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.523[a]	.273	.205	1.0477

a. Predictors: (Constant), LSIZE, LFISH, LPOP5, LSWIMS

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.726	4	4.432	4.037	.007[a]
	Residual	47.201	43	1.098		
	Total	64.927	47			

a. Predictors: (Constant), LSIZE, LFISH, LPOP5, LSWIMS

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.050	1.599		4.410	.000
	LSWIMS	.660	.271	.402	2.436	.019
	LFISH	-1.64E-02	.143	-.015	-.114	.910
	LPOP5	.152	.129	.160	1.177	.246
	LSIZE	.178	.194	.157	.916	.365

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LWT, LPOP5, LSWIMS[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.507[a]	.257	.207	1.0552

a. Predictors: (Constant), LWT, LPOP5, LSWIMS

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.984	3	5.661	5.085	.004[a]
	Residual	48.991	44	1.113		
	Total	65.976	47			

a. Predictors: (Constant), LWT, LPOP5, LSWIMS

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.766	1.501		4.507	.000
	LSWIMS	.777	.230	.465	3.382	.002
	LPOP5	.141	.127	.146	1.114	.271
	LWT	5.463E-02	.119	.064	.461	.647

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LFISH, LSWIMS, LPOP5[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.509[a]	.259	.208	1.0458

a. Predictors: (Constant), LFISH, LSWIMS, LPOP5

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.805	3	5.602	5.122	.004[a]
	Residual	48.122	44	1.094		
	Total	64.927	47			

a. Predictors: (Constant), LFISH, LSWIMS, LPOP5

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.108	1.595		4.458	.000
	LSWIMS	.812	.214	.494	3.791	.000
	LPOP5	.120	.124	.126	.964	.340
	LFISH	-3.95E-02	.141	-.037	-.280	.781

a. Dependent Variable: LVAL

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LSWIMS[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LVAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.505[a]	.255	.248	1.2001

a. Predictors: (Constant), LSWIMS

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	53.753	1	53.753	37.323	.000[a]
	Residual	156.981	109	1.440		
	Total	210.733	110			

a. Predictors: (Constant), LSWIMS

b. Dependent Variable: LVAL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.124	.532		15.276	.000
	LSWIMS	.853	.140	.505	6.109	.000

a. Dependent Variable: LVAL

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
VPS	111	93.75	93750.00	4504.5785	10065.12
Valid N (listwise)	111				

Appendix 4.7 Model Selection for Canal Rents

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
RENTPM	187	.03	16.67	.7298	1.5560
Valid N (listwise)	187				

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LPARK, LOGLDEP, LOGWT, LPEGS, LOGFISH, LOGP50, LOGWIDTH, LOGLEN[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LOGRENT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.767[a]	.588	.557	.7244

a. Predictors: (Constant), LPARK, LOGLDEP, LOGWT, LPEGS, LOGFISH, LOGP50, LOGWIDTH, LOGLEN

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	79.378	8	9.922	18.911	.000[a]
	Residual	55.617	106	.525		
	Total	134.995	114			

a. Predictors: (Constant), LPARK, LOGLDEP, LOGWT, LPEGS, LOGFISH, LOGP50, LOGWIDTH, LOGLEN

b. Dependent Variable: LOGRENT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.519	2.345		-.221	.825
	LOGP50	.153	.145	.070	1.052	.295
	LOGLEN	.469	.118	.496	3.985	.000
	LOGLDEP	.225	.217	.070	1.038	.302
	LOGWIDTH	.175	.214	.054	.818	.415
	LOGWT	-.141	.079	-.118	-1.780	.078
	LOGFISH	-.106	.094	-.073	-1.126	.263
	LPEGS	.294	.138	.263	2.131	.035
	LPARK	-1.57E-02	.053	-.019	-.299	.766

a. Dependent Variable: LOGRENT

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LPARK, LOGLDEP, LOGP50, LPEGS, LOGLEN[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LOGRENT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.728[a]	.530	.511	.7464

a. Predictors: (Constant), LPARK, LOGLDEP, LOGP50, LPEGS, LOGLEN

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	77.327	5	15.465	27.761	.000[a]
	Residual	68.523	123	.557		
	Total	145.851	128			

a. Predictors: (Constant), LPARK, LOGLDEP, LOGP50, LPEGS, LOGLEN

b. Dependent Variable: LOGRENT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.790	2.196		.360	.720
	LOGP50	8.257E-02	.139	.038	.592	.555
	LOGLEN	.465	.109	.503	4.271	.000
	LOGLDEP	.289	.194	.093	1.492	.138
	LPEGS	.277	.124	.263	2.244	.027
	LPARK	-5.40E-02	.048	-.072	-1.119	.265

a. Dependent Variable: LOGRENT

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LPARK, LOGLDEP, LPEGS, LOGLEN[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LOGRENT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.715[a]	.511	.497	.7384

