Land - Valuation

Adapting the Agricultural Land Evaluation and Site Assessment (LESA) System in the Pacific Northwest

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Introduction

This publication is not intended to be a definitive explanation of the Soil Conservation Service's Land Evaluation and Site Assessment (LESA) system. Rather, it is a review of how various researchers, planners, and conservationists in Idaho, Oregon, and Washington are adapting the system to local situations. The Pacific Northwest is ecologically diverse, and there is great variety among the land-use statutes in the three states. As a result, LESA may be adapted in a number of ways.

LESA is not a panacea. Alone, it cannot resolve agricultural land retention issues. However, the system does offer a logical, straightforward, and flexible framework for evaluating a site's value for agriculture. The case studies in this report review both the strengths of the system and some of its pitfalls. We hope that by sharing this experience we can help others learn about the options LESA presents to local governments.

The LESA System

A new rating system has been proposed by the U.S. Soil Conservation Service (SCS) to evaluate land being considered for conversion from farmland to other uses. This type of system is needed because standard soil surveys do not provide enough information to meet current planning needs regarding issues of farmland conversion and farmland protection. Soil surveys do not provide information on such issues as parcel size or shape, access, conflicts, or costs of land improvements that affect the relative suitability of land parcels for agricultural use.

The new SCS system provides additional site-specific data for making such assessments. It is known as the agricultural land evaluation and site assessment (LESA) system. The system is designed to help planners rate the agricultural value of land and determine its relative suitability for agricultural or nonagricultural use. Social and economic factors and site attributes are considered by the LESA system in addition to the quality of the soil for farming.

Soil Survey Information: Uses and Limitations

The most established system for defining the ability of the land to support agricultural use is SCS's land capability classification (SCS, 1961). Land capability classes are very general ratings of soil limitations that affect agricultural use of soil without leading to serious deterioration of soil productivity over time. These classes are published in county soil surveys produced by the SCS.

Published soil surveys also include interpretations of soil survey information that suggest limitations for land use as sites for septic tanks, sewage lagoons, homesites, lawns, streets and parking lots, parks and play areas, campsites, and sanitary landfills. This information is being used more and more by planners, landscape architects, and civil engineers because it is one of the most comprehensive and standardized sources of information about our country's natural environment.

Several researchers have illustrated how soil survey information can be applied to planning and resource management (Bartelli and others, 1966; Lynch, 1971; McCormack, 1974; and Meyers and others, 1979). Miller (1978) noted that soil surveys are under pressure because of the limited information contained in them for urban land-use planning. According to Gordon and Gordon (1981), soil survey information was found to be accurate when determining the limitations of soils as sites for septic tanks but inconsistent for homesites and roads. "This implies that the planners must use these published ratings with extreme caution in making environmental and land-use planning decisions and that consultation with state and local soil experts should be sought" (p. 301). These limitations arise in part because soil variability deemed of limited importance to agricultural use, and which often cannot be shown at the scale of routine soil mapping by the SCS, can be of great importance to urban or similar land uses.

To assist planners and resource managers, SCS has developed other systems of land classification. One such effort is the Important Farmlands Mapping Program. This system identifies two major categories of farmland having national importance— prime lands and unique lands, both categories having national criteria. The system also identifies two other categories—farmlands of statewide importance and farmlands of local importance, with criteria established on the state and local levels (Dideriksen, 1984).

The Important Farmlands Mapping Program, coupled with the National Agricultural Lands Study (1981) which documented substantial loss in the nation's cropland base, presents new problems for both planners and soil scientists. For instance, in Dekalb County, Illinois, 97 percent of the land is classified as prime farmland. Obviously, not all of this land can be preempted for agricultural use, since there are also demands for other uses. On the other hand, only 2.8 percent of the land in Whitman County, Washington, is in the prime category. Most of the land there is excluded from the prime category because of steep slopes and high erosion potential; however, Whitman County is the most productive wheat county in the nation, and most of the land in the county is under cultivation.

In 1981, Lloyd E. Wright of the SCS Land Use Division in Washington, D.C., was assigned responsibility for the design of a new system to weigh the agricultural suitability of land against demands for other uses (Wright, 1981; Wright and others, 1982, 1983; Dunford and others, 1983; and Steiner and others, 1984). While various types of agricultural ratings had been developed and used (Rogers, 1980; Tulare County, 1975; and Rathburn, 1977), SCS had not formally designed or tested such a system. During 1981-83, planners and soil scientists from twelve counties in six states tested the proposed LESA model.

The system consists of two phases: (1) agricultural land evaluation (LE), and (2) agricultural site assessment (SA). Together the LE and SA are known as the agricultural land evaluation and site assessment (LESA) system. The pilot counties were in Florida, Illinois, Maryland, Pennsylvania, Virginia, and Washington. SCS has expanded the pilot program to include counties in all 50 states. In addition, LESA is being used by USDA to evaluate impacts of proposed federal projects on farmlands as required by the 1981 Farmlands Protection Act.

