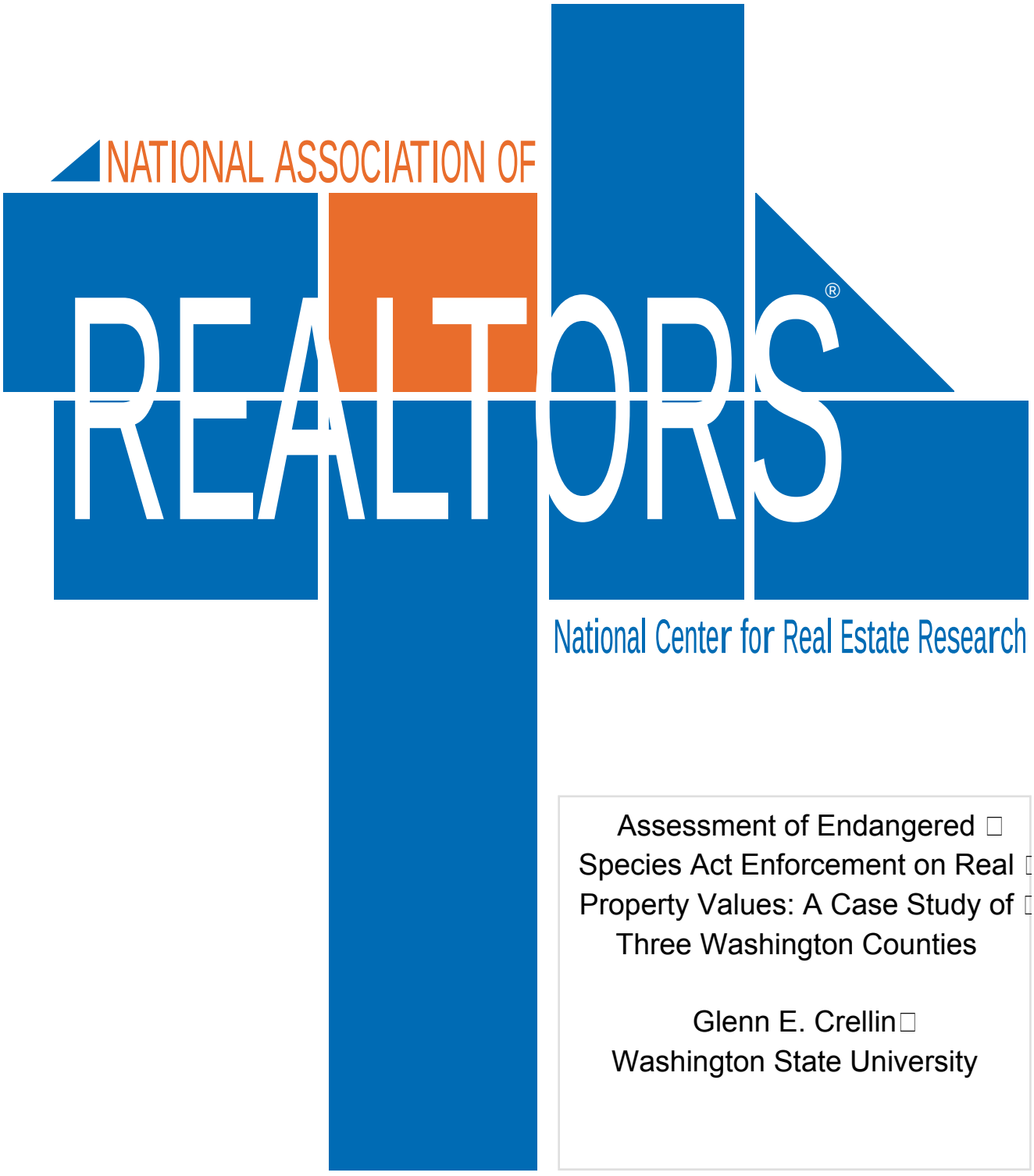


Assessment of Endangered Species Act Enforcement on Real Property Values: A Case Study of Three Washington Counties

Glenn E. Crellin
Washington State University

NATIONAL ASSOCIATION OF REALTORS®
The Voice For Real Estate®
REALTOR®

Assessment of ESA Enforcement on Real Property Values:
A Case Study of Three Washington Counties

Table of Contents

Assessment of Endangered Species Act Enforcement on Real Property Values: A Case Study of Three Washington Counties

Synopsis: ***This study of three counties in Western Washington, where a cloud hangs over real estate transactions related to the active enforcement activities of the Endangered Species Act (with current attention focused on several species of salmon) indicates that the location of a property in an area subject to greater regulation typically results in lower sales prices for those properties. Those lower prices are statistically significant and observed in virtually all property types and agricultural as well as suburban and city communities.***

Executive Summary

The Washington Center for Real Estate Research (WCRER) at Washington State University conducted a geographic and statistical case study analysis of the impacts of enforcement activities related to the Endangered Species Act (ESA) on property values in three counties in Washington state:

- Clallam County (Port Angeles/Sequim, rural)
- Clark County (Vancouver, suburban Portland)
- Snohomish County (Everett, suburban Seattle)

The study was designed to identify other potential sources of price effects, especially other policy or regulatory initiatives, in an effort to isolate the impacts of the ESA. Especially important is the relationship of Washington's Growth Management Act which directs development into urban areas and prohibits urban development outside the locally adopted urban growth boundaries. WCRER also reviewed the potential impacts of the Shoreline Management Act, the Clean Water Act and the State Environmental Protection Act as components of this research.

Very little statistical research has been previously published on this topic, although a large number of opinion pieces with selected anecdotes and isolated facts often presented as research, appear on the Internet and in general interest publications.

Of the published research, only three articles addressed the impact of environmental regulation on property values. A survey of real estate brokers in Texas suggested there was minimal overall impact of ESA on real estate values, but that prices in urban fringe areas might be depressed by as much as 30 percent. A study in Maryland found that the value of waterfront property increased, with the increase statistically attributed to cleanup of the Chesapeake Bay, but it did not address impacts on any other properties. The third study, in Oregon, found that encouraging waterfront property owners to plant buffers between their properties and the water reduced the value of the properties where buffers were planted, with the amount of value reduction depending on the width of the buffer. A 50 foot buffer reduced value, on average, by 11 percent.

The WCRER research began with the development of maps illustrating private land ownership, land use, political and growth management boundaries, watersheds, species-specific habitat and ultimately species richness, illustrating those parts of each county which were most affected by ESA regulation because they

provided habitat to an above average number of species. Supplemental maps were also drawn illustrating precipitation and distances outside urban growth boundaries for use in some of the models.

Simultaneously, property transaction databases were assembled for each county. Those databases included all real property sales from 1985 through 2001 in Clallam and Snohomish counties, and sales between 1995 and 2000 in Clark County. These real estate databases included information on property characteristics (bedrooms, baths, building size, land size, view, condition, type of transfer, etc.). Transactions with incomplete information were excluded from the databases, as were transactions which were less than arms-length transactions or transfers of partial interests, etc. Separate models were developed for key property types:

- single-family residential
- condominium
- commercial
- land.

Additional economic variables were added to the analysis. First, all prices were deflated by the consumer price index to eliminate the effects of aggregate inflation. The resulting prices are referred to as real prices. Several variables were constructed including the number of real estate transactions in the current year compared with a study period average, a measure of population growth, an index of local personal income compared to the study period average and an index of building permit activity relative to the study period average to capture price effects which are related to overall local market economics rather than the specifics of the individual property or the key policy analysis variable.

No two estimated models were identical, but each provided a statistically significant estimation of the price of real estate (or price per acre, as appropriate). While models which provided direct estimates of price, rather than logarithmic transformations, would have been preferable, as is often the case in this type of research, the explanatory power of the transformed equations was significantly better.

As the various pieces of the puzzle came together, it became apparent that there was consistency across the local markets, despite the difficulty of estimating similar models. While any generalization has exceptions, it is clear from the analyses that enforcement of the Endangered Species Act, despite its success at preserving the viability of some species, has reduced selected property values in the affected communities. No evaluation of the benefit to society of the preservation of the endangered species is explicitly stated, implied or should be inferred.

The accompanying table summarizes the impacts of ESA enforcement across the three counties and various property types. First, it is apparent that in virtually every case ESA enforcement exerted a **significant negative** influence on property values. Second, the consistency of

Impact of ESA Enforcement on Property Value (Models of Real Prices or Real Prices/Acre)

County	Market Segment	Impact (%)
Clallam	Single-family homes	-11.9
	Unplatted land	2.6
	Improved commercial	-19.9
	Commercial land	-14.4
Clark	Single-family homes	-6.7
	Land	-4.0
Snohomish	Single-family homes	-4.2
	Unplatted land	-1.4
	Multifamily	-3.5
	Improved commercial	-10.8

the impacts across the models, despite their unique specifications is striking. It is also apparent that the impacts are most significant in percentage terms in the most natural resource-dependent jurisdiction studied – Clallam County.

Applying these price effects to the proportions of the assessed real property in each county which can be characterized as high-impact ESA, then applying the effective property tax rates for that county provides an estimate of how Federal enforcement of the Endangered Species Act has negatively impacted the financial capacity of the State of Washington and its counties and cities. While the state of Washington does not use differential tax rates for various classes of real estate, since the models demonstrated differential impacts on price levels, separate impacts were estimated for various property types, then aggregated into county-wide impacts. Unfortunately, these impacts cannot be generalized to the remaining 36 counties of the state because each county has a different degree of ESA enforcement potential and, therefore, unequal impacts. Based on impacts by property type above, affected real estate in Clallam County has had value reduced by approximately 9.1 percent, the greatest impact among the analysis communities. In Clark County the average impact is about 6.0 percent, while in Snohomish the impact is estimated at 4.8 percent. It must be emphasized that these are the impacts on those properties in areas which are habitat for an above-average number of protected species. Other properties in each county would not have prices directly affected by ESA enforcement. The accompanying table calculates the tax revenue impact in each county.

Property Tax Revenue Impacts
ESA-Impacted Properties

County	Assessed Value ($ Millions)	Tax Rate	Impacted Share	Value Reduction	Value Loss ($ Millions)	Revenue Loss ($ Millions)
Clallam	$3,988.6	1.07%	13.8%	- 9.1%	$50.1	$0.5
Clark	$23,211.9	1.27%	39.5%	- 6.0%	$550.1	$7.0
Snohomish	$42,501.7	1.16%	33.9%	- 4.8%	$691.6	$8.0

The governments of the State of Washington, the three analysis counties, the incorporated cities within those counties, and the special taxing jurisdictions (hospitals, libraries, etc.) within those counties collectively received $15.5 million less in property tax revenues from those properties each year than would otherwise be collected. Given the revenue structure of the state of Washington, this is not so much a reduction of revenue to the governmental units as it is a redistribution of tax burden away from the impacted properties to the properties which are subject to fewer ESA-oriented restrictions. Accordingly, all property owners are losers in this process – the owners of the high impact properties see a direct reduction in the value of their property. The remaining owners see their property taxes rise more rapidly than the taxes of those properties whose values are constrained.

Background to Study

The Washington Center for Real Estate Research (WCRER) at Washington State University has consistently encouraged and pursued a program of policy research which attempts to balance public good against the needs of free enterprise. This balance has been apparent in the work conducted surrounding one of the most hotly debated public policy topics of the 1990s in Washington, the impact of the Growth Management Act (GMA). Passed by the Washington Legislature in 1991, GMA was implemented by local governments during the middle of the decade. Growth management, and its accompanying topic, smart growth, has generated many opinions, but little hard data or academic research.