a. Predictors: (Constant), LPARK, LOGLDEP, LPEGS, LOGLEN

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	80.929	4	20.232	37.110	.000[a]
	Residual	77.417	142	.545		
	Total	158.346	146			

a. Predictors: (Constant), LPARK, LOGLDEP, LPEGS, LOGLEN

b. Dependent Variable: LOGRENT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.588	.384		6.746	.000
	LOGLEN	.255	.078	.308	3.292	.001
	LOGLDEP	.282	.178	.093	1.581	.116
	LPEGS	.479	.095	.460	5.039	.000
	LPARK	-2.88E-02	.043	-.041	-.667	.506

a. Dependent Variable: LOGRENT

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LPEGS, LOGLDEP, LOGLEN[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LOGRENT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.691[a]	.477	.468	.7565

a. Predictors: (Constant), LPEGS, LOGLDEP, LOGLEN

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	84.682	3	28.227	49.317	.000[a]
	Residual	92.722	162	.572		
	Total	177.403	165			

a. Predictors: (Constant), LPEGS, LOGLDEP, LOGLEN

b. Dependent Variable: LOGRENT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.561	.357		7.177	.000
	LOGLEN	.231	.074	.276	3.125	.002
	LOGLDEP	.206	.162	.072	1.268	.206
	LPEGS	.492	.095	.457	5.187	.000

a. Dependent Variable: LOGRENT

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	LPEGS, LOGLEN[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LOGRENT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.716[a]	.512	.507	.7590

a. Predictors: (Constant), LPEGS, LOGLEN

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	101.110	2	50.555	87.768	.000[a]
	Residual	96.193	167	.576		
	Total	197.304	169			

a. Predictors: (Constant), LPEGS, LOGLEN

b. Dependent Variable: LOGRENT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.509	.336		7.473	.000
	LOGLEN	.237	.074	.279	3.206	.002
	LPEGS	.514	.094	.476	5.458	.000

a. Dependent Variable: LOGRENT

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	URBAN, LOGLEN, LPEGS[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: LOGRENT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.721[a]	.520	.511	.7555

a. Predictors: (Constant), URBAN, LOGLEN, LPEGS

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	102.556	3	34.185	59.894	.000[a]
	Residual	94.747	166	.571		
	Total	197.304	169			

a. Predictors: (Constant), URBAN, LOGLEN, LPEGS

b. Dependent Variable: LOGRENT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.556	.335		7.618	.000
	LOGLEN	.237	.074	.279	3.218	.002
	LPEGS	.519	.094	.480	5.533	.000
	URBAN	-.194	.122	-.086	-1.592	.113

a. Dependent Variable: LOGRENT

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	DISPARK, WIDTH, WEIGHT, URBAN, POP50, LENGTH, DEPTH, POP5, POP25[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: RENT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.851[a]	.724	.693	975.9271

a. Predictors: (Constant), DISPARK, WIDTH, WEIGHT, URBAN, POP50, LENGTH, DEPTH, POP5, POP25

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.0E+08	9	2.2E+07	23.314	.000[a]
	Residual	7.6E+07	80	952433.8		
	Total	2.8E+08	89			

a. Predictors: (Constant), DISPARK, WIDTH, WEIGHT, URBAN, POP50, LENGTH, DEPTH, POP5, POP25

b. Dependent Variable: RENT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-159.375	420.237		-.379	.706
	URBAN	186.501	298.523	.049	.625	.534
	POP5	9.744E-04	.003	.047	.346	.730
	POP25	-2.83E-04	.000	-.162	-.931	.355
	POP50	2.523E-04	.000	.254	2.273	.026
	WEIGHT	-25.198	21.781	-.074	-1.157	.251
	LENGTH	.372	.029	.870	12.760	.000
	DEPTH	110.494	172.306	.046	.641	.523
	WIDTH	-33.592	31.217	-.079	-1.076	.285
	DISPARK	-.386	.232	-.104	-1.665	.100

a. Dependent Variable: RENT

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	DISPARK, POP50, LENGTH[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: RENT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.747[a]	.558	.548	1152.9133

a. Predictors: (Constant), DISPARK, POP50, LENGTH

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.3E+08	3	7.6E+07	57.227	.000[a]
	Residual	1.8E+08	136	1329209		
	Total	4.1E+08	139			

a. Predictors: (Constant), DISPARK, POP50, LENGTH

b. Dependent Variable: RENT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-59.702	283.517		-.211	.834
	POP50	9.522E-05	.000	.093	1.596	.113
	LENGTH	.330	.026	.765	12.851	.000
	DISPARK	-.214	.221	-.059	-.972	.333

a. Dependent Variable: RENT

Regression

Variables Entered/Removed[b,c]

Model	Variables Entered	Variables Removed	Method
1	LENGTH, POP50[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: RENT

c. Linear Regression through the Origin

Model Summary

Model	R	R Square[a]	Adjusted R Square	Std. Error of the Estimate
1	.832[b]	.691	.688	1113.8120

a. For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.