Land Evaluation (LE)

Agricultural land evaluation (LE) is a process of rating soils of a given area and placing them into priority groups, ranging from the best suited to the poorest suited for a specific agricultural use. A value is determined for each group, with the best group being assigned a value of 100 and all other groups assigned a lower relative value. LE is based on National Cooperative Soil Surveys (U.S. Department of Agriculture, 1983).

Land evaluation encompasses four rating systems: land capability classification, important farmlands classification, soil productivity, and soil potential. SCS recommends that one of the last two ratings (preferably soil potential) be used in conjunction with the first two ratings. The land-use division of SCS has published the method to combine these systems in the *National Agricultural Land Evaluation and Site Assessment Handbook* (U.S. Department of Agriculture, 1983). Federal agencies use this handbook for LESA evaluations. A local LESA system may be used by federal officials if it has been approved by SCS. In the LESA handbook the four systems are summarized:

Land Capability Classification identifies for local planners degrees of agricultural limitations that are inherent in the soils of a given area. It enables state and regional planners to use the system for planning and program implementation at regional and state levels.

Soil Productivity relates the LE score to the local agricultural industry based on productivity of the soils for a specified indicator crop. The use of both soil productivity and land capability classification should provide some indicators as to relative net income expected from each category of soils.

Soil Potentials for specified indicator crops are preferred in place of soil productivity in the LE system. Development of soil potential ratings produces classes of soils based on a standard of performance, recognition of the costs of overcoming soil limitations, plus the cost of continuing limitations if any exist. These classes enable planners at the local level to relate to the local agricultural industry.

Important Farmland Classification enables planners to relate to national efforts to protect prime and other important farmland. It enables planners to identify prime and other important farmlands at the local level. Use of the national criteria for definition of prime farmland provides a consistent basis for comparison of local farmland with farmland in other areas.

Site Assessment (SA)

Although the LE value is a good indication of the relative quality of a soil for a particular agricultural use, it does not take into account the effect of location, distance to market, adjacent land uses, zoning, and other considerations which determine land suitability. In other words, relative soil quality is only one of the many site attributes which may be considered by planners and land-use decision-makers. Consequently, SCS has incorporated the site assessment (SA) system to account for some of these other attributes.

The attributes that are included in the SA system come from seven groups: agricultural land use; agricultural viability factors; land-use regulations and tax concessions; alternatives to proposed use; impact of proposed use; compatibility with comprehensive development plans; and urban infrastructure.

The following factors have been identified in the LESA handbook for use in site assessment procedures. Any of the factors in the list may or may not be needed or used in the design of any local LESA system. Local communities may identify other factors.

Agricultural Land Use:
- —Percentage of area in agricultural use within 1 mile
- —Percentage of site farmed in 2 of the last 10 years
- —Land use adjacent to site

Agricultural Viability Factors:
- —Size of farm
- —Agricultural support system (infrastructure)
- —Land ownership
- —Onsite investments (barns, storage, conservation measures, etc.)
- —Impacts of this conversion on retention of other farmland and the agricultural infrastructure
- —Conservation plan

Land-Use Regulations and Tax Concessions:
- —Zoning for site
- —Zoning for area around site
- —Use of agricultural value assessment or other tax benefits
- —Agricultural districts or right-to-farm legislation

Alternatives to Proposed Use:
- —Unique siting needs for proposed use
- —Suitability of site for proposed use
- —Availability of less productive lands with similar attributes for proposed use
- —Number of undeveloped and suitable alternative sites

Impact of Proposed Use:
- —Compatibility of proposed use with existing land use
- —Impact on flooding
- —Impact on wetlands
- —Impact on historical areas
- —Impact on recreation and open spaces
- —Impact on cultural features
- —Impact on unique vegetation

Compatibility with Comprehensive Development Plans:
- —Local
- —Regional
- —Economic/social importance of proposed use to the community

Urban Infrastructure:
- —Distance to urban area
- —Central water distribution system (within *x* miles)
- —Central sanitary sewage system (within *x* miles)
- —Investment for urban development
- —Transportation
- —Distance to job centers, schools, shopping, etc.
- —Emergency services

Combining the LE and SA Systems

Although the LE and SA systems can be used separately, the land evaluation rating combined with the site assessment rating gives the best indication of agricultural viability for land-use planning purposes. Table 1 shows one method being considered to combine these systems. For each site, the acreage of each soil unit is multiplied by its relative value. These products are summed over all soil units, and the sum is divided by the total acreage of the site to get an average LE rating. The SA score is then doubled (giving it more importance in the combined system) and added to the average LE rating. In the counties where attribute scores are weighted, the weights are adjusted so that the maximum SA score is 200. The average LE rating is then added to the SA score. In either case, there is a maximum combined rating of 300. The LESA handbook recommends such a 2:1 weighting.

Table 1 presents a hypothetical example of land-use site evaluation combining the LE and SA systems. This approach is being tested in one county in Washington State.

In this example, a larger LESA score results for Site 1, indicating that it is more suitable for agricultural use than Site 2. Thus Site 2 would be favored for the mobile home development.