Similarly, there is a great deal of rhetoric surrounding the impacts of the Endangered Species Act (ESA) on local economies, property values and tax collections of local governments. There are both Federal and State requirements regarding the protection of the environment and the preservation of habitat critical to the survival of species of plants and animals which are threatened or endangered. Since growth management and environmental regulations interact, and occasionally work at cross purposes, it has been imperative that this research begin by identifying which types of regulation directly affect which properties, so the research may isolate various sources of impacts on value.

One issue remains virtually impossible to quantify – the impact of possible remedies under discussion, but not yet in the form of formal proposals for governmental action under any of these initiatives. Dam breaching remains an issue foremost on that list in the Washington consciousness. While this policy option is clearly ESA-related, it and other potential policies are beyond the scope of this study.

Literature Review

Despite the high public profile of the costs of ESA enforcement activities, and the impacts on property values, etc., relatively little rigorous analysis of the issue has been done. Very little research appears in the economic literature. Many articles, often available primarily through the Internet, purport to provide data, but in fact are primarily opinion pieces with a few selected "facts" thrown in. Those are not research efforts which have been subjected to peer review. Examples of this type of material are Adler's *Property Rights, Regulatory Takings, and Environmental Protection*, distributed by the Competitive Enterprise Institute and an unattributed *Faking Takings – Farm Subsidies and Private Property in Perspective* posted by the Environmental Working Group. The prevalence of opinion materials and relative lack of substance make it especially important that rigorous research be conducted.

One of the first articles addressing the role of endangered species on property values appeared in the **Appraisal Journal** in early 1994. In that article Guidry and Do review the administration of ESA, then suggest approaches appraisers might use to incorporate impacts of ESA into their appraisal assignments. No empirical research on the impacts was conducted or reported in this article. The authors suggested the impacts would be most significant on unimproved land.

Foremost among the economic research on the Endangered Species Act is a Symposia which appeared in the Summer 1998 issue of the **Journal of Economic Perspectives**. Two articles in that issue were especially relevant. Brown and Shogren reviewed the *Economics of the Endangered Species Act*, concluding that the Act itself provides no role for economics in the decision making process, and suggesting that economists should be asked to contribute more actively to the discussion. More directly, Innes, Polasky and Tschirhart addressed *Takings, Compensation and Endangered Species Protection on Private Lands*. Their analysis focused on how public policy imperatives to protect species on the verge of extinction can be

balanced against the constitutional issue of takings. Again, a rigorous economic analysis of the issue was not attempted in either study.

A related article by White, *Valuing Unique Natural Resources: Endangered Species*, which appeared in the **Appraisal Journal** in July, 1996, attempted to establish a value for the individual species being protected, but surprisingly did not address how the protection of that species influenced the underlying value of the real estate whose use was being restricted. The article did not even suggest a methodology for that analysis.

A study conducted by Gilliland at the Real Estate Center at Texas A&M University in September, 1995 (*Endangered Species Act: Impact on Texas Rural Land Values*), also provided useful insights. He conducted a survey of real estate brokers concluding that the impacts of the Endangered Species Act in developed urban areas were minimal, but that a significant minority of the respondents felt there was reduced value which could be attributed to ESA. However, the brokers contended that most of the lost value was concentrated on the urban fringe and transitional land groups. The brokers estimated that values in those areas had declined between 30 and 40 percent. The study also included evaluation of property tax data from Travis County, Texas (Austin MSA). Statements by property owners suggested ties to endangered species restrictions on property development reduced taxable values of those properties by an average of 43 percent.

Two related studies use research methods similar to those employed in this study. Leggett and Bockstael explored the effect of improvements in water quality on residential land prices along the Chesapeake Bay. They concluded that water quality improvements resulted in increased values for waterfront properties. Mooney and Eisgruber explored effects of the growth of a buffer strip of vegetation of variable width on the value of waterfront residential property in Oregon. The State of Oregon developed a plan for salmon recovery and watershed protection, which encouraged private landowners to plant strips of vegetation along the water to enhance water quality and salmon habitat. Since many owners acquired their property for the view or sound of the water, both of which decrease with planting width, their findings indicated that property values decreased as the width of the buffer increased.

Local Community Information

This research was limited to case studies in three communities where the Center has developed in-depth understanding based on prior studies focusing on the State's Growth Management Act (GMA). While each of the communities is fully planning under GMA, they represent the diverse nature of economies throughout the state. The availability of property transaction detail also limited the number of counties that could be included in this case study. For many counties this type of data does not exist or is extremely costly to acquire. The counties selected for analysis (and their primary cities) were:

- Clallam (Port Angeles/Sequim, WA, rural)
- Clark (Vancouver, WA)
- Snohomish (Everett, WA).

The accompanying data illustrates the role each selected county plays in the population, housing

Basic Characteristics of Analysis Counties

County	Population (Rank)	Housing Units (Rank)	Land Area – Sq. Miles (Rank)
Clallam	64,525 (18)	30,683 (15)	1,739 (20)
Clark	345,238 (5)	134,030 (5)	628 (35)
Snohomish	606,024 (3)	236,205 (3)	2,089 (13)

and geography of Washington, presenting their populations, housing units and land area (square miles) rank among Washington's 39 counties.

The initial phase of the project focused on aggregate data in the case study communities, leading to an estimate of the acreage affected by ESA protections. WCRER used a geographic information systems (GIS) approach for much of the analysis. More detailed information about the methodology is presented in subsequent sections.

Environmental Regulations in Washington

Environmental laws seek to protect, preserve and restore portions of the world in which we live. Volumes of regulation are associated with each law to provide for administration and enforcement. Endangered Species Act (ESA), Shoreline Management Act (SMA), Clean Water Act (CWA), Growth Management Act GMA) and State Environmental Policy Act (SEPA) were considered in this study.

The Endangered Species Act was designed to protect certain species of plants and animals from extinction as a consequence of human activity. ESA makes it illegal to "take" any species listed as endangered without specific authorization. In addition to killing, taking is defined to include disrupting normal animal behaviors, or alteration or degradation of habitat.

Federal listing is a process by which a plant (including fungi) or an animal (including insects and fish) is determined, with the best scientific and commercial data available to the Secretary of the Interior, to be in danger of, or threatened with, extinction. The Secretary is also responsible for designation of critical habitat based on the best scientific data available after taking into account economic impacts. Current listings are available at ecos.fws.gov/webpage.

State listings occur under Washington Administration Code 232-12-297, Endangered, Threatened and Sensitive Wildlife Species Classification administered by the Washington Fish and Wildlife Commission. Washington Department of Fish and Wildlife publishes Priority Habitat Species and Species of Concern lists. The Wildlife Management Program is responsible for the Species of Concern list, which contains only native Washington fish and wildlife species. Currently the lists available at www.wa.gov/wdfw/hab contain 18 habitat types, 140 vertebrate species, 28 invertebrates, and 16 species groups.

Directly or indirectly SMA, GMA, CWA and SEPA all dovetail with ESA. Each contains elements of species and habitat protection. Although they focus directly on other related areas, all of them deal with preserving and improving some portion of habitat. SMA works to protect areas along rivers, streams, lakes and ocean shores. GMA strives to preserve open space, necessary as wildlife corridors among other things. CWA requires protection at the watershed level of surface and ground water supplies. Since water is required for all species, and either surface or ground water runs eventually to the ocean carrying with it traces of the environment, human activity in the environment can contaminate water, resulting in harm to species of interest. SEPA is essentially an environmental safety net for areas not triggering review by any other law. Environmental impact studies required when this act is called upon must consider wildlife including endangered species. Text of these laws and implementing regulations fill many volumes. The reader is encouraged to seek more specific information on the individual acts.

Associations Between Ecology and Geography

Determining the effects of environmental regulation on the value of property requires a direct association between regulation enforcement areas, land location and valuation. Mapping the various data with geographic information systems (GIS) software[1] provided the means by which valuation data could be directly associated with any given piece of property recorded (linked to land survey information) and associated species data. Data for the public land survey, Growth Management Boundaries, Shoreline Management streams and watersheds for the Clean Water Act were readily obtained. Regulation enforcement areas for the Endangered Species Act were somewhat more troublesome to map, in part due to the variation in listing protocols, variability of animal populations and limited availability of information.

Identification of Species

Both Federal and State governments are active in protection of species of plants and animals, and many of those species are present in Washington. Unfortunately, Federal and State regulations confer differing degrees of protection on individual species. In addition, there are various degrees of protection that regulators may choose to impose.

The hierarchy for species protection at the Federal level begins with species of concern, advancing to candidate, threatened and finally endangered. In the state of Washington, the sequence is monitor, sensitive, candidate, threatened and endangered. From the list current through June 2002, the state of Washington had identified 14 mammals, six birds, two reptiles, two amphibians and two butterflies as endangered. It is noteworthy that no fish are currently on the state's endangered list. In addition, three mammals, six birds and two reptiles are identified as threatened by the state. Again no fish are on the state threatened list. Of the 26 species on the state's endangered list, 12 are also on the Federal endangered list. Of these 12, four are considered threatened by the Federal agencies, two are candidates, two are species of concern, and six do not carry any Federal designation.

Meanwhile, of the 50 species of fish in the state species of concern database, 40 species are identified by the state of Washington as candidates for listing, including three that are already considered endangered federally and 13 more that are on the Federal threatened list. Salmonids are included in this group. Three of the 40 species are listed by the state as sensitive, including one listed as a Federal species of concern. These differences between state and Federal listings complicate the issue of determining how the enforcement of state and Federal regulation interact, and how these activities impact real estate values, development potential, and state/local revenues. A comprehensive listing of the species included in this study, and the status of each species in terms of state and Federal listings is included in Appendix 1.

Private Land

This study focuses on values of private land, but no discussion of real estate ownership in the American West can ignore the major issue of public ownership of land. These public lands include park lands, tribal lands, military installations, etc. In some of the analysis counties public lands materially affect this analysis. Differences in the proportion of private and public lands are noteworthy among the three counties.

Clallam County

The accompanying map (Map 3-2) of private land in Clallam County is somewhat misleading. The

[1]ESRI, Environmental Research Systems Institute, 1992-1999.

northern boundary of the county is the Strait of Juan de Fuca, which connects the Puget Sound to the Pacific Ocean. The Western boundary of the county is the Pacific. In both cases the boundaries of the county extend into the water, and are represented on the map as private land (land boundaries are also shown, but may not be obvious). Public lands in the county include Olympic National Park and surrounding national forests, and several tribal lands.

Private lands are clustered around the towns of Port Angeles, Sequim and Forks. In total, only 37.8 percent of the land area in Clallam County is privately owned.

There are 47,207 real property parcels in Clallam County, with a 1999 assessed value of $3.581 billion. This represents 1.7 percent of real property parcels and 1.0 percent of total assessed value in Washington. Assessed values in Clallam County increased on average 3.6 percent between 2000 and 2001.

Clark County

Clark County (Map 3-3), with its principal city of Vancouver, lies across the Columbia River from Portland, Oregon. Clark County is part of the Portland, OR-WA PMSA. Other primary communities in the county include Camas, Battle Ground and Washougal. Public lands in the county include forest lands and military installations. The Columbia River defines the southern and western boundaries of the county. The northern boundary is the Lewis River. In sharp contrast to Clallam and Snohomish counties, 82.4 percent of the land area in Clark County is privately owned.

There are 130,968 private real property parcels in the County, with a 1999 assessed value of $20.790 billion. Clark County represents 4.8 percent of the real property parcels and 5.6 percent of the assessed value of real property statewide. Assessed values in Clark County on average increased 5.6 percent between 2000 and 2001.