b. Predictors: LENGTH, POP50

ANOVA[c,d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.4E+08	2	2.2E+08	179.306	.000[a]
	Residual	2.0E+08	160	1240577		
	Total	6.4E+08[b]	162			

a. Predictors: LENGTH, POP50

b. This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.

c. Dependent Variable: RENT

d. Linear Regression through the Origin

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	POP50	7.564E-05	.000	.167	3.320	.001
	LENGTH	.315	.022	.737	14.624	.000

a. Dependent Variable: RENT

b. Linear Regression through the Origin

Appendix 4.8 Spreadsheet for Calculating Site Values

Species	v1	v2	v3	v4	Value £	b0	b1	b2	b3	b4	lv1	lv2	lv3	lv4	ly	y
Salmon	**5yr catch**	**Park**	**Pop 20 mi**				**L5yrcatch**	**Parking**	**LPop20**			**park=1**				**£**
Value	10	TRUE	100000		73,914	6.896	0.598	0.52	0.21		2.303	1	11.513		11.211	73,914
	10	FALSE	50000		37,991	6.896	0.598	0.52	0.21		2.303	0	10.820		10.545	37,991
	40	FALSE	250000		122,038	6.896	0.598	0.52	0.21		3.689	0	12.429		11.712	122,038
	40	TRUE	20000		120,775	6.896	0.598	0.52	0.21		3.689	1	9.903		11.702	120,775
	6	TRUE	200000		62,991	6.896	0.598	0.52	0.21		1.792	1	12.206		11.051	62,991
	27.2	TRUE	144618		145,294	6.896	0.598	0.52	0.21		3.303	1	11.882		11.887	145,294
River trout	**WPAD lb**	**Width m**	**%wild**	**Length m**			**lwpad**	**lwidth**	**lwildb**							**£/m**
Value	1.80	30	50	500	132,820	- 2.767	1.561	1.29	0.78		0.588	3.401	3.912		5.582	266
	0.44	20	20	10000	85,559	- 2.767	1.561	1.29	0.78		- 0.821	2.996	2.996		2.147	9
	0.18	4	100	5000	4,665	- 2.767	1.561	1.29	0.78		- 1.715	1.386	4.605		- 0.069	1
	0.80	10	100	2000	62,382	- 2.767	1.561	1.29	0.78		- 0.223	2.303	4.605		3.440	31
	0.38	14.82	63.6	7678	88,521	- 2.767	1.561	1.29	0.78		- 0.960	2.696	4.153		2.445	12
Coarse river	**length m**	**wpad lb**	**width m**	**park**			**llnen**	**lwpad**	**lwidth**	**parking**				**park=1**		**£000**
Value	5,000	2	10	TRUE	30,171	1.867	0.637	0.35	0.79	0.964	8.517	0.693	2.303	1	10.315	30,171
	500	4	20	TRUE	15,285	1.867	0.637	0.35	0.79	0.964	6.215	1.386	2.996	1	9.635	15,285
	1,000	4	10	TRUE	13,747	1.867	0.637	0.35	0.79	0.964	6.908	1.386	2.303	1	9.529	13,747
	2,500	2	3	FALSE	2,858	1.867	0.637	0.35	0.79	0.964	7.824	0.693	1.099	0	7.958	2,858
	250	8	2	TRUE	2,025	1.867	0.637	0.35	0.79	0.964	5.521	2.079	0.693	1	7.613	2,025
	1,000	8	10	TRUE	17,460	1.867	0.637	0.35	0.79	0.964	6.908	2.079	2.303	1	9.768	17,460
	2,578	7.78	24.03	TRUE	63,191	1.867	0.637	0.35	0.79	0.964	7.855	2.052	3.179	1	11.054	63,191
Trout Still	**weight lb**	**swims**					**lwt**	**lswims**								**£**
Value	4	24			58,923	8.134	0.662	0.61			1.386	3.178			10.984	58,923
	2	24			37,239	8.134	0.662	0.61			0.693	3.178			10.525	37,239
	4	10			34,603	8.134	0.662	0.61			1.386	2.303			10.452	34,603
	4	24			58,923	8.134	0.662	0.61			1.386	3.178			10.984	58,923
	1	5			9,068	8.134	0.662	0.61			-	1.609			9.113	9,068
	1	100			56,047	8.134	0.662	0.61			-	4.605			10.934	56,047
	8.34	61			168,983	8.134	0.662	0.61			2.121	4.111			12.038	168,983
Coarse Still	**swims**						**lswims**									**£**
Value	25				52,559	8.124	0.853				3.219				10.870	52,559
	12				28,103	8.124	0.853				2.485				10.244	28,103
	35				70,032	8.124	0.853				3.555				11.157	70,032
	4				11,009	8.124	0.853				1.386				9.307	11,009
	100				171,478	8.124	0.853				4.605				12.052	171,478
	61				112,485	8.124	0.853				4.111				11.631	112,485
Canals	**length m**	**pegs**					**llen**	**lpegs**								**£**
rent p.a.	1,000	100			674	2.509	0.237	0.51			6.908	4.605			6.513	674
	500	500			1,308	2.509	0.237	0.51			6.215	6.215			7.176	1,308
	5,000	100			987	2.509	0.237	0.51			8.517	4.605			6.895	987
	1,000	50			472	2.509	0.237	0.51			6.908	3.912			6.157	472
	100	10			120	2.509	0.237	0.51			4.605	2.303			4.784	120
	2,000	100			794	2.509	0.237	0.51			7.601	4.605			6.677	794
	3,323	135			1,045	2.509	0.237	0.51			8.109	4.905			6.952	1,045