The LESA system can also be used to help decide whether a parcel should be converted to a nonfarm land use. Local decisionmakers would have to specify a cut-off LESA score. Parcels with a LESA score below the cut-off could be considered for conversion.

Table 1. Hypothetical example combining LE and SA systems for land-use site evaluation.

Proposed Land Use: Mobile Home Development

Site 1:	23 acres of Palouse silt loam, 7-25% slope with an LE of 87
	37 acres of Anders silt loam, 3-15% slope with an LE of 48
	SA score = 91
Site 2:	32 acres of Cheney silt loam, 0-7% slope with an LE of 80
	23 acres of Staley silt loam, 7-25% slope with an LE of 63
	SA score = 64

Suitability Evaluation:

Site 1:

LE rating: 23 x 87	=	2001		
37 x 48	=	1776		
Average LE rating	=	3777 ÷ (23 + 37)	=	63
Average LE rating	+	(2 x SA score)	=	LESA score
63	+	(2 x 91)	=	245

Site 2:

LE rating: 32 x 80	=	2560		
23 x 63	=	1449		
Average LE rating	=	4009 ÷ (32 + 23)	=	73
Average LE rating	+	(2 x SA score)	=	LESA score
73	+	(2 x 64)	=	201

Choice for Development: Site 2

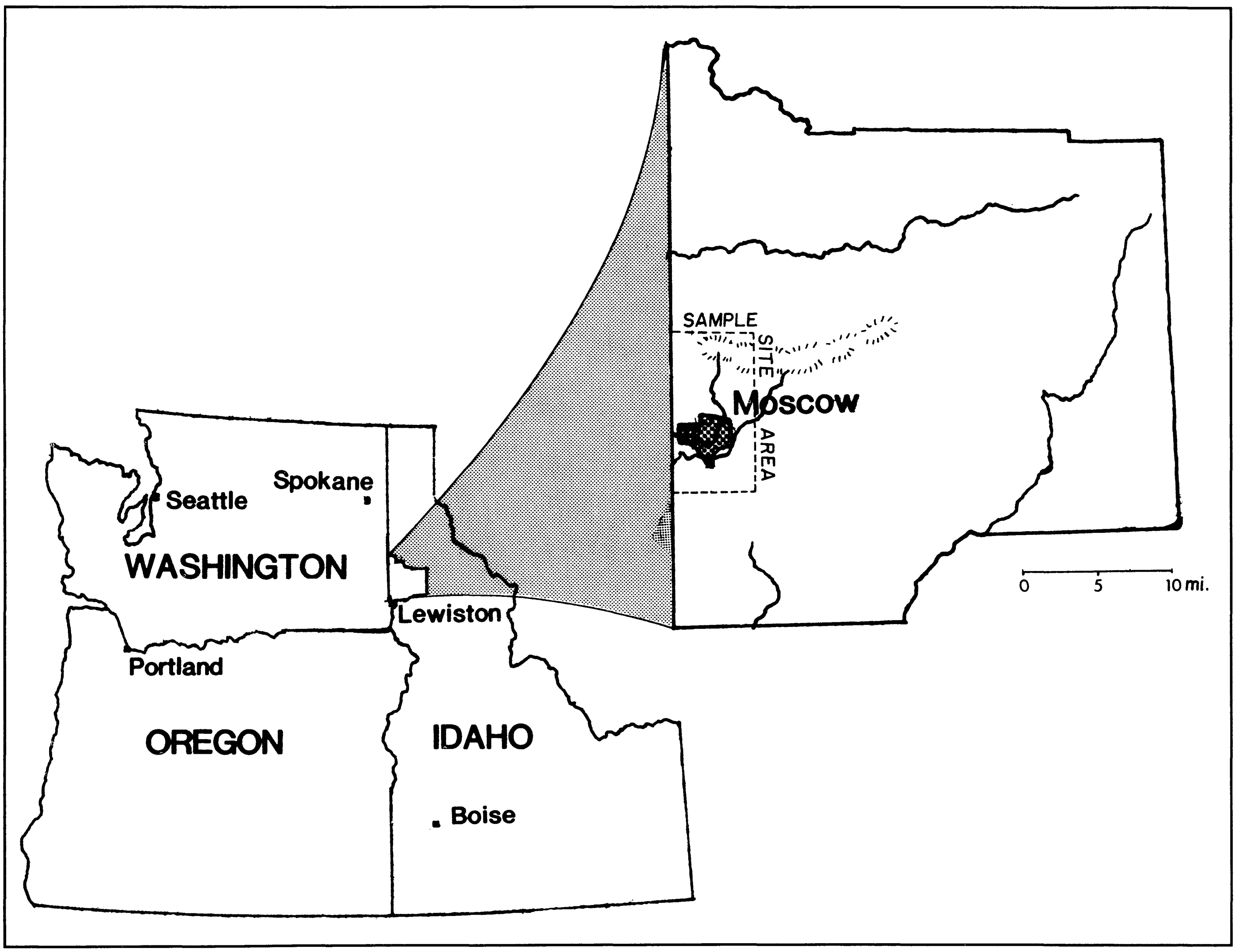

Figure 1. Regional location of Latah County, Idaho.