Snohomish County

Despite the fact that Snohomish County (Map 3-4) has the largest population of the three counties studied, the eastern part of the county has a surprising amount of public lands in the Cascade mountains. These are principally the Mt. Baker and Snoqualmie National Forests. The Tulalip Indian Reservation and U.S. Navy facilities are also part of the public lands. There are three state parks in the county. The Puget Sound forms the Western boundary of the county. As in the case of Clallam County, the accompanying graphic includes extension of county boundaries into the Sound as part of the private land. Approximately 39.6 percent of the total land area in Snohomish County is in private hands.

There are 228,143 private real property parcels in Snohomish County, with a 1999 assessed value of $37.033 billion. Snohomish County represented 8.4 percent of real property parcels statewide, and 9.9 percent of total assessed value. Assessed values in the county, on average, increased 6.2 percent between 2000 and 2001.

GIS Activities

Mapping areas affected by environmental regulations including Endangered Species Act, Shoreline Management Act, Clean Water Act, Growth Management Act and State Environmental Policy Act (ESA, SMA, GMA, CWA, and SEPA) is the first phase of the study. Objectives include:

- Acquisition of appropriate GIS data themes
- Manipulating the acquired themes to show only study areas
- Evaluating themes relative to one another
- Attaching resultant study area maps to tabular valuations for evaluation.

Imagine a map on your desk – an interactive map that not only gives you a picture of the place you are interested in but also is able to answer questions about a place. Who owns the land? What kind of animals could live there? In a specific place on the map, what part of the land is developable and what are the environmental or regulatory constraints on that development? GIS (Geographic Information Systems) is that map. GIS answers questions about places (spatial data sets) by combining and evaluating individual map data layers (themes) one on top of another much like a layer cake. Each layer represents a collection of data about a place (attributes) in a database associated with a shape (point, line, or polygon) tagged with geospatial coordinates (latitude, longitude and elevation) locating the attributes on the earth.

Specific layers containing input data are gathered to answer our questions. Thematic data is available from a variety of sources, either free or for sale. Each source has collected or acquired the data for a specific purpose relative to their own needs. Consequently, data from several sources represent the originator's perspective on the world in terms of how the data appears on the computer screen. Because of differing choices made by the originators of the data, the resulting displayed maps of the same areas will not coincide on the screen. Over time, agreements have been made to select a common way to describe the data, helping other users convert the maps and allowing the themes to coincide.

Land, animals, water and plants provide the general basis of the layer search. Land layers include: political boundaries (city limits), growth management boundaries, ownership and land use. Current county boundary themes for Clallam, Clark and Snohomish counties were downloaded from Census 2000 to provide outlines to select county areas from the other themes. Land use and ownership, legal description and parcels were obtained from the University of Washington GIS Library reference site. This data was in the form of USGS 1:250,000 land use and cover themes and statewide Public Land Survey data. U.S. Geological Survey also created the theme used for land ownership in conjunction with the Washington GAP data for species habitat.

Individual units (quads, or pages of maps as in an atlas) representing a portion of the state based on latitude and longitude were merged to form a single county map. Excess data remaining beyond the county boundary was removed by "clipping" with county shapes much like a cookie cutter to produce countywide themes. Private land ownership by county was made into a new theme to use in the process of clipping the legal descriptions theme. Legal description data associated with a map will permit the addition of valuation attributes to the mapped data. Other land use themes include city and Growth Management boundaries from CTED, which clarify urban areas and help define human habitat.

Habitat emerges as the key concept for deriving the animal themes and relating the animals to the land. Three things complicate acquisition of themes related to endangered species. First, endangered species location mapping is exempt from public disclosure and only available for scientific or environmental research on a small area basis at significant cost. The limited extents of the map units available are a function of the detail with which identification and location has been mapped on the ground. Second, location mapping of endangered species is confounded by the independent mobility of the individual animals making such mapping only approximations. Third, as has been noted elsewhere, certain animals take the ESA spotlight while others including insects and plants may not be extensively mapped. Plants and ecosystems worthy of protection may not receive the same advocacy or level of regulation as animals, which are easier to identify

with. For this study, a generalized plant data theme image was available offering little species-specific information, so plants were omitted from consideration. Animal locations were taken to be the habitat associated with endangered or threatened species in the Washington Gap Analysis mappings. Identification of core habitat for a given species was used as a reasonable proxy for location. Salmonid species locations were derived from the Evolutionary Significant Unit themes produced by the National Oceanographic and Atmospheric Administration (NOAA) and the National Marine Fisheries Service (NMFS) available from Bonneville Power Administration. Use of a habitat proxy is reinforced by the need to develop habitat conservation plans as a way to protect endangered species.

Shoreline Management was mapped by themes from the Department of Ecology. Areas of interest include where regulated streams pass through privately owned land within the counties being studied. Restrictions on land use in terms of what must be done to prevent contamination of the running surface water of the streams need to be considered in these areas. Coastal management also affects marine shores in the same way.

Wetlands and aquifer recharge represent another area of regulatory impact. Wetlands were identified from the National Wetlands Inventory to the degree possible, as not all areas of the state have been mapped. Manipulation as described above produced areas coinciding with private land; they were buffered according to the requirements identified in tables 3 to 7 in **Impacts of Washington's Growth Management Act on the Development Process**.

Valuation impacts of environmental regulation could have confounding factors including natural hazards like volcanoes, floods, earthquakes as well a human created hazards like waste sites or industrial locations. In an attempt to control for these factors themes for waste sites, volcano and earthquake zones were included from the USGS National Atlas.

Combining thematic layers described above allows identification of developable private land areas subject to environmental regulation that have been tagged with legal descriptions. The addition of valuation data permits conclusions to be drawn about the effects of such regulation on the valuation.

Species Mapping

Choosing which species to use from the state and federal listings posed some problems. Mapped data for state species, while available for environmental research on a small scale, are protected under freedom of information to preserve the species. Mobility of the animals also makes determining precise locations difficult. As a solution, data about species habitat collected for biological diversity studies and gap analysis was used as a proxy for animal locations.

Habitat loss is one of the major factors in considering if an animal is in danger of extinction. Encroachment by development appears in the literature as a significant cause of habitat loss. Habitat Conservation Planning (HCP) was one of the legislative efforts designed to soften the economic impact of ESA (Moser, 2000; Hansen, 1995; Smallwood, 2000). Development of a plan to preserve a percentage of the land on any given site as habitat allowed development on the remaining portion. Although HCP is not without its own problems, it demonstrates that habitat is an acceptable surrogate for animal presence since the converse of no habitat is no animals.

Gap analysis identifies holes in the biological diversity of an area. Vegetation types, predicted and existing animal distributions were evaluated to look for areas that may contain less than expected diversity

or gaps (Scott et al, 1993). Gaps are indications of potential risk of extinction unless changes are made. The products of these analyses are individual maps specific to a wide variety of bird, mammal, amphibian and reptile species habitat. Salmonid species maps were from the National Marine Fisheries/National Oceanic and Atmospheric Administration. From the available lists, species occurring on either the state or federal endangered/threatened/candidate species lists and present in the study counties were chosen. Our list appears in Appendix 1. Mapping data has been assembled for 58 separate species of animals for the purposes of this report. Habitat maps of especially high profile species (salmon, spotted owl, bald eagle) were included wherever possible.

Species habitat maps, when layered on the study counties, produced a continuous coverage of each county, making differentiation between affected and unaffected land impossible (all land in each county was part of the habitat of at least one protected species). Application of GAP (Geographical Approach to Protection)[2] analysis produced species richness maps. As described by Stevenson in 1998, these maps summarize the number of protected species which might consider a specific geographic area "home". Repeated GIS manipulations of clipping, intersecting, merging, and unioning the individual habitat maps produced maps for each species group and each county representing areas likely to contain species of concern. The more species attached to an area, the darker the color on the species richness maps. Since this project endeavored to produce a dichotomy between more affected/less affected areas rather than a continuous series counting individual species, when merging species groups to produce countywide information, the individual maps were simply summed. Because each of the counties had different numbers of species, results are reported as equal or greater than half the possible number of species groups, or less than half of the possible number. In terms of the models to be presented later, properties which are in areas providing habitat to an above average number of species have a value of "1" for the dummy ESA variable, while remaining areas have the default "0" value.

Real Estate Data, **Models and Analysis**

Data for Clallam County was obtained from The Digest, a consulting firm in that market specializing in real property data. Considerable detail about the physical characteristics of the individual parcels was provided, although isolating arms-length transactions was difficult. Merging the real estate data with the geographic and policy variables was generally straightforward.

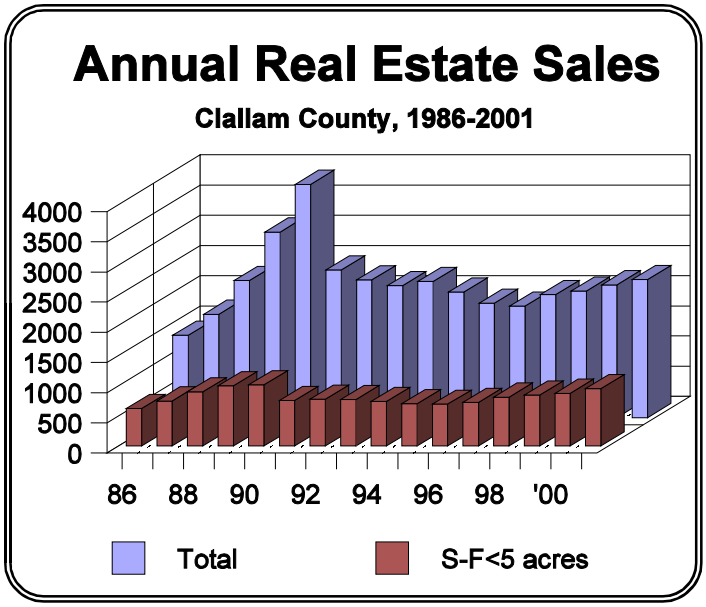
Data for Clark County was acquired from Real-Estats, a local vendor of public record data for Clark County. Because of the cost of the data, only data from 1996 through 2001 was purchased. Merging the Real-Estats data across time periods proved difficult, as was linking with rectangular survey system (township-range-section) geographic identifiers, but in the final analysis a clean, usable data set emerged.

Detailed, property-specific data on real estate sales and assessed values was obtained for Snohomish County from MetroScan, a national vendor of real property transaction data. That data set contained sufficient identifiers to allow it to be merged with the GIS information on impacted properties.

In each county, the primary unit of geography for this analysis is the section component of the Government Survey System (township, range, section). While it would have been preferable to be more precise, this provided the generally available linkage between the real estate data and the environmental data.

[2]Unfortunately, the same terminology is used on the previous page to represent holes in biological diversity. Henceforth, gap (lowercase) refers to the holes and GAP (all caps) refers to Geographic Approach to Protection.

Clallam County



Located on the Olympic Peninsula, the county is largely rural in character, with development concentrated in the Sequim and Port Angeles communities on the northern coast, fronting on the Strait of Juan de Fuca. The other primary development is around the town of Forks, an inland community near the west coast. There is a great deal of public land in the County, especially Olympic National Park.

The real estate transaction database for Clallam County included 36,268 recorded sales taking place between 1986 and early 2002. The accompanying graph provides an illustration of the variation in market activity over the period, showing both total sales and sales of single-family homes on less than five acre lots. Since much of the economic activity in Clallam County historically has been resource-based (especially logging and fishing), the last decade has been challenging. In recent years the Sequim community, in particular, has attracted a significant number of retirees.