Appendix 5 Value per Acre by Sub Groups

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
size category * COARSE	195	38.6%	310	61.4%	505	100.0%

size category * COARSE Crosstabulation

			COARSE		Total
			.00	1.00	
size category	1.00	Count	15	51	66
		% within size category	22.7%	77.3%	100.0%
		% within COARSE	25.0%	37.8%	33.8%
		% of Total	7.7%	26.2%	33.8%
	2.00	Count	13	33	46
		% within size category	28.3%	71.7%	100.0%
		% within COARSE	21.7%	24.4%	23.6%
		% of Total	6.7%	16.9%	23.6%
	3.00	Count	19	41	60
		% within size category	31.7%	68.3%	100.0%
		% within COARSE	31.7%	30.4%	30.8%
		% of Total	9.7%	21.0%	30.8%
	4.00	Count	13	10	23
		% within size category	56.5%	43.5%	100.0%
		% within COARSE	21.7%	7.4%	11.8%
		% of Total	6.7%	5.1%	11.8%
Total		Count	60	135	195
		% within size category	30.8%	69.2%	100.0%
		% within COARSE	100.0%	100.0%	100.0%
		% of Total	30.8%	69.2%	100.0%

Means

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Valuepacre * size category * COARSE	195	38.6%	310	61.4%	505	100.0%

Report

Valuepacre

size category	COARSE	Mean	N	Std. Deviation
1.00	.00	26,375.40	15	48,249.55
	1.00	92,771.66	51	*********
	Total	77,681.60	66	*********
2.00	.00	41,226.65	13	32,330.39
	1.00	61,561.56	33	*********
	Total	55,814.74	46	*********
3.00	.00	21,743.36	19	23,585.28
	1.00	35,502.34	41	59,858.57
	Total	31,145.33	60	51,386.30
4.00	.00	3,975.18	13	4,912.96
	1.00	6,101.57	10	5,067.76
	Total	4,899.70	23	4,983.35
Total	.00	23,272.98	60	33,104.40
	1.00	61,329.61	135	*********
	Total	49,619.88	195	*********

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
size category * COARSE * easting < 34000 and northing > 19000 and northing < 48000 (FILTER)	187	37.0%	318	63.0%	505	100.0%

size category * COARSE * easting < 34000 and northing > 19000 and northing < 48000 (FILTER) Crosstabulation

easting < 34000 and northing >				COARSE		Total
				.00	1.00	
Not Selected	size category	1.00	Count	14	47	61
			% within size category	23.0%	77.0%	100.0%
			% within COARSE	27.5%	40.2%	36.3%
			% of Total	8.3%	28.0%	36.3%
		2.00	Count	10	29	39
			% within size category	25.6%	74.4%	100.0%
			% within COARSE	19.6%	24.8%	23.2%
			% of Total	6.0%	17.3%	23.2%
		3.00	Count	15	34	49
			% within size category	30.6%	69.4%	100.0%
			% within COARSE	29.4%	29.1%	29.2%
			% of Total	8.9%	20.2%	29.2%
		4.00	Count	12	7	19
			% within size category	63.2%	36.8%	100.0%
			% within COARSE	23.5%	6.0%	11.3%
			% of Total	7.1%	4.2%	11.3%
	Total		Count	51	117	168
			% within size category	30.4%	69.6%	100.0%
			% within COARSE	100.0%	100.0%	100.0%
			% of Total	30.4%	69.6%	100.0%
Selected	size category	1.00	Count	1	2	3
			% within size category	33.3%	66.7%	100.0%
			% within COARSE	11.1%	20.0%	15.8%
			% of Total	5.3%	10.5%	15.8%
		2.00	Count	3	2	5
			% within size category	60.0%	40.0%	100.0%
			% within COARSE	33.3%	20.0%	26.3%
			% of Total	15.8%	10.5%	26.3%
		3.00	Count	4	5	9
			% within size category	44.4%	55.6%	100.0%
			% within COARSE	44.4%	50.0%	47.4%
			% of Total	21.1%	26.3%	47.4%
		4.00	Count	1	1	2
			% within size category	50.0%	50.0%	100.0%
			% within COARSE	11.1%	10.0%	10.5%
			% of Total	5.3%	5.3%	10.5%
	Total		Count	9	10	19
			% within size category	47.4%	52.6%	100.0%
			% within COARSE	100.0%	100.0%	100.0%
			% of Total	47.4%	52.6%	100.0%