Latah County, Idaho

Located on the eastern fringe of the wheat-rich Palouse region of the Pacific Northwest (Figure 1), the 1064 square miles of terrain in Latah County vary from deep, fertile rolling hills of wheat and barley along the Idaho-Washington border, to upland plateaus and ridges of dry pea and lentil farming, to low mountain forests of ponderosa pine, grand fir, white pine, and cedar. Elevation ranges from 1,000 to 6,000 feet, with most of the farming on hills of loess at 2,500 to 3,000 feet, while some of the higher elevations and steep canyons are used for pasture or rangeland. According to the Soil Conservation Service, about 270,000 acres of the county are in crop or pasture land. Despite high yields, steep and erodible soils result in only 50,000 acres—about 7 percent of the county—classified as prime farmland.

The 29,000 residents of the county are supported by a diverse economy. Most reside in Moscow, home of the principal employer, the University of Idaho. But a large percentage of the residents are employed directly in the agriculture or forestry sectors of the local economy or indirectly in support industries. Annual growth rates are near a moderate 1.5 percent, but much of the new population has sought a rural lifestyle. This demand has resulted in pressure for conversion of farmlands to rural subdivisions within commuting distances of Moscow and other employment centers.

Latah County has responded to this need in a manner that may be unique to the state of Idaho. Relying upon policies of agriculture preservation and protection expressed in a recently revised comprehensive plan, the governing 3-member Board of County Commissioners adopted complementary zoning and subdivision ordinances that permit a limited number of nonfarm residences for each parcel in the rural area. For example, this sliding scale allows creation of two 1-acre lots from a 40-acre parcel, or four housing sites from a 600-acre farm. More extensive development requires rural-residential zoning, with decisions based on land-use suitability and compatibility. Strong comprehensive plan policies practically mandate that urban development shall be in or adjacent to existing cities and towns.

Some local officials saw the proposed LESA program as an unnecessary complication to a smoothly-functioning planning process where the market directed development onto less valuable nonfarmlands. Others considered LESA as a potentially useful tool for identifying the most farmable sites in the county as well as preferred residential development sites. Those of the latter opinion have prevailed thus far, but only by directing the LESA program toward a planned growth—rather than anti-growth—format. This concept is in line with local policies of assuring adequate areas for housing residents of all lifestyles, while still protecting farm and forestry land from scattered urbanization.

Idaho Land-Use Law

While Idaho land-use law mandates comprehensive planning and regulation through zoning and subdivision ordinances, the Local Planning Act of Idaho gives local governments flexibility in determining the content of their plans and the means by which they are implemented (*Idaho Code* (I.C.), Title 67, Chapter 65). An appointed planning commission is generally required to assist the governing body in developing a comprehensive plan and land-use ordinances in accordance with the adopted plan, and to review rezone requests, plan amendments, and other proposed developments. The Local Planning Act describes twelve elements which are to be addressed in a comprehensive plan, including land uses, natural resources, and special areas or sites (those significant for archaeological, ecological, scenic, or other reasons). Suitability of lands for agriculture and other uses is to be addressed as part of the land-use element of the plan.

One of the stated purposes of the act is "to encourage the protection of prime agricultural, forestry and mining lands for production of food, fiber, and minerals." Another is "to encourage urban and urban-type development within incorporated areas" (I.C. 67-6502). But no particular method of conserving such farmlands is recommended by the state. On the whole, the statute is principally procedure-oriented—not policy-oriented. It lays out the procedures of land-use planning. The determination of goals and methods by which they are to be achieved is left to local residents, planning commissions, and county commissioners or city councils.

Uniform and fair application of zoning and other regulations is required both by statute and the courts of Idaho. The requirements that decisions be made on the basis of adopted findings of fact (required by Idaho statutes) favors a system such as LESA where the method of rating a site's suitability for a particular use is well defined in advance of a zone-change request.

The Idaho state legislature has adopted specific statues manifesting an unwritten state policy that agriculture be protected both from private and public interference. The Local Planning Act provides that county commissioners shall not deprive "any owner of full and complete use of agricultural land for production of any agricultural product" (I.C. 67-6529). "Agricultural land" may be defined locally. Farm buildings on 5 acres or more are exempt from state and local building codes (I.C. 39-4103(4)). The Right to Farm Act protects farmers from nuisance suits arising from continuing agricultural practices (I.C., Title 22, Ch. 45). Within this context, the Latah County Planning Commission debated whether and how best to use LESA.

Planning officials in Latah County, Idaho, approached the new LESA system with caution and some skepticism. A few years ago, the county had attempted to develop a similar system of ranking farmlands as part of their agriculture protection efforts. This attempt was aborted when the proposed regulatory scheme (a zone with a 40-acre minimum lot size) failed to win acceptance. Those officials and planning staff members who were not deterred by this experience with numeric systems were concerned that LESA could not be fair and practical in a jurisdiction as diverse as Latah County.