In addition to the changes in the overall level of transactions from year to year, there was significant variation in the relative shares of activity among property types. For example, residential resales on lots smaller than five acres ranged from a high of 45.5 percent of total sales in 1986 to a low of 26.2 percent of sales in 1990. These variations become important to the analysis in the event that the impacts of GMA and ESA enforcement activity are more related to delays in the ability to develop property rather than direct price impacts. The Digest database allowed WCRER to identify 19 separate property types, some of which were combined during the analysis phase. The following land use descriptions were identified:

- Single-family < 5 acres
- New single-family < 5 acres
- Condo
- Duplex
- Mobile home w/ land
- Apartment building
- Office
- Industrial
- Lot
- Unplatted land
- Single-family > 5 acres
- New single-family > 5 acres
- Multiple single-family
- 3/4-plex
- Mobile home park
- Commercial
- Retail
- Commercial land
- Short plat

The initial plan was to create a single model which incorporated different property types through dummy variables. It quickly became apparent that the database, despite its size and richness, was incapable supporting a single approach. Accordingly, separate models were created for selected property types.

➢ *Single-family Homes*

The largest proportion of real estate transactions were single-family residential sales, including both new construction and resale homes. This sector was chosen for the original analysis, not because it was believed to be the most relevant for analysis, but because it offered the greatest potential to use the property characteristics included in the database.

After reviewing several potential models, the functional form selected for the analysis was a basic linear model, with the log of real (inflation adjusted) property price as the dependent variable. Independent variables included a vector of property characteristics (house size, number of bedrooms, number of baths, home age, view and lot size); a vector of economic factors (an index of property transfers for the sale year, building permits issued for the sale year); and a vector of policy characteristics (ESA, representing a higher level of endangered species claiming the area as habitat; GMA, representing the location of the property inside a Growth Management boundary); and a time variable centered on 1990 (the year when increased enforcement activity, especially for salmon, became apparent). For a complete description of the model and individual variables, see Appendix 2.

Clallam County Single-family Home Model
Log of Real Price

Variable	Coefficient	Standardized Coefficient	t-statistic
Intercept	2.216		21.641
ESA	-.0896	-.119	-13.250
GMA	-.0183	-.021	-2.178
log_sqft	.569	.335	25.278
log_BR	.0642	-.034	-3.269
log_ba	.354	.218	16.489
T	.0024	.040	2.667
log_prmt	.0982	.035	2.959
V	.0678	.107	11.812
HAGE	-.0017	-.144	-14.003
log_LSIZ	.120	.260	20.847
dAC	.0282	.038	3.302
Mkt	-.0375	-.037	-3.269

All coefficients significant at .01.
Adjusted R^2 = .607

As illustrated in the accompanying table, both the Endangered Species Act and Washington's Growth Management Act exerted downward pressure on housing values. The impact on home values based on their location in an area of above average ESA enforcement activity is negative (nearly 12 percent) and very significant. Applying that percentage to the median sales price in Clallam County means a typical home located in an area which provides habitat to an above-average number of protected species has a value roughly $14,200 less than an identical home in an area subject to less regulation. In terms of residential properties there is also a discount applied to homes inside the urban growth boundaries in Clallam County, suggesting households are willing to pay significantly higher prices for more rural residences, all other things being equal.

➢ *Residential Condominiums*

The second residential model developed was for condominiums. Based on more than 750 condominium records in the database, the resulting model had significant explanatory power, except that all condominium units were located in areas where fewer endangered species are encountered, so the ESA variable disappeared from the model. Since the model is useless from a policy perspective, the statistical results are omitted.

➢ *Unplatted Land*

Since the *a priori* expectation that the most significant models of ESA-related property value impacts would be found in currently undeveloped land, the model for unplatted land received a great deal of attention. Here the log of real price per acre was the dependent variable, with the policy analysis variables, physical property variables, dummies for land use alternatives, economic and climatic variables rounding out the model. A couple of especially interesting variables are highlighted here.

A variable was created to represent the distance the land was from the urban growth boundary (for properties outside the urban growth area), with the expectation that more remote properties would command lower prices. Since precipitation is a significant issue in Clallam County, which is home to the wettest spot in the continental United States, and to communities along the strait of Juan de Fuca in the so-called rain shadow where the climate is usually dry, even when rain is abundant fewer than 10 miles distant, a rainfall variable was also mapped and added to the analysis. The model also included a transfer-specific variable, for the situation where only a right-of-way was being acquired.

Clallam County Unplatted Land Model
Log of Real Price/Acre

Variable	Coefficient	Standardized Coefficient	t-statistic
Intercept	3.827		46.226
ESA	.0220	.026	2.001
GMA	.085	.042	3.487
V	.124	.102	8.923
d_right	-.185	-.089	-7.023
distGMA	-.0156	-.084	-6.261
T	.0122	.123	8.338
log_rain	-.311	-.153	-11.404
log_pop	.0476	.028	1.926
d_wet	.209	.090	7.786
d_resid	.104	.107	8.067
d_ag	.075	.080	6.243
d_urban	.105	.061	5.193
prmt	.161	.056	4.428
d_2ac	.441	.368	28.853
d_10ac	-.294	-.300	-25.698

All coefficients significant at .01.
Adjusted R^2 = .401

Despite the large number of significant variables, the model was only capable of describing 40 percent of the variation in the log of prices. This model was also disappointing because the ESA variable, while significant, had the wrong sign. Fortunately, the small coefficient means that for unplatted land in Clallam County other factors far outweigh ESA enforcement as a determinant of land value. The fact that Clallam County is developing more slowly than other parts of the state, and that the areas which are habitat for a larger number of protected species are less desirable for development based on other criteria, may be influencing this result.

This model implies that the location of a property in an area of higher interest in terms of ESA enforcement would have a value approximately 2.6 percent higher than a property in a less critical area. However, since this model only explains 40 percent of the variation in the log of real price per acre of unplatted land in the County, an improved specification of the model might result in a more intuitively acceptable result.

➢ *Commercial Real Estate*

The analysis of commercial real estate in Clallam County included a range of commercial and industrial properties which were already developed. The analysis included roughly 1,100 properties, anything from apartment buildings to abandoned wood products mills. Because of the variety of uses, the

models developed had relatively poor explanatory power. Part of the difficulty may have been the transfers of less than fee simple ownership which nonetheless were recorded on the deeds. One example is a long-term lease. Since those leases do not include the transfer of the land, it would be preferable to exclude them from the analysis, but the structure and content of the database did not allow practical identification of these properties. The initial model structure did not include the size of the property because that variable was only available for half of the observations, but when the model did not prove robust, it was decided to reduce the number of observations available to the model in order to incorporate the size variable. The result was a model with much improved (but still disappointing) explanatory power, based on 660 observations.

Clallam County Improved Commercial Property Model
Log of Real Price

Variable	Coefficient	Standardized Coefficient	t-statistic
Intercept	3.357		29.306
ESA	-.304	-.199	-5.478
GMA	.173	.139	4.130
d_industrial	-.169	-.129	-3.513
d_retail	.106	.089	2.586
d_apt	.214	.135	3.932
log_LSIZ	.363	.526	14.132

all coefficients significant at .01.
Adjusted R^2 = .265

In terms of the policy variables emphasized in this study, the properties located inside the urban growth areas did command higher prices, and the properties subject to higher levels of ESA enforcement suffered significant reductions in value (19.9 percent, standardized).

Since the focus of this analysis is on land for development, WCRER estimated a separate model focusing on land specifically for future commercial development. There were 114 properties sold throughout Clallam County during the study period which fit this description. While this is one of the smallest samples modeled in the study, the results were quite robust.

Since this was a land model, the dependent variable was the log of real price per acre. Independent variables include the policy variables, dummies representing extremes of property size, precipitation, urban status and distance outside the GMA boundary, if appropriate. It is likely the separate urban status variable resulted in lack of significance for the usual GMA formulation.

Clallam County Commercial Land Model
Log of Real Price/Acre

Variable	Coefficient	Standardized Coefficient	t-statistic
Intercept	5.648		13.725
ESA	-.295	-.144	-1.663
d_2ac	.316	.247	3.225
d_10ac	-.654	-.295	-4.204
log_rain	-.712	-.193	-2.534
d_urban	.249	.199	2.972
distGMA	-.121	-.247	-3.417

all coefficients significant at .01
Adjusted R^2 = .566

As expected, the impact of ESA enforcement on the value of property was negative and statistically significant. Similarly, properties in especially wet locales were lower valued, as were commercial properties which were further outside the GMA boundary. Also, the larger the property, the lower the value per acre. These were the anticipated results. The adjacent table illustrates the results.

The interpretation of this model is especially significant. All other things being equal (based on standardized coefficients), commercially-zoned land located in an area of high ESA enforcement would typically see a reduction in value of 14.4 percent

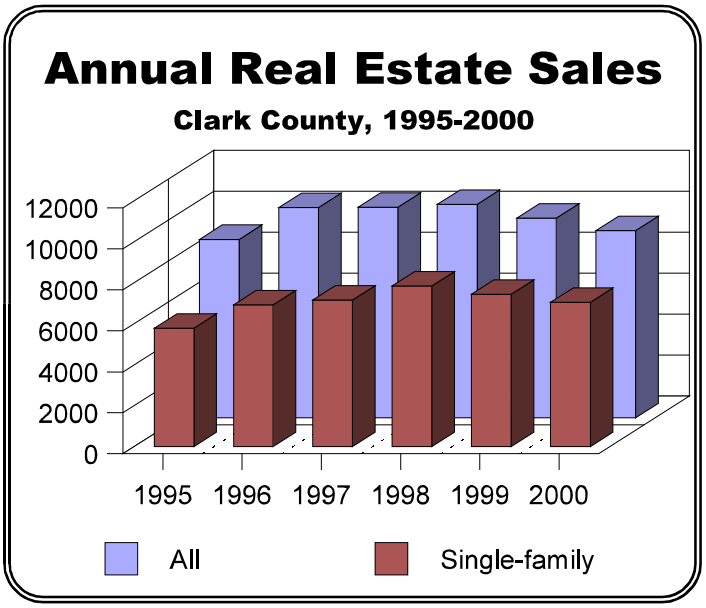
compared to basically identical properties subject to less intensive regulatory interest.

➢ *Residential Lots*

Discussion of the impacts of the Endangered Species Act often seems to focus on the inability to construct homes on lots which have already been platted. Accordingly it was expected that modeling the value of existing (or newly created) residential lots would illustrate the impact of ESA enforcement in this mostly rural/small town county. Unfortunately the models were incapable of explaining much variation in lot prices. The ESA variable was only marginally significant, and was as likely to have the opposite sign as the anticipated sign. The estimated model was capable of explaining only 16 percent of the variation in the log of real price per acre, one of the least effective models in this exercise. Given the poor performance of this model, further reporting of results is without merit.

Clark County

A noted earlier, WCRER limited the analysis in Clark County to the period 1995 through 2000. Even so, the initial database for Clark County included approximately 58,000 transactions. Unlike data in the other counties included in this study, the data set did not include most non-arms-length transactions. As a suburban community, most real estate transactions were single-family homes as shown in the accompanying graph. Models were developed for the key property types used in the analysis of Clallam and Snohomish counties.



➢ *Single-family Homes*

A total of 30,010 transactions were used to model single-family housing in Clark County. While the complete database included over 42,000 residential transactions, a significant number did not include information on one or more key analysis variables – home age, number of bedrooms or number of baths. While Clark County has been Washington's most rapidly growing jurisdiction throughout most of the decade of the 1990s, the new home market has not been disproportionately represented in these statistics. Although the national average for new home construction is about 20 percent of the overall housing market, the newly-built units ranged from 22.4 to 26.7 percent of the home sales in Clark County during the analysis period. Certainly this represents an active housing construction market, but the role of existing housing is sufficiently large to suggest that these statistics are representative of a rapidly growing market.