Means

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Valuepacre * size category * COARSE * easting < 34000 and northing > 19000 and northing < 48000 (FILTER)	187	37.0%	318	63.0%	505	100.0%

Report

Valuepacre

size category	COARSE	easting < 34000 and northing >	Mean	N	Std. Deviation
1.00	.00	Not Selected	28,125.43	14	49,574.43
		Selected	1,875.00	1	.
		Total	26,375.40	15	48,249.55
	1.00	Not Selected	84,295.96	47	*********
		Selected	354,722.22	2	*********
		Total	95,333.77	49	*********
	Total	Not Selected	71,404.36	61	*********
		Selected	237,106.48	3	*********
		Total	79,171.65	64	*********
2.00	.00	Not Selected	46,494.64	10	34,828.64
		Selected	23,666.67	3	14,545.90
		Total	41,226.65	13	32,330.39
	1.00	Not Selected	69,204.13	29	*********
		Selected	10,795.45	2	9,481.66
		Total	65,435.83	31	*********
	Total	Not Selected	63,381.18	39	*********
		Selected	18,518.18	5	13,340.45
		Total	58,283.12	44	*********
3.00	.00	Not Selected	25,483.93	15	25,175.45
		Selected	7,716.23	4	6,894.71
		Total	21,743.36	19	23,585.28
	1.00	Not Selected	35,218.95	34	63,883.73
		Selected	20,737.50	5	21,371.69
		Total	33,362.35	39	60,135.47
	Total	Not Selected	32,238.84	49	54,874.28
		Selected	14,950.27	9	17,125.98
		Total	29,556.13	58	51,154.39
4.00	.00	Not Selected	4,295.99	12	4,987.18
		Selected	125.48	1	.
		Total	3,975.18	13	4,912.96
	1.00	Not Selected	7,585.48	7	5,044.18
		Selected	62.50	1	.
		Total	6,645.11	8	5,374.32
	Total	Not Selected	5,507.91	19	5,132.10
		Selected	93.99	2	44.54
		Total	4,992.30	21	5,133.87
Total	.00	Not Selected	25,343.40	51	35,188.52
		Selected	11,540.60	9	12,694.16
		Total	23,272.98	60	33,104.40
	1.00	Not Selected	61,704.04	117	*********
		Selected	83,478.54	10	*********
		Total	63,418.57	127	*********
	Total	Not Selected	50,665.99	168	96,961.35
		Selected	49,402.67	19	*********
		Total	50,537.63	187	*********

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	AREASQ, ACRES[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: MAXSWIMS

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.509[a]	.259	.249	69.0324

a. Predictors: (Constant), AREASQ, ACRES

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	241880.1	2	120940.0	25.378	.000[a]
	Residual	690992.7	145	4765.467		
	Total	932872.7	147			

a. Predictors: (Constant), AREASQ, ACRES

b. Dependent Variable: MAXSWIMS

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	51.097	5.917		8.635	.000
	ACRES	.539	.150	.876	3.607	.000
	AREASQ	-2.43E-04	.000	-.398	-1.639	.103