The Decision to Proceed with LESA

The commission's decision to proceed with LESA was based upon five principal considerations:

1. minimal out-of-pocket costs and staff time required;
2. minimal local commitment—the opportunity to withdraw from the project at a later date if it appeared to be of no value to local planning efforts;
3. local control—the opportunity for a local committee to guide the project was very important given some local distrust of anything resembling federal land-use planning;
4. the process of developing a LESA-type formula would be a good opportunity to reassess planning policies; and
5. the assistance of SCS personnel would not be available indefinitely, given shifting priorities within the agency and federal administration.

Instead of creating a new committee, the Latah County Board of Commissioners assigned the task of developing the system to the Planning and Zoning Commission. The commission acted as an advisory committee to SCS personnel in developing the land evaluation (LE) portion of the system and was principally responsible for developing the site assessment (SA) methods with the assistance of the county planning office. The commission was chosen because of its experience with local planning issues and agriculture preservation methods, diverse membership representing most sectors of the community, and because it would ultimately be responsible for deciding how to implement the results of the LESA project. Technical assistance was available through the University of Idaho, county Extension, and other local agencies.

Early meetings of the commission centered on the project purpose and objectives. Some members questioned whether it would yield any practical information not already available in other forms or known intuitively by people familiar with farming in the county. Other members argued that it could provide a more clearly defined and fairer basis for decisions. The latter viewpoint ultimately prevailed—with a promise that the final product would be critically analyzed before LESA became a formal part of Latah County planning.

Initially the commission determined that the land evaluation and site assessment portions of the project could be developed concurrently. Once the general direction of the project was determined, the members emphasized developing a system which would be useful and applicable within the context of the existing county planning process. The planning staff was assigned data acquistion and analysis while the commission retained public policy functions, such as weighting each factor as very important to unimportant.

Site-Specific Review of LESA

Land Evaluation (LE). Following a formal request for assistance from the Board of County Commissioners, the local Soil Conservation Service office assumed responsibility for a relative evaluation of county soils. This land evaluation will be used in conjunction with the planning commission-developed site assessment factors. The SCS evaluation categorized land into forestland, rangeland, or cropland; collected local soils into ten relative agricultural groups; determined the relative value of each soil group; and calculated adjusted yield figures.

Most soils investigated in Latah County were categorized as cropland, including some forest soils with timber still in place. Seventy-eight percent of all the soil survey area in the county was placed in cropland. The survey covers approximately 70 percent of the county, the remainder being primarily in national forest.

Since many cropland acres are on forest soils, all forest soils suitable for farming were included. It was considered too time-consuming to separate out the acres presently in forest, as this could be taken into account during the site assessment portion of LESA. Since the total acreage of these soils is fixed and the amount of cropland is not, it was thought that the total acres would be a better representation of each soil type's agricultural value. It was assumed evaluations would eventually be made of forestland and rangeland.

Soils in Latah County have been surveyed at least three times in the past 70 years and have been classified under the U.S. Department of Agriculture land capability classification system. Additionally, "prime" farmland and "lands of statewide importance" have been identified. While the SCS had traditionally been concerned with classification systems based on a physical description of the soil, there was interest in management implications. For example, in the recent past the SCS in Latah County had emphasized soil erodibility rather than soil productivity. By using the LESA criteria for dividing soils into relative agricultural groups, accurate divisions for conservation planning were created.

Winter wheat was chosen as the indicator crop in Latah County since it is the major cash crop and is grown on a wider range of soils than any other crop in the county. Additionally, because of its ubiquity and a history of cultivation, data for winter wheat was easily available and highly reliable. After consultation with the planning commission, several soil types were included in the LESA classification system on which winter wheat could not be grown. This problem was corrected by creating a yield scale based upon hay with a later adjustment to winter wheat yield figures for ease in comparison. Data was available from the U.S. Department of Agriculture computerized database in Ames, Iowa, through the state SCS office. Because of problems associated with distinguishing between wheat and winter wheat yields, it was necessary to compile the productivity index by hand from the soil survey. This step required 1 day for the local SCS staff.

Calculation of adjusted yield numbers for Latah County based upon winter wheat required a careful evaluation of existing data by SCS personnel. Figures were available for relative yield rankings, but were poor for actual yield values. Typically, only a single yield figure was given for each soil type and had not been corrected for environmental gradients such as rainfall or temperature. Fortunately, concurrent with the LESA evaluation in Latah County, the Idaho state SCS office had organized a 4-county yield correlation conference. Representatives from Benewah, Whitman, Latah, and Kootenai Counties (north and west of Latah County) met to compare and revise official yield estimates. The resulting yields used for Latah County are those considered valid, sustainable, and profit-maximizing under a "high" management regime. The most productive group of soils was rated at 83.4 bushels per acre.

Soil group information and the resulting relative values (land evaluation scores) are summarized in Table 2. Note that the ten groups are far from uniform in area or score distribution. This clustering resulted from an emphasis upon grouping soils with similar characteristics. Despite this clustering, planners in Latah County feel that the resulting groups and their relative values will provide a reliable and useful representation of relative soil productivity. As a second check on this data, a map of these groups was prepared and presented to local farmers, who generally agreed that it approximated the relative productivity of sites they were familiar with.