As with other communities, a logarithmic model of real home prices was estimated. In Clark County this model explained 59.4 percent of the variation in the log of prices, a reasonably good model fit. Most coefficients had the expected signs, but there were a couple of anomalies. While a location in an area with above average ESA impacts was negative, there was also a negative coefficient on a location inside the urban growth area. This result is similar to the housing model in Clallam County, indicating many residents pay a premium to live in more rural areas. Also, the basic time trend variable was negative, indicating a general pattern of declining home prices in Clark County over time. This result is consistent with prior research

conducted by WCRER on Clark County[3], research which used different data sets. It is noteworthy that these quality-adjusted model estimates of real price changes indicate a downward trend in prices, while the community sustained strong population and housing growth and median prices continued to rise. The apparent decline in real, quality-adjusted housing value is due to two factors. First, new homes are generally larger with more amenities than the existing stock. Since the model adjusts for those changes, the time trend variable really could decline. Second, the new construction in the county, which has been significant given the population growth, has apparently emphasized entry level ownership homes to a greater extent than most urban markets.

Clark County Single-family Home Model
Log of Real Price

Variable	Coefficient	Standardized Coefficient	t-statistic
Intercept	3.198		14.062
ESA	-.0245	-.067	16.084
GMA	-.0547	-.132	-22.377
distGMA	-.0309	-.150	-24.727
Mkt	-.126	-.046	-5.042
yp_indx	-.265	-.202	-3.169
pop_indx	2.104	.731	7.847
log_HAGE	-.0790	-.242	-53.820
log_acre	.181	.485	100.303
BR	.0150	.083	20.729
ba	.0964	.375	81.239
d_ex	.0413	.045	11.751
View	.0820	.113	29.641
T	-.0445	-.433	-4.823

all coefficients significant at .01.
Adjusted R^2 = .594

Examining the standardized coefficients, a location in a high-impact ESA area reduced the selling price of a home by 6.7 percent. This translates to a $10,500 reduction in value to the average home which is subject to greater ESA enforcement.

➢ *Commercial Real Estate*

Only 411 transactions were usable in estimating the model of improved commercial property in Clark County, making this one of the smaller samples available during this research. While the estimated model had good fit for a cross-sectional model, several variables, including ESA were eliminated as having insignificant explanatory power. Others which were deemed insignificant included the distance outside the GMA boundary, economic variables (property transfer index and personal income index) and the time trend variable. Size of the structure, amount of land, presence inside the growth management boundary and a population growth index were the only remaining variables, but they were capable of explaining 68.4 percent of the variation in the log of price.

Unfortunately, the available data did not permit the creation of dummy variables representing various business specialties within the commercial sector. Accordingly, it is impossible to separate retail space from warehouses or offices. This is an unfortunate weakness in the model, and having access to variables such as these might have resulted in statistical significance of the ESA variable. We simply cannot tell.

➢ *Land*

A review of the data for the land model in Clark County showed that it consisted primarily of residential building lots, typically in groups of two to five lots, with some larger parcels thrown in. The data available did not permit estimation of a model which identified agricultural or resource lands as an explanatory variable, although variables of that type were significant in the other markets studied. A total

[3]Wolverton. Growth Management and Housing Affordability in Clark County, Washington, 2001, p. 8.

of 6,032 land parcels sold between 1995 and 2000 were available for the analysis.

The resulting model had a very good fit, and included a significant negative coefficient for the ESA variable, and a significant positive coefficient for the GMA variable. A bit surprising, however, were negative coefficients for both the economic variables – the property transfer index and the personal income index. As activity rises, theory suggests that property values should rise. Similarly, as available income increases land prices generally are expected to increase. Further analysis of these issues is beyond the scope of this report.

For this model, looking at the standardized form, location of the parcel in a high-impact area in terms of the Endangered Species Act resulted in a 4.0 percent lower real price per acre when compared to similar properties which are habitat for a smaller number of protected species. This is consistent with other models estimated.

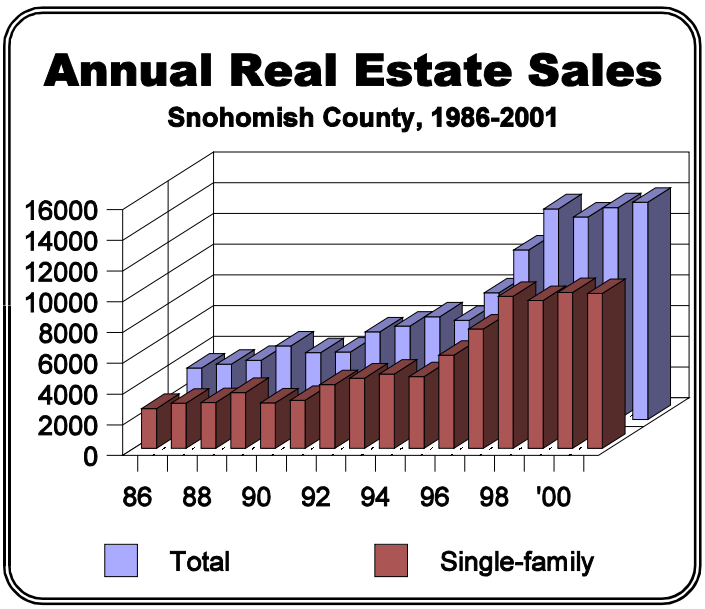
Clark County Land Model
Log of Real Price per Acre

Variable	Coefficient	Standardized Coefficient	t-statistic
Intercept	9.454		15.372
ESA	-.0442	-.040	-6.802
GMA	.0323	.029	3.606
dist_GMA	-.0623	-.161	-20.080
Mkt	-.972	-.086	-6.654
yp_indx	-3.475	-.512	-7.094
log_acre	-.616	-.785	119.715
T	.224	.461	6.918

all coefficients significant at .01
Adjusted R^2 = .812

Snohomish County

Snohomish County represents the Everett portion of the Seattle-Bellevue-Everett Metropolitan Area, due north of King County. The County's population in 2001 was estimated at 618,600, making it the most populated of the counties studied. In addition to Everett, incorporated areas include: Edmonds, Lynnwood, Marysville, Mountlake Terrace, Mukilteo, Monroe, Bothell and Arlington, each of which have over 10,000 residents. There are also ten smaller incorporated places.



There are 2,090 square miles of land area within Snohomish County, and 60,588 acres devoted to agriculture. This is about 4.5% of the total land area. The character of the county is primarily suburban, with a significant manufacturing economy providing nearly one-third of the county's employment. The largest private employer is Boeing. The Navy, especially Home Port Everett, is another significant employer.

The suburban character of the Snohomish County market is clearly illustrated by the accompanying graphic of real estate sales activity. The single-family residential component of the market represents a far greater share of overall real estate market activity than was observed in the similar graphic for Clallam County, but is

very similar to the comparable graphic for Clark County.

As the greater Seattle area has grown during the 1990s, considerable pressure has been placed on the real estate industry in Snohomish County. The county is frequently viewed as a somewhat lower cost alternative to neighboring King County. Accordingly, issues related to Washington's Growth Management Act and the enforcement of the Endangered Species Act have been of considerable local interest.

Primary data for this analysis was acquired from MetroScan, which provides information culled from public records. Initially, WCRER selected all records of transactions between 1986 and 2001 – a total of over 165,000 records. Once unusable data with inadequate geographic detail to locate the property, transactions which were less than arms-length sales, incomplete interests, etc. were removed, a total of approximately 123,000 observations remained for the analysis. As in the other counties studied, these properties were subdivided into property types for detailed analysis – single-family residential, condominiums, undeveloped land, commercial properties and multifamily housing. Results are presented below for each property type individually.

➢ *Single-family Homes*

Consistent with the analysis in the other communities, the single-family housing model in Snohomish County, using 70,000 transactions in the database, was estimated as the log of real price, and explained by the policy variables, physical property details and economic variables.

Snohomish County Single-family Home Model
Log of Real Price

Variable	Coefficient	Standardized Coefficient	t-statistic
Intercept	1.753		18.166
ESA	-0.01484	-0.042	-16.89
GMA	0.01008	0.029	7.258
ba	0.06107	0.242	83.125
d_ex	0.0094	0.017	6.648
d_poor	-0.02549	-0.034	-13.791
V	0.172	0.145	60.23
yp_indx	0.05918	0.083	3.457
pop_indx	2.012	0.096	17.974
T	0.01137	0.299	11.632
log_sqft	0.501	0.45	151.855
log_LSIZ	0.08097	0.195	71.117
log_prmt	-.160	-.103	-26.772

All coefficients significant at .01
Adjusted R^2=.605

One comment should be made about the model. One of the primary intuitive variables influencing price has been omitted, number of bedrooms. This is because there was a significant degree of correlation between the number of bedrooms and the total square footage of the home, with the size variable having greater explanatory power. Accordingly, bedrooms do not appear in the final model.

The interpretation of this model is that homes located in areas of above average numbers of ESA-regulated species have values which are 1.5 percent lower than otherwise comparable homes which are less burdened by ESA regulations. If the model is standardized without an intercept, the impact seems even greater, with a 4.2 percent negative coefficient. For the median priced home in Snohomish County as of mid-year 2002 ($218,000), this means a location in an area with a significant degree of enforcement potential would reduce the probable selling price by approximately $3,270 (at 1.5%) to $9,156 (at 4.2%).

➢ *Residential Condominiums*

A total of 8,589 residential condominiums were included in the initial database developed from

Snohomish County Residential Condominium Model
Log of Real Price

Variable	Coefficient	Standardized Coefficient	t-statistic
Intercept	5.003		18.401
GMA	-.0249	-.057	-3.692
log_sqft	.322	.269	28.646
log_br	.146	.103	9.499
log_ba	.467	.383	33.068
HAGE	-.00199	-.113	-10.885
pop_indx	-1.396	-.059	-5.351
yp_indx	.144	.172	11.942
V	.278	.162	18.093
d_ex	.0221	.036	3.878

all coefficients significant at .01
R^2 = .480

the MetroScan data, but after excluding transactions which did not conform to the specification, 6,646 were available for modeling. These units had an average of 2.2 bedrooms and 1.8 baths, and averaged 1,011 square feet in size. They were located in all urbanized parts of the county, and were sold throughout the study period. While 20 percent of the sample was either outside urban areas or sold prior to the development of the initial urban growth boundaries, the GMA variable was significant in the model, and the resulting negative sign is consistent with other residential models discussed previously. A small proportion of the condominium units were located in areas of above average ESA interest, and the analysis variable was the least significant of all variables tested, and was excluded from the final model. The logarithmic form of the model explained nearly half of variation in prices.

➢ *Plex Units*

Plex units are defined as duplexes and 3 or 4-family structures, often referred to as tri-plexes and four-plexes. These property types behave in many ways like single-family homes (especially duplexes), and in some regards like multifamily housing, typically defined as structures with five or more units. Duplexes appeal to individuals who desire some investment income from real estate, but are uncomfortable with the demands of being an absentee landlord, often choosing to occupy one of the units while renting out the adjoining unit. Three-and-four-plex units appeal principally to small investors. Unlike other communities in this study, there were a sufficient number of plex units in Snohomish County to justify a modeling attempt.

There were a total of 2,485 plex units in the initial database. Eliminating the observations which were less than arms-length transactions, or those which reflected property modifications rather than actual sales, resulted in a usable database of 1,393 transactions. Virtually all of the transactions involving these properties were within the urban growth boundaries, and in areas with little variation in the ESA enforcement criteria. Furthermore, the explanatory power of the model was limited, with an adjusted R^2 of only .272, meaning that the model explains only 27 percent of the variation of prices. Since the key analysis variable was not significant in any formulation of a model, results are not reported here.