a. Dependent Variable: MAXSWIMS

Appendix 6 Historic Salmon and Trout Values

Migratory Fisheries: Sea Trout and Salmon

	Journal	Journal Date	Date of Sale	Location Fishings advertised with Price	Asking Price	Targeted Species	Price per Fish	Water Type	single Bank	Double Bank	Number of Beats
1	T&S	Apr-90	?	River Nith	£ 250,000	S&ST	2000	River	3/4 mile		
2	T&S	Jun-90	?	River Don - Bridge of Alford - Aberdeenshire	£ 50,000	BT		River	1.5mile		
3	The Field	Jun-90	?	River Spey - Lower West Elchies Beat		S	3600	River			1
4	T&S	Aug-90	?	River Taw - Eggford	£ 40,000	S&ST&BT		River	2000	500	
5	T&S	Aug-90	?	Rivger Torridge - Weare Giffard	£ 60,000	S&ST&BT		River	880		
6	T&S	Aug-90	?	River Exe - Exeter	£ 25,000	S		River	750		
7	The Field	Aug-90	?	River Wye - Brobury Fishery - Herefordshire	£ 300,000	S		River	2mile		
8	The Field	Sep-90	?	River North Esk -(Montrose 3m)		S	3000	River		1mile	1
9	The Field	Oct-90	?	River Wye - Middle Wye Fishery - Herefordshire	£ 130,000	S		River	3/4mile		
10	T&S	Nov-90	?	River Dee - Banchory - Aberdeenshire	£ 230,000	S&ST		River	325	271	
11	The Field	May-91	?	River Dee							
12	T&S	Jun-91	?	River Dee - Kirkcudbrightshire	£ 100,000	S&BT		River	933		
13	T&S	Jul-91	?	River Coe - nr. Loch Achtnochtan	£ 150,000	S&ST&Gr		River&Loch		1mile	
14	T&S	Dec-91	?	Lower River Wye - Lower Symonds Yat Fishery	£ 525,000	S		River		2.5mile	
15	T&S	Dec-91	?	River Wye - Old Harp Fishery - Hereford	£ 150,000	S		River		1400	
16	T&S	Jul-92	?	River Taw - North Devon	£ 385,000	S&ST		River		1mile	
17	T&S	Oct-92	?	River Lamborn - Boxford	£ 135,000	T		River		630	
18	T&S	Jan-93	?	River Usk - Newhouse Fishing - nr Usk	£ 125,000	S&T		River	3/4 mile		
19	The Field	Mar-93	?	River Tweed - Edinburgh	£ 190,000	S&ST		River	0.75 Mile		
20	T&S	Jul-93	?	River Taw - Mole Junction - nr. Sth. Molton	£ 125,000	S&ST		River	1629		
21	T&S	Sep-93	?	River Ribble - Wheatly Farm Beat - Lancs	£ 50,000	S&ST		River	950		
22	T&S	Apr-94	?	River Mole - North Devon	£ 130,000	S&T		River		?	
23	T&S	May-94	?	River Torridge - Devon	£ 38,000	S&ST		River	1040		
24	T&S	May-94	?	River Taw - above & below Cheson Bridge - Devon	£ 30,000	S&ST		River	1mile	566	
25	T&S	May-94	?	River Taw -nr.Crediton	£ 15,000	S&ST		River	1100		
26	T&S	Jun-94	?	River Hoddle & River Ribble - Edisford Hall estate fishery	£ 300,000	S&ST&BT		River		4mile	
27	T&S	Jul-94	?	River Wye - Home Lacey No.4 & Part Elms Beat	£ 90,000	S		River	3/4 mile		
28	T&S	Sep-94	?	River Taw - Devon	£ 175,000	S&ST		River	350	1200	
29	T&S	Dec-94	?	River Deveron - Huntley Aberdeenshire	£ 230,000	S&ST		River	0.75mile		
30	The Field	Dec-94	?	River Deveron - Aberdeenshire	£ 230,000	S&ST		River	075mile		1
31	T&S	May-95	?	River Wye - Eardisley Fishery - Herefordshire	£ 75,000	S		River			
32	T&S	Jul-95	?	River Welsh Dee - Sodylt Fishery	£ 18,000	S		River	1mile		
33	The Field	Jan-97	?	River Beauly - The Middle River - Inverness-shire	£ 500,000	S		River		6miles	2
34	The Field	Apr-97	?	River Duel - Argyll	£ 2,500	?		River	2mile	5mile	

Migratory Fisheries: Sea Trout and Salmon (continued)

	Journal	Number of named pools	Catch Rate Salmon	Catch Rate Sea Trout	Catch Rate Trout	Catch Rate Unspecified	NOTES	Property Included Size and Nature of Main House	Number of Outbuildings	Size of Estate	Shooting/ Hunting	Estate Agent
1	T&S	5	126	?								Savills - Edinburgh
2	T&S	6					fishing rights					
3	The Field		139									Strutt & Parker- London
4	T&S	3										Strutt & Parker
5	T&S											Strutt & Parker
6	T&S											Strutt & Parker - Exeter
7	The Field								2 FH			Carter Jonas
8	The Field	9	520									Savills Edinburgh
9	The Field								1FH			Carter Jonas
10	T&S									18 acres		Brodies
11	The Field											
12	T&S		22			76bt						Brodies
13	T&S	3	23	44		24gr	rights	cottage on Loch side				Savills - Ediburgh
14	T&S		100									Harris & Stokes
15	T&S											Carter Jonas
16	T&S	9						4 bed hse		9.5 acres		William. H. Brown
17	T&S									25	Duck	Strutt & Parker
18	T&S											Woosnam & Tyler
19	The Field	9										Savills - Edinburgh
20	T&S	9	32	55						1.17acres		Strutt & Parket
21	T&S											Lancashire County Council
22	T&S							4 Bed hse				Stags
23	T&S	4										Strutt & Parker - Exeter
24	T&S	10	5.2	42.5								Strutt & Parker - Exeter
25	T&S	8	2.18	15.75			rights					Strutt & Parker - Exeter
26	T&S	23	55	200	?							ARICS
27	T&S	13	31									Berringtons
28	T&S	12	23	42					2 FH			Strutt & Parker
29	T&S		71.4	?					1 FH			Strutt & Parker
30	The Field	13	71.4						1FH			Strutt & Parker
31	T&S											Berringtons
32	T&S	7	30				This is a 1/8 share of river					Denton Clark & Co.
33	The Field		89									Knight Frank
34	The Field						This is 1/6 ownership					Brodies - Edingburgh

Migratory Fisheries: Sea Trout and Salmon (continued)