The SCS staff in Latah County feels that the final LESA handbook is clear and useful. (Only draft copies were

Table 2. Land evaluation for Latah County, Idaho.

Ag Group	Capability Class	Farmland Importance	Productivity Index	Percent of Ag Soils	Thousands of Acres	LE Score
1	IIe	Prime	100-82	2.8	13	100
2	IIIe,IIIw	Prime	82-71	5.4	25	82
3	IIIe	Statewide	82-71	21.3	102	76
4	IIIe,IIIw,IVe	Other	71-65	8.8	42	62
5	IIIe,IVe	Statewide	65-47	8.8	42	52
6	IVe,IVw	Other	71-47	16.3	9	49
7	IVe	Other	53-47	2.0	9	43
8	IIIw,IIIe,IVe	Statewide	39-25*	4.0	19	38
9	IVe,VIe	Other	39-25*	7.8	37	36
10	VII	Other	No Crop	22.8	107	0

* = Index based on hayland.

available when this project began.) Some minor streamlining of the worksheets would be desirable. The system lends itself readily to periodic updating which could be easily adapted to a microcomputer spreadsheet format. Overall, this project required 4 days of two soil conservationists' time, plus attendance at a half-dozen evening meetings of the county planning commission.

Site Assessment (SA). While the SCS staff was preparing the land evaluation scores based upon physical properties of the soils, the planning commission went about the task of developing the site assessment portion of the system incorporating those nonsoil factors which determine the suitability of a site for agricultural use. When presented with a list of 24 possible factors (the handbook recommends using 10 factors or fewer) the commissioners had to make a few basic decisions: One, what is meant by an agricultural use? Two, should the potential of a site for conversion to other uses be a factor? Three, should the system be designed to identify the most viable agricultural sites with a long- or short-term perspective? The commission chose to concentrate on the heavily mechanized, agrichemical grain production common to the rolling Palouse hills and to emphasize a long-term perspective. Grain production, although not the sole type of farming in the county, was used as a standard because of its economic importance and sensitivity to residential development. Unique agricultural uses of land such as orchards may be addressed separately through a new comprehensive plan policy.

After addressing the importance of potential conversion of a site to other uses, the commission broke from the recommended format. Instead of one index rating agricultural viability, Latah County officials felt that five indexes rating agricultural, forestry, range, urban, and rural residential development would yield more useful information. This design will permit the commission to compare scores for existing and proposed land uses for a particular parcel instead of incorporating the latter into the first score. The decision to use this alternative system was not arrived at lightly. Given the very different needs and conflicts associated with rural and urban densities, the commission found it very difficult to incorporate both the potential for urban and the potential for rural residential development into one agricultural viability index. Many commissioners also felt that a system with multiple indexes would yield more meaningful final scores, since it would be clearer why a site scored as it did. (For example, with only one score it would not be clear whether a low score resulted from poor soils or from a high suitability for housing.) The ecological, social, and economic diversity of Latah County meant that it would be necessary to develop forestry and rangeland, as well as agricultural, indexes. Establishing two more indexes for developed land uses followed naturally from this design.

In a county where land-use planning is still viewed with suspicion, some commissioners also expressed a concern that one agriculture-oriented index would be viewed as anti-development by certain sectors of the community. These individuals felt that a system designed to also identify the areas most suitable for development would be more in line

Table 3. LESA agricultural index for Latah County, Idaho.

Category	Description and Scoring
SOILS	Relative score based on winter wheat productivity of soils, with operating costs adjustments. Weighted score if more than one soil present on site. (Range 0 - 100 points.) See Table 2—Land Evaluation Score; 65 soils in 10 groups.
COMPATIBILITY	Sum of three lowest (of four) adjacent land-use compatibility scores; plus vicinity land use score based on housing units within 1/4-mile. (Range 0 - 15 points.)

Land Use	*Score*	*Vicinity Housing*	*Score*
Ag/Forest/Range	3	0 or 1	6
Commercial/Industrial/Recreation	2	2 - 5	4
Rural Residential	1	6-10	0
Urban Residential	0	More than 10	2

Category	Description and Scoring
OPERABILITY	Sum of "natural" field size, field access, and field shape scores. (Range 0 - 15 points.)

Field Size	*Score*	*Field Access*	*Score*	*Field Shape*	*Score*
> 40 ac.	5	Adequate	5	No Restriction	5
10 - 40 ac.	2	Via Arterial	3	Length:Width > 8:1	3
< 10 ac.	0	Restricted	2	Avg. Width < 100 ft.	2
		None Existing	0	Severe Inefficiency	0

Category	Description and Scoring
AG INVESTMENT	Score based on present permanent improvements on site for ag use; such as buildings, irrigation, drainage, and flood control systems. One point for each $10,000 of assessed value with maximum of 10 points.
ENVIRONMENTAL SENSITIVITY	Sum of scores for erosion potential and wildlife habitat factors. (Maximum score of 10 points.)