➢ *Multifamily*

The large number of apartment units in Snohomish County makes it feasible to examine this property type which was not available for analysis in the other counties. A total of 592 apartment buildings were sold, and provided sufficient detail to be included in this analysis.

GMA was excluded from this model because virtually all the apartment properties are included inside current urban growth boundaries. The two dummy variables reflect the value impacts of having

between 100 and 199 units or having more than 200 units. Both have significant positive impacts on value compared to the default project size of fewer than 100 units. The potential for significant ESA enforcement activities results in a 3.5 percent negative impact on value, based on the standardized model. This is certainly consistent with the impacts noted for other property types in Snohomish County.

Snohomish County Multifamily Model
Log of Real Price

Variable	Coefficient	Standardized Coefficient	t-statistic
Intercept	10.618		4.252
ESA	-.0555	-.035	-1.469
T	-.0927	-.784	-3.193
HAGE	-.0067	-.326	-12.929
Pop_indx	-6.749	-.106	-2.462
yp_indx	2.028	.913	4.015
d_100	.828	.341	14.095
d_200	1.268	.562	23.208

all variables, except ESA significant at .01; ESA significant at .1
Adjusted R^2 = .679

➢ *Commercial Real Estate*

Unlike the Clallam County data, it was impossible to segregate commercial land from other commercial properties in the Snohomish County data. While it was possible to identify general business characteristics of the property in terms of current use, those identifiers related more to industry than to the degree of physical development of the property already in place. Accordingly, it is not surprising that the models developed did not provide a high degree of fit, even in logarithmic form.

Snohomish County Improved Commercial Property Model
Log of Real Price

Variable	Coefficient	Standardized Coefficient	t-statistic
Intercept	7.105		21.764
ESA	-.141	-.108	-6.140
GMA	.177	.155	4.821
T	-.052	-.433	2.734
log_prmt	-.739	-.154	6.680
log_acre	.430	.512	29.249
yp_index	1.213	.537	3.480
d_zon_res	-.165	-.097	-.5628

all variables significant at .01
Adjusted R^2 = .312

Of the 3,557 commercial transactions included in the MetroScan data, 2,362 were usable in the modeling effort. This model explained 31.2 percent of the variation in the log of real price. The location of a property inside the GMA boundary had the anticipated effect of increasing value by 15.5 percent. Similarly, properties significantly influenced by enforcement of the Endangered Species Act suffered a significant reduction in value, 10.8 percent in the standardized model, all other things being equal. Commercial properties which are actually located in a zoned residential area commanded lower values. One economic variable was significant in the model, log of building permits issued, but that variable carried a surprising negative sign. Larger commercial properties, in terms of land acres, not building size, carried higher prices.

➢ *Undeveloped, Resource or Agricultural Land*

The issue of impact of ESA enforcement on property values is nowhere more important than on land which may be developed in the future. In these cases, it is less important to know how the land is currently used than it is to know what type of zoning prevails, because that is the best indicator of the purchaser's intentions.

As discussed regarding the data in Clallam County, the sharply different nature of these properties makes modeling exceptionally difficult. Unlike Clallam, however, there were far fewer instances of timber

sales without conveyance of the land in the Snohomish County data. There were, however, many transactions where the zoning codes, which are part of the record, have been abandoned by the jurisdiction responsible for the property in the years since the transaction took place. Moreover, it was exceptionally difficult to obtain explanations of those zoning codes so that the properties could be treated consistently with the zoning code administered under current regulations.

In the final database, there were 8,336 parcels of land transferred by General Warranty Deed, Special Warranty Deed, Bargain and Sale Deed or Land Contract between 1985 and 2001 in Snohomish County that had adequate information about the physical property. The model was developed to estimate the log of real price (inflation adjusted) of the land per acre.

The estimation results indicate that undeveloped parcels located in areas of above average ESA enforcement in Snohomish County had values reduced by 2.7% relative to a more-or-less identical parcel which was subject to less intensive ESA scrutiny. If, however, the model is standardized without an intercept, the price impact of location in an ESA enforcement zone indicates a reduction in value of approximately 1.4 percent. It should also be noted that additional functional forms were attempted, including one which achieved a greater degree of fit (R^2=.608). That model was rejected, however, because a number of variables which were included in other models reported here (including, but not limited to ESA) were excluded as statistically insignificant. It is also worth noting that the key undeveloped land model was more satisfactorily estimated in Snohomish County than in the other analysis jurisdictions.

Snohomish County Undeveloped Land Model
Log of Real Price/Acre

Variable	Coefficient	Standardized Coefficient	t-statistic
Intercept	3.664		73.071
ESA	-.02676	-.014	-1.802
GMA	.459	.231	25.049
d_2ac	.791	.422	37.542
d_10ac	-.217	-.091	-91484
yp_indx	.505	.129	14.506
d_zon_com	.475	.161	18.179
d_zon_rsc	-.06497	-.025	-2.625
d_zon_res	.08393	.045	4.527
d_ease	.260	.043	5.540
d_plat	.06424	.035	3.422
prmt	-.289	-.082	-10.203

all coefficients significant at .01
Adjusted R^2 = .511

Conclusion

As the various pieces of the puzzle come together, it has become apparent that there is consistency across the local markets, despite the difficulty of estimating models with structurally similar functional forms. While any generalization has exceptions, it is clear from the analyses that enforcement of the Endangered Species Act, despite its success at preserving the viability of some species, has reduced selected property values in the affected communities. This extends far beyond the inability of land owners in areas where the spotted owl have habitat to sell the lumber from the trees. It extends beyond the frustration felt by a farmer who cannot sell his land at a handsome profit for residential development because much of the land is located within 200 feet of a river which has been designated salmon habitat. It is also important to emphasize that this study is not a cost-benefit analysis. No evaluation of the benefit to society of the preservation of the endangered species is explicitly stated, implied or should be inferred.

Virtually every piece of real estate in these three counties is native habitat to at least one endangered species, and often to a large number of species. The highest profile species (spotted owls, salmon, bald eagles) were treated as critical in their own right. Other lesser species were tallied collectively and linked

geographically to the real estate. In the final analysis, properties were identified as being subject to above average regulation under the Endangered Species Act for purposes of this study. Other approaches might have been tried, but short of limiting the models to enforcement activities targeting a single species, this approach seemed the most appropriate.

The accompanying table summarizes the estimated and standardized coefficients on the ESA variable across the various counties and property types. First, it is apparent that in virtually every case ESA enforcement exerted a significant negative influence on property values. Second, the consistency of the coefficients across the models, despite their unique specifications is striking. It is also apparent that the impacts are most significant in percentage terms in the most natural resource-dependent jurisdiction studied – Clallam County.

Coefficients on ESA from Standardized Log-linear Models
Real Prices (or Real Prices/Acre)

County	Market Segment	Coefficient on ESA	Standardized Coefficient
Clallam	Single-family homes	-.0896	-.119
	Unplatted land	.022	.026
	Improved commercial	-.304	-.199
	Commercial land	-.295	-.144
Clark	Single-family homes	-.0245	-.067
	Land	-.0442	-.040
Snohomish	Single-family homes	-.0148	-.042
	Unplatted land	-.0276	-.014
	Multifamily	-.0555	-.035
	Improved commercial	-.141	-.108

Applying these price effects to the proportions of the assessed real property in each of those counties which can be characterized as high-impact ESA, then applying the effective property tax rates which apply in that county provides an estimate of how Federal enforcement of the Endangered Species Act has negatively impacted the financial capacity of the State of Washington and its Counties and Cities. While the state of Washington does not use differential tax rates for various classes of real estate, since the models demonstrated differential impacts on price levels, separate impacts were estimated for various property types, then aggregated into county-wide impacts. Unfortunately, these impacts cannot be generalized to the remaining 36 counties of the state, because each county has a different degree of ESA enforcement potential, and therefore differing possible impacts. Based on the table of coefficients above, affected real estate in Clallam County has had value reduced by approximately 9.1 percent, the greatest impact among the analysis communities. In Clark County the average impact is about 6.0 percent, while in Snohomish the impact is estimated at 4.8 percent. It must be emphasized that these are the impacts on those properties in areas which are habitat to an above-average number of protected species. Other properties in each county would not be directly affected by ESA enforcement. The accompanying table calculates the tax revenue impact in each of these communities.

The governments of the State of Washington, the three analysis counties, the incorporated cities within those counties, and the special taxing jurisdictions (hospitals, libraries, etc.) within those counties collectively received $15.5 million less in property tax revenues per year from those properties than would otherwise be collected. Actually, given the revenue structure of the state of Washington, this is not so much a reduction of revenue to the governmental units as it is a redistribution of tax burden away from the

Property Tax Revenue Impacts
ESA-Impacted Properties

County	Assessed Value ($ Millions)	Tax Rate	Impacted Share	Value Reduction	Value Loss ($ Millions)	Revenue Loss ($ Millions)
Clallam	$3,988.6	1.07%	13.8%	- 9.1%	$50.1	$0.5
Clark	$23,211.9	1.27%	39.5%	- 6.0%	$550.1	$7.0
Snohomish	$42,501.7	1.16%	33.9%	- 4.8%	$691.6	$8.0

impacted properties to the properties which are subject to fewer ESA-oriented restrictions. Accordingly, all property owners are losers in this process – the owners of the high impact properties see a direct reduction in the value of their property. The remaining owners see their property taxes rise more rapidly than the taxes of those properties whose values are constrained.

Appendix 1
Species Detail

Common Name	Scientific Name	Status		Clallam	Clark	Snohomish
		State	Fed			
Reptiles & Amphibians						
Western Toad	*Bufo boreas*	c	sc	x	x	x
Striped Whipsnake	*Masticophis taeniatus*	c				
Larch Mountain Salamander	*Plethodon larselli*	s	sc		x	
Van Dyke`s Salamander	*Plethodon vandykei*	c	sc	x		
Red-legged Frog	*Rana aurora*		sc	x	x	x
Cascades Frog	*Rana cascadae*		sc	x	x	x
Columbia Spotted Frog	*Rana luteiventris*	c	sc			
Cascades Torrent Salamander	*Rhyacotriton cascadae*	c			x	
Sagebrush Lizard	*Sceloporus graciosus*		sc			
Mammals						
Gray Wolf	*Canis lupus*					x
Wolverine	*Gulo gulo*				x	x
Black-tailed Jack Rabbit	*Lepus californicus*					
White-tailed Jack Rabbit	*Lepus townsendii*					
Lynx	*Lynx canadensis*					x
Fisher	*Martes pennanti*	*e*	*sc*	x		x
Townsend`s Vole	*Microtus townsendii*		*c*	x	x	x
Keen`s Myotis	*Myotis keenii*			x		x
Yuma Myotis	*Myotis yumanensis*		*sc*	x	x	x
White-tailed Deer	*Odocoileus virginianus*	*e*	*e*			
Bighorn Sheep	*Ovis canadensis*		*sc*			
Merriam`s Shrew	*Sorex merriami*	*c*				
Trowbridge`s Shrew	*Sorex trowbridgii*		*sc*	x	x	x
Washington Ground Squirrel	*Spermophilus washingtoni*	*c*	*c*			
Pygmy Rabbit	*Brachylagus idahoensis*	*e*	*sc*			
Mazama Pocket Gopher	*Thomomys mazama*	*c*	*c*	x		
Northern Pocket Gopher	*Thomomys talpoides*				x	x
Grizzly Bear	*Ursus arctos*	*e*	*t*			x
Birds						
Northern Goshawk	*Accipiter gentilis*	*c*	*sc*	*x*	x	
Western Grebe	*Aechmophorus occidentalis*	*c*				
Sage Sparrow	*Amphispiza belli*	*c*				
Golden Eagle	*Aquila chrysaetos*	*c*		*x*		
Canada Goose	*Branta canadensis*	t	*sc*	*x*	x	x
Marbled Murrelet	*Brachyramphus marmoratus*	*t*	*t*	*x*		x
Ferruginous Hawk	*Buteo regalis*	*t*	*sc*			
Vaux`s Swift	*Chaetura vauxi*	*c*		*x*	x	x
Olive-sided Flycatcher	*Contopus borealis*		*sc*		x	x
Sage Grouse	*Centrocercus urophasianus*	*t*	*c*			
Pileated Woodpecker	*Dryocopus pileatus*	*c*			x	x
Willow Flycatcher	*Empidonax traillii*		*sc*	*x*	x	x
Horned Lark	*Eremophila alpestris*	*c*	*c*	*x*		x
Merlin	*Falco columbarius*	*c*		*x*		x
Peregrine Falcon	*Falco peregrinus*	*e*	*sc*	*x*		
Tufted Puffin	*Fratercula cirrhata*	*c*	*sc*	*x*		