	Journal	Journal Date	Date of Sale	Location	Asking Price	Targeted Species	Price per Fish	Water Type	single Bank	Double Bank	Number of Beats
				Fishings advertised with Price							
35	T&S	May-97	May-97	River Tay - Upper Kercock and Devline	£ 3,000,000	?	£7,300	River			
36	T&S	May-97	May-97	River Exe - Bickleigh Bridge	£ 30,000	?		River			
37	T&S	May-97	May-97	River Torridge - Riversmeet	£ 50,000	?		River			
38	T&S	May-97	?	River Dart - above Staverton Bridge	£ 75,000	S & ST		River	875		
39	T&S	May-97	May-97	River Dart - Below Staverton Weir	£ 75,000	S & ST		River		590	
40	T&S	Jun-97	?	Part of Edwinsford Estate - River Cothi (S-Wales)	£ 700,000	S & ST		River		4miles	4
41	T&S	Jun-97	?	Glenrossal - River Cassley (Highlands)	£ 1,700,000	?		River	2.5miles		2
42	T&S	Jul-97	?	River Balgy & Loch Damph- Western Ross	£ 125,000	S & Gr		River/loch	1 mile		
43	The Field	Jul-97	?	River Test - nr. Romsey, Hants	£ 275,000	T		River and Lakes	1025	405	
44	The Field	Nov-97	?	River Blackwater - Ross-shire-nr.Beauly	£ 500,000	S&GR		River		1.5mile	
45	T&S	May-98	?	River Taw - right bank below Umberleigh Bridge(Barnstable	£ 300,000	S&ST		River	3,383		
46	T&S	May-98	?	River Taw -Chenson beat (upper beat) of Fox & Hounds	£ 50,000	S &ST		River	1,043		1
47	T&S	May-98	?	River Taw -Bridge Reeve Beat (lower beat) of Fox & Hounds	£ 50,000	S&ST		River	825		1
48	T&S	May-98	?	River Taw - Kingsford Bridge (Umberleigh)	£ 50,000	S&ST		River	225	400	1
49	T&S	May-98	Sep-98	River Avon - Bridgecombe Fishing -Loddiswell South Devon	£ 10,000	S&ST		River	600	200	
50	T&S	Jun-98	?	River Eachaig - Argyll	£ 95,000	S&ST		River			
51	T&S	Aug-98	?	Warwick Hall (Cumbria)- River Eden.		S		River		1.9 miles	
52	T&S	Aug-98	?	River Carron - Gledfield Estate - Ardgay	£ 1,750,000	S&ST		River	1mile		
53	T&S	Jan-99	?	River Spey - Kincardine Fishings	£ 600,000	S&ST&Gr		River		1.65mile	
				Fishings advertised without Price							
1	The Field	Apr-90		River Wye - Herefordshire	?	S		River		0.75 mile	
2	The Field	Jun-90		River Earn	?	S&ST		River		1200	
3	The Field	Jul-90		River Doon - Ayrshire	?	S&ST		River		0.5 mile	
4	The Field	Oct-90		River Earn - Upper Strowan Fishings - Perthshire	?	S&Gr		River		2.25mile	
5	The Field	Dec-90		River Deveron - Banff - Banffshire	?	S&ST		River		1mile	
6	The Field	Aug-92		River Wye - Lydbrook Fishery - Monmouthshire	?	S		River		2.6mile	
7	The Field	Aug-92		River Tay - Upper Grandtully Fishings	?	S		River	1300		
8	The Field	Sep-93		River Tay - Perthshire - Dalguise beat	?	S		River		1mile	
9	The Field	Jul-94		River Tweed - Coldstream	?	S&Gr&ST		River	0.75 mile		
10	The Field	Nov-94		River Tweed - Boleside Fishings	?	S&Gr		River		2mile	
11	The Field	Jul-96		River Tay - Upper Kercock & Delvine Fishings - Perthshire	?	S		River		2mile	
12	The Field	Apr-97		Rver Dee - Tilbouries Fishings nr. Aberdeen	?	S&Gr		River	1.4mile		

Note: Distance in Yards unless specified

Key

Fish	
S	Salmon
ST	Sea Trout
GR	Grilse
BT	Brown Trout
RT	Rainbow Trout
T	Speciefied as just Trout

Property	
FH	Family House
HC	Holiday Cottage
KC	Keepers Cottage
FL	Fishing Lodge
FO	Fishing Office

Migratory Fisheries: Sea Trout and Salmon (continued)