Erosion Potential (SCS rating)	*Score*	*Wildlife Habitat*	*Score*
None or Slight	9	Big Game Winter Feeding Ground	5
Moderate	6	Game Bird Primary Habitat	5
High	3		
Very High	0		

Category	Description and Scoring
LESA AG SCORE	Sum of above 5 categories—Range of scores 0 - 150 points. (Sites currently in urban uses receive a score of 0.)

with local policies of responding positively to growth pressures.

Having decided to use this multiple-index variation of the LESA system, Latah County officials proceeded with developing the agricultural index. (The county is now in the process of refining the agricultural and rural residential indexes, while laying the foundation for the forestry index.) Characteristics relating to the suitability of a site for other uses were dismissed as being properly addressed in other indexes. Other possible factors were eliminated because of a lack of reliable information (for example, aquifer recharge areas are undefined); possibilities of double counting (rainfall is also reflected in soils productivity data); lack of variation within the county (such as in the commercial agriculture support system); or because local officials viewed the factor as insignificant. Eventually, the list of factors determining the agricultural suitability of a site was narrowed to eight (see Table 4). Existing urban development completely eliminated some parcels from consideration.

These eight factors fell naturally into five categories.

—*Operability:* How easily can a site be farmed?

—*Compatibility:* Is farming compatible with neighboring land uses or is there a potential for conflict?

—*Agricultural Investment:* What existing capital improvements for farming are on the site?

—*Environmental Factors:* What benefit or harm to the environment may result from continued farming of the site?

—*Soil Productivity:* What is the SCS land evaluation score based on soil characteristics?

The factors aligned under these five categories were weighted to reflect the importance assigned to each by local farmers.

As defined by Latah County's LESA agricultural index, operability is based upon factors such as "natural" field size, shape, and access to the site. "Natural" fields are those created by soils, topography, and permanent obstacles—not fences or property boundaries. Compatibility is a combination of two factors: adjacent or neighboring land uses, and number of housing units within 1/4-mile. The agricultural investment score for a site is determined from the present value of any permanent improvements for farming such as buildings, irrigation, or drainage systems. Environmental scoring is based upon erosion and associated damage to streams and road drainages, and other factors such as wildlife habitat damage or loss.