Common Name	Scientific Name	Status		Clallam	Clark	Snohomish
		State	Fed			
Bald Eagle	*Haliaeetus leucocephalus*	*t*	*t*	*x*	x	x
Harlequin Duck	*Histrionicus histrionicus*		*sc*	*x*		x
Loggerhead Shrike	*Lanius ludovicianus*	*c*	*sc*			
Lewis` Woodpecker	*Melanerpes lewis*	*c*				
Sage Thrasher	*Oreoscoptes montanus*	*c*				
Black-backed Woodpecker	*Picoides arcticus*	*c*				x
Vesper Sparrow	*Pooecetes gramineus*	*c*	*sc*	*x*		
Cassin`s Auklet	*Ptychoramphus aleuticus*	*c*	*sc*	*x*		
White-breasted Nuthatch	*Sitta carolinensis*	*c*	*sc*		x	
Spotted Owl	*Strix occidentalis*	*e*	*t*	*x*	x	x
Golden Eagle	*Uria aalge*	*c*		*x*		
Salmonids						
Chum salmon (Hood Canal)	*Oncorhynchus keta*		*t*	*x*		
Chum salmon (Lower Columbia)	*Oncorhynchus keta*		*t*		*x*	
Sockeye salmon (Lake Ozette)	*Oncorhynchus nerka*		*t*	*x*		
Chinook salmon (Puget Sound)	*Oncorhynchus tshawytscha*		*t*	*x*		*x*
Chinook salmon (Lower Columbia)	*Oncorhynchus tshawytscha*		*t*		*x*	
Westslope cutthroat (Columbia R/SW Washington)	*Onchrhynchus clarki/lewisi*		*sc*		*x*	
Steelhead (Lower Columbia)	*Oncorhynchus mykiss*		*t*		*x*	
Coho (Puget Sound/Strait Georgia)	*Oncorhynchus kisutch*		*c*	*x*		*x*
Coho (Columbia R/SW Washington)	*Oncorhynchus kisutch*		*c*		*x*	

Appendix 2
Description of Model Variables

The general form of the models estimated for this project is illustrated by the following functional form, specific to the Clallam County single-family housing model.:

$$\log P = \alpha + \beta_1 ESA + \beta_2 GMA + \beta_{3\,\log\_} sqft + \beta_{4\,\log\_} BR + \beta_{5\,\log\_} ba + \beta_6 T + \beta_7 prmt + \beta_8 V + \beta_9 HAGE + \beta_{10\,\log\_} LSIZ + \beta_{11} dAC + \beta_{12} Mkt + \varepsilon$$

where:

log P	= log of real home price
ESA	= dummy when at least four species are encountered in an area
GMA	= dummy for properties inside Urban Growth Area and sale after study county's enactment of boundaries
log_sqft	= log of size of house (sq. ft.)
log_BR	= log of number of bedrooms
log_ba	= log of number of baths
T	= time trend, where 1990 is 0, and years before 1990 are negative
prmt	= index of building permits issued in current year compared to study average
V	= dummy for properties with view
HAGE	= age of home
log_LSIZ	= log of lot size (sq. ft.)
d_AC	= dummy for houses on acreage
Mkt	= index of market activity, local real estate sales in current year compared to study period average

Similar, but not identical, functional forms are used in subsequent models. Other variables used in various models include:

Dependent variables

log_P/A	= log of real price per acre

Independent variables

d_right	= dummy indicating right-of-way transfer
distGMA	= distance to the GMA boundary for properties outside the urban growth boundary
log_rain	= log of annual rainfall, in inches
log_pop	= log of population
d_wet	= dummy indicating a portion of the property is wetland
d_resid	= dummy indicating current residential land use
d_ag	= dummy indicating current agricultural land use
d_urban	= dummy indicating current urban development
d_2ac	= dummy indicating smaller land parcel, less than 2 acres
d_10ac	= dummy indicating larger land parcel, more than 10 acres
d_indust	= dummy indicating current industrial land use
d_retail	= dummy indicating current retail land use
d_apt	= dummy indicating current apartment building
yp_indx	= index of personal income compared to study period average

log_acre	= log of lot size expressed in acres
pop_indx	= index of current population compared to study period average
d_ex	= dummy indicating property in "excellent" or "very good" condition
d_poor	= dummy indicating property in "poor" or "fair" condition
d_100	= dummy indicating apartment complex with 100-199 units
d_200	= dummy indicating apartment complex with 200+ units
d_zon_res	= dummy indicating property zoned residential (regardless of current use)
d_zon_com	= dummy indicating property zoned commercial (regardless of current use)
d_zon_rsc	= dummy indicating property zoned resource (regardless of current use)
d_ease	= dummy indicating easement
d_plat	= dummy indicating land is platted

Appendix 3
Maps

Bibliography

Economics

Brown, Gardner M. Jr. and Jason F. Shogren. "Economics of the Endangered Species Act", **Journal of Economic Perspectives**, *12(3)* summer 1998, pg. 3-20.

Constanza, Robert, John Cumberland, Herman Daly, Robert Goodland and Richard Norgaard. **An Introduction to Ecological Economics**, St. Lucie Press, Boca Raton, 1997.

Dunne, Kristen, James Long and Sumit Singh. Legal Aspects of Regulatory Takings: A Legal, Economic, Political and Social Analysis. sac.uky.edu/~jdlong00/takings.html.

Environmental Working Group. Faking Takings: Farm Subsidies and Private Property in Perspective, February 1995. www.ewg.org/pub/home/Reports/Takings/Faking.html.

Farber, Stephen, "Survey: Undesirable facilities and property values: a summary of empirical studies." **Ecological Economics**, Elsevier Science vol 24 (1998) pg. 1-4.

Gilliland, Charles E., **Endangered Species Act: Impact on Texas Rural Land Values**, Technical Report 1091, Real Estate Center at Texas A&M University, September 1995.

Gilliland, Charles E., "Endangered Species Act: What Landowners Should Know". **Tierra Grande**, Vol. 9, No. 4, October 2002, pp. 18-21.

Guidry, Krisandra A. and A. Quang Do, "Appraisal Assignment Involving Endangered Species," **The Appraisal Journal**, January 1994, p. 98-102.

Innes, Robert, Stephen Polasky and John Tschirhart. "Takings, Compensation and Endangered Species Protection on Private Lands," **Journal of Economic Perspectives**, *12(3)* summer 1998, pg. 35-52.

Isakson, Hans R. "An Empirical Analysis of the Determinants of the Value of Vacant Land," **Journal of Real Estate Research**, Vol. 13, Number 2, 1997, pp. 103-114.

Melitz, Robert. The Property Rights Issue. Congressional Research Service, CRS Report, 95-200 National Library for the Environment, January 20, 1995.

Metrick, Andrew and Martin L. Weitzman. "Conflicts and Choices in Biodiversity Preservation," **Journal of Economic Perspectives**, *12(3)* summer 1998, pg. 21-34.

Mooney, Sian and Ludwig M. Eisgruber, "The Influence of Riparian Protection Measures on Residential Property Values: The Case of Oregon Plan for Salmon and Watersheds," **Journal of Real Estate Finance and Economics**, 22(2/3), 2001, pg. 273-286.

Pilon, Roger. "Protecting Private Property Rights from Regulatory Takings". Testimony before the Subcommittee on Constitution Committee on Judiciary, February 10, 1995.

Shogren, Jason F. Economics and the Endangered Species Act. www.umich.edu/~esupdate/library/97.01-02/shogren.html

Siebert, Horst, **Economics of the Environment: Theory and Policy**, 5th Edition. Springer-Verlag, Berlin, 1998.

White, Mark A. "Valuing Unique Natural Resources: Endangered Species," **The Appraisal Journal**, July 1996, 295-303.

The Trust for Public Land. "Long-term Relationship Between Development and Property Tax Bills," 5/27/99. tpl.org/tier3_cdl.cmf?content_item_id=1137&fp;der_id827.

Regulations

"A Citizen's Guide to 404(d) Rule for Threatened Salmon and Steelhead on the West Coast." National Marine Fisheries Service, Northwest and Southwest Regions, June 20 2000.

Adler, Jonathan H. "Property Rights, Regulatory Takings, and Environmental Protection." Monograph, Competitive Enterprise Institute 4/1/96

Antidegradation Policy, Washington Administrative Code Chapter 173-200-030, 173-201a-70

Costal Zone Management Act of 1972 as Amended by the Administrative Proposal: The Coastal Management Enhancement Act of 1999. United States Code Title 16. Conservation.

Hansen, Craig. "The Nation's First Multi-Species HCP for a Forested Landscape." **Endangered Species Bulletin**, vol 20(6). endangered.fws.gov/esb/95/murryhcp.html

Kostyack, John. "NWF v. Babbit: Victory for Smart Growth and Imperiled Wildlife." **Environmental Law Reporter**, v34,june 2000, pg.10712-10718.

Mitchell, Robert L. "Builders React to EPA's Clean Water Act Rule." News release National Association of Homebuilders, July 11, 2000. www.nahb.com, 12/28/01

Moser, David E. "Habitat conservation Plans Under the U.S. Endangered Species Act: the Legal Perspective." **Environmental Management**, Vol . 26, Supplement 1, 2000 s7-s13.

Myers, Phyllis. "Growth At the Ballot Box: Electing the Shape of Communities in November 2000." www.brook.edu/es/urban/ballotbox/findings.htm.

Perkins Coie, LLP. Washington's New Shoreline Master Program Guidelines: Recommendations for Realtors.

"President Bush Expected to sigh Landmark Smart Growth Legislation" Smart Growth America, 1/16/02. www.smartgrowthamerica.com.

Samuel, Peter and Randal O'Toole. "Smart Growth at the Federal Trough: EPA's Financing of the Anti-Sprawl Movement" Policy Analysis, #361, Nov 24, 1999, Cato Institute.

SEPA Rules, Chapter 197-11 Washington Administrative Code, last update, 3/4/98.

Shoreline Management Act of 1971, Revised Code of Washington chapter 90.58.

Shoreline Management Act – Streams and Rivers Constituting Shorelines of the State, Washington Administrative Code Chapter 173-18.

Smallwood, K. Shawn. "A Crosswalk from the Endangered Species Act to the HCP Handbook and Real HCPs." **Environmental Management**, Vol . 26, Supplement 1, 2000, s23-s35.