	Journal	Number of named pools	Catch Rate Salmon	Catch Rate Sea Trout	Catch Rate Trout	Catch Rate Unspecified	NOTES	Property Included Size and Nature of Main House	Number of Outbuildings	Size of Estate	Shooting/ Hunting	Estate Agent
35	T&S											Knight Frank, Rettie & Co
36	T&S											Strutt & Parker - Exeter
37	T&S											Strutt & Parker- Exeter
38	T&S											Strutt & Parker- Exeter
39	T&S								1 FL			Strutt & Parker- Exeter
40	T&S		11	141				4 bed FH & 2 * 3 bed HC		318 acres	pheasant	Knight Franks - Hereford
41	T&S	35				127		HC		2400 acres	pheasant/deer	Knight Franks - Edinburgh
42	T&S					20	in the Loch					Finlayson Hughes - Perth
43	The Field								FH, 1FO	30.25 acres	shooting	Strutt & Parker - London
44	The Field		106+Gr									Knight & Frank - Edinburgh
45	T&S	20	32	117			5shares at £60,000 each		4 FL			Strutt & Parker - Exeter
46	T&S	6										Strutt & Parker - Exeter
47	T&S	5										Strutt & Parker - Exeter
48	T&S	5								0.5 acre woodland		Strutt & Parker - Exeter
49	T&S											Strutt & Parker - Exeter
50	T&S		4	64.9			perpetuity					
51	T&S		286					7 bed listed house,		266 acres	pheasant	Clegg Kennedy Drew - London
52	T&S	14	49	9				and 6 other house	1 FL	5,200	Pheasant, duck,gr	Finlayson Hughes - Inverness
53	T&S	19	84	176				12 bed Hse			grouse/stag	Finlayson Hughes - Inverness
												Clark Scott Harden - Penrith

1	The Field		129					1 cottage				Knight Frank & Rutley
2	The Field		35	32				5 bed				Langley Taylor
3	The Field	7	75	20								
4	The Field		45	150								Finlayson Hughes
5	The Field	8	147	94				4 bed		26 acres		Savills
6	The Field	20	98				2 gillies					Humberts
7	The Field		40							woodland		Finlayson Hughes
8	The Field		84				access to 2 islands	2 room FH				Knight Frank & Rutley
9	The Field	3	122									Strutt & Parker
10	The Field	11	445 + Gr					3bed FC		55 acres		Strutt & Parker
11	The Field	12	496									Knight & Frank
12	The Field	8	90+Gr						1KC			Savills - Brechin

Non-Migratory Fisheries

	Journal	Date	Date of Sale	Location	Asking Price	Targeted Species	Price per Fish	Water Type	Size of Lake(s)	no. Lakes	single Bank	Double Bank	Number of Beats	Number of named poc	Catch Rate Brown	Catch Rate Rainbow	Catch Rate Trout
1	T&S	Jul-97		Woodington Fishery -River Blackwater (Hants	£ 275,000	RT, BT, Gr		Lake/river		5	1025	405					
2	T&S	Jul-97		Westlow Mere - Congleton (Cheshire)	£ 190,000	T		Lakes	15acres - stock	2							
3	T&S	Jul-97		Astbury Lake - Congleton Cheshire	£ 210,000	?		Lake	43 acres.								
4	T&S	Mar-98		River Frome (Frome VanchurchFishing) - Dorset	£ 68,000	T		River				930					
5	T&S	Mar-98		River Frome/Hooke (Maiden Newton)	£ 18,000	T		River				730					
6	T&S	Mar-98		River Chess - Latimer beat (Bucks)		RT		River				0.6 miles	1	2			
7	T&S	Mar-98		River Chess - Chenies Beat (Bucks)		RT		River				1mile	1				
8	T&S	Aug-98		River Itchen East Lodge Fishings (Winchester)	£ 950,000	BT & S		River			82	3.1miles					
9	T&S	Aug-98															
10	T&S	Nov-98		Avington Fishery	£ 750,000	RT		River/Lake	4acres	3		1000					

Note: Distance in Yards unless specified

Key

Fish	
S	Salmon
ST	Sea Trout
GR	Grilse
BT	Brown Trout
RT	Rainbow Trout
T	Speciefied as just Trout

Property	
FH	Family House
HC	Holiday Cottage
KC	Keepers Cottage
FL	Fishing Lodge
FO	Fishing Office

Non-Migratory Fisheries (continued)

	Journal	Catch Rate Salmon	Catch Rate Sea Trout	Notes	Size and Nature of main House/cottages	Number of Outbuildings	Size of Estate	Shooting/ Hunting	Estate Agent	Telephone
1	T&S			River has good Mayfly hatch May/June		1*FL & 1*F0	30 acres		Strutt & Parker - Salisbury	
2	T&S									
3	T&S			currently used for watersports					Humberts Leisure	
4	T&S			Frome has good reputation for trout					Symonds & Sampson - Dorchester	01305 264172
5	T&S								Symonds & Sampson - Dorchester	01305 264172
6	T&S			one of few rivers where RT breed wild					Fisher Hogarth - Mkt Harborough (Leics)	
7	T&S								Fisher Hogarth - Mkt Harborough (Leics)	
8	T&S				4 bed FH	2 FL with overnight facilities	14.5 acres		Clegg Kennedy Drew - London	0171 4091944
9	T&S									
10	T&S				2 houses	1 brick FH	14.75 acres		Dreweatt Neate's - Winchester	01962 842742