The Endangered Species Act of 1973, endangered.fws.gov/esa.html.

The Watershed Planning Act, HB 2514, RCW 90.82

U.S. Department of the Interior, Fish and Wildlife Service. "Habitat Conservation Planning and Incidental Take Permit Processing Handbook", November4, 1996, U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Marine Fisheries Service.

WAC 232-12-297 Endangered, Threatened and Sensitive Wildlife Species Classification, Washington Department of Fish and Wildlife, www.wa.gov/wdfw/wlm/diversity/soc/was-297.htm.

Washington Center for Real Estate Research. *Impacts of Washington's Growth Management Act on the Development Process*. Washington Center for Real Estate Research, College of Business and Economics, Washington State University, March 2002, pages 31-35.

Washington State Department of Ecology, "Understanding the State Environmental Policy Act", seminar, June 12,2002, Spokane, Washington.

Washington State Department of Ecology, "Beyond the Basics, SEPA Workshop," seminar, June 13, 2002, Spokane, Washington.

Land

"Fish and Wildlife and the Growth Management Act", Washington Department of Fish and Wildlife, www.wa.gov/wdfw/hab/gma-phs.pdf

"Laws We Use" **Earthjustice**, 2001, www.earthjustice.ort/about/work/laws.html.

National Wildlife Federation. Habitat Conservation Plans. (multiple links), Reston, VA, 2002. www.nwf.org/smartgrowth/learnhcp.html.

Wetlands Program. "Just the facts: About the National Wetlands Inventory" Oregon Division of State Lands, Salem OR, June 1991, www.statelands/dsl.state.or.us/fact1.pdf

Methods

Kohley, Thomas W., Jeffrey D. Hamerlinck and Patrick J. Crist. "A Biological Decision Support System for County Land Use Planning." Planning for Biological Resources at the County Level, ESRI User Conference Proceedings 1997, www.esri.com/library/userconfproc97/to550/pap520/p520.htm .

Scott, J. Michael, Frank Davis, Blair Scuti, Bart Butterfield, Craig Groves, Hal Anderson, Steve Caicco, frank D'Erchia, Thomas C. Edwards, Jr., Joe Ulliman and R. Gerald Wright. "GAP Analysis: A Geographic approach to Protection of Biological Diversity," Wildlife Monograph, 123, pg 1-41.

Stevenson, Matt. "Applying Washington GAP", Remote Sensing Applications Laboratory, University of Washington Department of Urban Design and Planning, University of Washington, depts.washington.edu/rsal/GAP/spokane_brochure.html (11/19/98).

Stevenson, Matthew Robert. Protecting Biodiversity: Applying GAP Analysis in Spokane County, Washington. Thesis. Remote Sensing Applications Laboratory, University of Washington Department of Urban Design and Planning, University of Washington, 1998, 141pp.

Animals

Defenders of Wildlife. "Habitat Conservation Plans: Fact Sheet." www.defenders.org/hcp/factsheet.html, Jan 14, 2002.

Endangered Species List, 11/29/01. endangered.fws.gov/wildlife.html#Species .

Higgins, Margot. "Habitat conservation policies get a makeover," Environmental News Network, www.enn-news-archive/2000/06/06052000/hcprevosopm_13578.asp , June 5, 2000.

Knutson, K.L. and V.L. Naef. 1997 Management Recommendations for Washington's Priority Habitats: Riparian. Washington Department of Fish and Wildlife, Olympia, 181 pp

Larsen, Eric M., editor. 1997 . Management Recommendations for Washington's Priority Species. Volume 3: Amphibians and Reptiles. Washington Department of Fish and Wildlife, Olympia, 122, pp.

Larsen, Eric M. and John T Morgan, editors 1998. Management Recommendations for Washington's Priority Habitats, Oregon White Oak Woodlands. Washington Department of Fish and Wildlife, Olympia. 37pp.

Larsen, Eric M. Elizabeth Roderick, and Ruth Milner, Technical Editors. Management Recommendations for Washington's Priority Species. Volume 1: Invertebrates. Washington Department of Fish and Wildlife, December , 1995.

USGS, Gap Analysis Program: Introduction to Gap Analysis in Biodiversity, www.gap.uidaho.edu/About/Overview/IntroductionToGAShort/default.htm .

Washington Department of Fish and Wildlife, Management Recommendations for Washington's Priority Species, Volume 4: Birds.

Washington Department of Fish and Wildlife, Criteria for Assessing Wildlife Potential of an Urban Area,

Washington Department of Fish and Wildlife, "Listed Salmonid Species: current through June 21, 2000." www.wa.gov/wdfw/recovery/listedsalmon.htm

Washington Department of Fish and Wildlife. Priority Habitats and Species , definitions, Lists www.wa.gov/wdfw/hab/phsdef, www.wa.gov/wdfw/hab/phsinvirt.htm, www.wa.gov/wdfw/hab/phsvirt.htm .

Washington Department of Fish and Wildlife, Species of Concern, www.wa.gov.wdfw/wlm/diversity/soc/concern.htm

Washington Department of Fish and Wildlife, Washington GAP data, www.wa.gov/wdfw/wlm/gap/vdm.htm , www.wa.gov/wdfw/wlm/gap/landcov.htm .

Washington Fish and Wildlife Commission, "Policy of Washington Department of Fish and Wildlife and Western Washington Treaty Tribes Concerning Wild Salmonids. December 5, 1997, www.wa.gov/wdfw//fish/wsp/joint/final/finalwsp.pdf

Water

Army Corps of Engineers, Department of Defense. "Issuance of Nationwide Permit for Single-Family Housing", Federal Register: July 27, 1995 Environmental Protection Agency, www.epa.gov/owow/wetlands/plan/single.html

Boyd, James. "The New Face of the Clean Water Act: A Critical Review of the EPA's Proposed TMDL Rules", Discussion Paper 00-12, March 2000, Resources for the Future, Washington, D.C., rff.org.

Leggett, Christopher G and Nancy E. Bockstael. Evidence of the Effects of Water Quality on Residential Land Prices. **Journal of Environmental Economics and Management**, 2000, *39*, 124-144.

Municipal Research & Services Center . "Water Resource Inventory Area (WIRA) Activities by County" links to cities in the WIRA, maps and watershed conditions., www.mrsc.org/environment/esa-what2.htm

Rea, Maria, Tim Hamlin, Christine Reichgott, Jim Werntz, Cathy Tortorici, Jacqueline Wyland, Carol Schuler and Stephen Zylstra. "Integrating the Clean Water Act and Endangered Species Act: Analysis, Commitments and Recommendations for Aligning the Total Maximum Daily Loads and Habitat Conservation Plans" Draft August 16, 1999. EPA, from yosmite.epa.gov/r10water.nsf .

Satterlund, Donald R. and Paul W. Adams, **Wildland Watershed Management**, 2nd Edition, John Wiley & Sons: New York, 1992, pp 48.

Valente, Christina M. and William D. Valente. **Introduction to Environmental Law and Policy**. West Publishing Company: Minneapolis/St. Paul. 1995, pp. 268-69.

Ward, Andy D. and William J. Elliot, Eds. Environmental Hydrology, CRC, Lewis Publishers: Boca Raton. 1995, pp. 2.

Washington State Department of Ecology, "The Watershed Planning Act", www.ecy.wa.gov/watershed/background.html . 1/16/02

Washington State Department of Ecology. "Watershed Conditions: Links to online resources" List of subwiras with codes and names. www.ecy.wa.gov.programs/eap/wrias/index.html

Data

Cassidy, K. M., "Washington Gap Project Reptile and Amphibian Distribution, Version 5." Washington Cooperative Fish and Wildlife Research Unit, University of Washington. January 1, 1997.

www.wa.gov/wdfw/wlm/gap/herps.htm.

Cassidy, K. M., "Washington Gap Project 1991 Land Cover for Washington State, version 5." Washington Cooperative Fish and Wildlife Research Unit, University of Washington. January 1, 1997. www.wa.gov/wdfw/wlm/gap/landcov.htm

Dvornich, K. M., K. R. McAllister, and K. Aubry. "Washington Gap Project Reptile and Amphibian Distribution Models, Version 5." Washington Cooperative Fish and Wildlife Research Unit, University of Washington, 1997. www.wa.gov/wdfw/herps.htm .

Johnson, R. E. and K M. Cassidy. Washington Gap Project Mammal Distribution Models, Version 5." Washington Cooperative Fish and Wildlife Research Unit, University of Washington, 1997. www.wa.gov/wdfw/wlm/gap/mammals.htm.

Smith, M.R., P.W. Mattocks, Jr. and K.M. Cassidy. Washington Gap Project Breeding Bird Distribution Models, version 5." Washington Cooperative Fish and Wildlife Research Unit, University of Washington, 1997. www.wa.gov/wdfw/wlm/gap/birds.htm.

U.S. Fish & Wildlife Service, National Wetland Inventory, "National Wetland Inventory, Metadata", St. Petersburg FL. www.nrc.state.ne.us/databank/spat.html, (attribute data, geo references).

U.S. Geological Survey, 1:250,000 Land Use and Cover LULC Data, www.wagda.lib.washington.edu/data/lulc250k/.

U.S. Geological Survey, SAGE Project, Washington Ownership (WAOWN), 2001.

U. S. Forest Service, U.S. Department of Agriculture, Pacific Northwest Research Station. 2001 The Interior Columbia Basic Ecosystem Management Project: Project Data, Pacific Northwest Research Station, Portland.

Washington State Department of Transportation, county bundle data: hydrography, roads. www.wdot.wa.gov/mapsdata/geodatacatalog/default.htm .

Washington Department of Community Trade and Economic Development, map of Urban Growth Areas, UGA v1, June 2000.

Environmental Systems Research Institute, ArcView 3.2, Spatial Analyst and associated data, 1992-1999. ESRI, Redlands, CA.

Metro Area Geographic Information Consortium, Clark County Quarter Sections.

National Marine Fisheries Service, National Oceanic Atmospheric Administration and Bonneville Power Administration, Evolutionarily Significant Units, www.nwr.noaa.gov/1salmon/salmesa/mapswitc.htm .

Washington State Cadastral Framework, Public Land survey, Township, Range and Section themes, Washington State Department of Natural Resources, framework.dnr.state.wa.us retrieved from www.wagda.lib.washington.edu .

Washington State Department of Health, Water Resource Inventory Areas (WIRA), Water Resource Inventory Areas WIRA-sub, Cities 2000, ftp3.doh.wa.gov/geodata/layers .

Washington State Department of Ecology: Data Layers: SMA streams, SMA, www.ecy.wa.gov/services/gis/data/data.htm .

Washington State Department of Revenue, **A Comparison of County Assessor Statistics: 1999 County Comparison**, 2001.

Washington State Department of Revenue, **Property Tax Statistics 2001**, August 2001.

The NATIONAL ASSOCIATION OF REALTORS® National Center for Real Estate Research supports academic research which contributes to the expansion of understanding of real estate and the practical application of this research for real estate business, markets, policy and Realtors®.

Topics include, but are not limited to:

- Real estate brokerage
- Real estate brokerage business models
- Real estate markets
- Housing policy
- Housing markets
- Real estate wealth effect
- New economy / technology
- Cost and impact of regulation
- Land use controls
- Multifamily
- Retail
- Office
- Industrial
- Commercial property finance

For further information, contact Ellen Roche, Vice President of Research, NATIONAL ASSOCIATION OF REALTORS® at 202-383-1286, or via e-mail at eroche@realtors.org

NATIONAL ASSOCIATION
OF REALTORS®

The Voice For Real Estate®