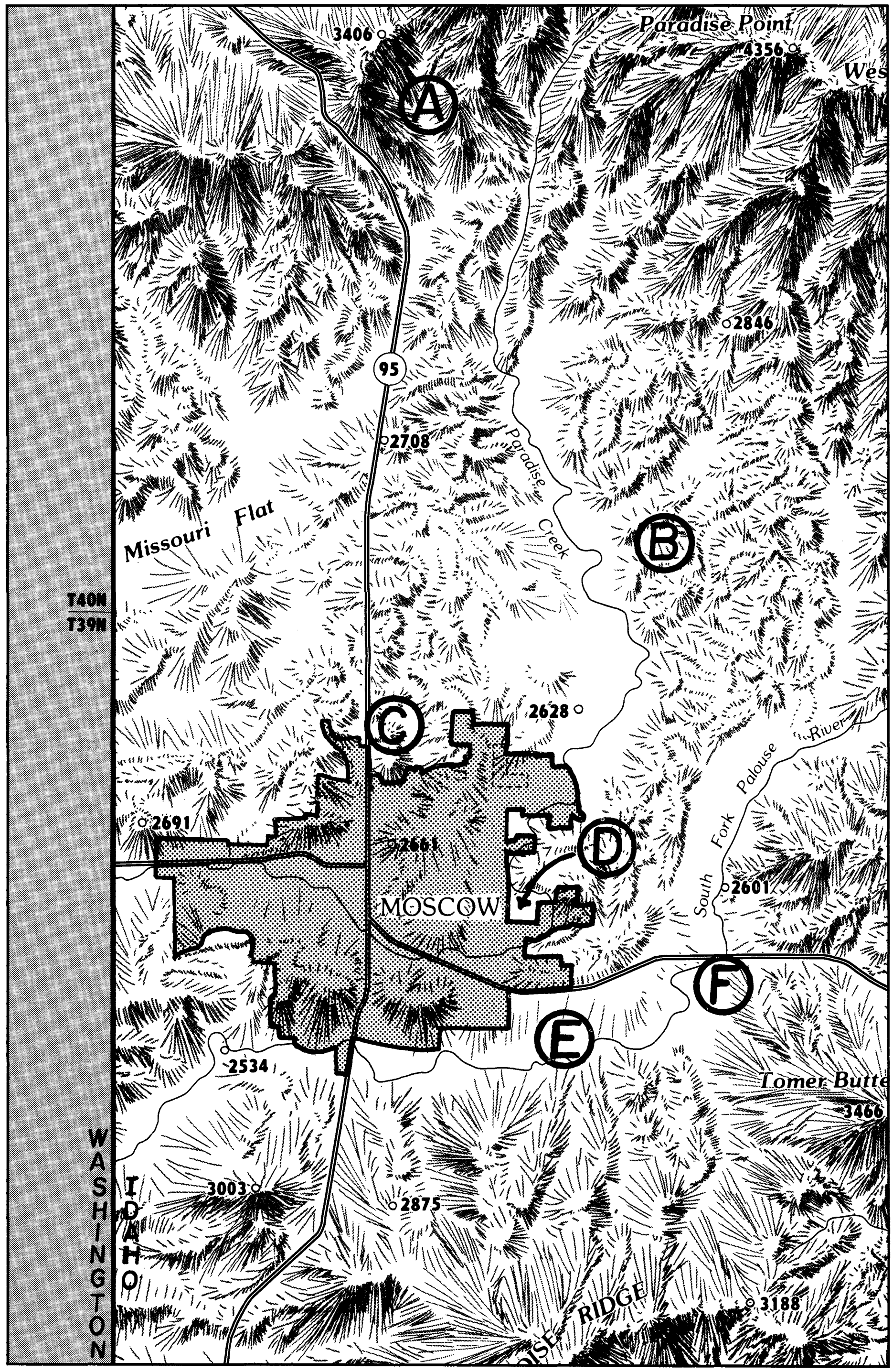

Figure 2. Sample site locations, Latah County, Idaho. Site A: high ridge near rural subdivision; Site B: remote foothills farmland; Site C: Palouse hill on development fringe; Site D: prime farmland adjacent to city; Site E: prime farmland outside developing area; Site F: prime farmland near scattered development. Scale: ⅝" = mile.

Table 4. Sample site characteristics, Latah County, Idaho.

Site	Soil Group	Adjacent Uses* (# Sides)	Vicinity Housing (# Units)	Size (Acres)	Shape	Access	Ag. Invest. ($)	Erosion Potential
A	9	Ag-(3) RR-(1)	12	30	Good	Good	0	High
B	(1/3)-3 (2/3)-5	Ag-(4)	0	40	Good	Good	0	Mod/High
C	3	Ag-(1) RR-(2) UR-(1)	25	40	Good	Highway	0	High
D	2	UR-(2) Ag-(2)	50	30	Good	Arterial	5,000	Slight
E	1	Ag-(4)	1	40	Good	Good	0	Mod/Slt
F	(1/2)-1 (1/2)-3	Ag-(3) RR-(1)	6	40	Good	Good	0	Moderate

*Ag = Agriculture; RR = Rural Residential; UR = Urban Residential.

Table 5. LESA scores for sample sites, Latah County, Idaho.

	Land Evaluation	Site Assessment					
Site	Relative Soil Productivity	Compat. Adj. + Vic.	Oper.	Ag. Inv.	Env. Sens.	Subtotal	Total LESA Score
A	36	7 + 0	12	0	4	23	59
B	60	9 + 6	15	0	5	35	95
C	76	2 + 0	13	0	4	19	95
D	82	3 + 0	10	5	10	28	110
E	100	9 + 6	15	0	9	39	139
F	88	7 + 2	15	0	7	31	119

Combining the LE and SA Systems. A simplified version of Latah County's LESA agricultural suitability index appears in Table 3. The system actually being proposed for Latah County is more complex and is still being refined. Higher scores indicate sites more suitable for agricultural uses, especially mechanized grain production. For purposes of this system, a "site" is usually 10 acres or a quarter/quarter/quarter section. (Sites substantially covered by urban uses—single-family residential, commercial, or industrial—automatically receive a score of 0.)

Six sample sites and their characteristics are displayed in Table 4 (see Figure 2 for their locations). These sites range from marginal soils on the lower slopes of the mountains to prime farmlands on the perimeter of the city of Moscow.

Latah County did not adopt the 2:1 weighting ratio between site assessment and land evaluation as used by many counties. Instead, a ratio of 1:2 was used. Giving greater weight to the soil productivity of a site was based on the fact that the extreme local variability in soils makes the soil an uncommonly important consideration. Also, the LESA handbook assumes that development potential will be incorporated in this site assessment and not into another index as is intended in Latah County. This decision to bias the scoring system toward soils was summed up by one farmer/commissioner: "If it will produce 80 bushels, the owner will find some way to farm it."

Table 5 illustrates this attitude. The final scores result in a ranking of the site identical to that which would result from a ranking based on soil productivity alone. However, a comparison of sites B and C shows that a site with poor soils and good location may achieve an agricultural suitability score as high as that for a site with good soils but a poor location. However, a site with the most productive soil (E) would nearly always achieve a higher score. This result is consistent with local policies of preserving and protecting this regionally rare natural resource.

Scoring System Refinement. Latah County has now started the difficult stage of refining a LESA agricultural suitability rating system. Developing a formula for ranking various sites has consumed nearly a dozen hours of commission meeting time, more than a hundred hours of planning staff time, and a comparable period of SCS staff time; but most of that effort will have been wasted unless the system is refined to truly reflect local goals and policies. Refining the scoring system involves adjusting numeric weights to ensure that each variable has the true weight intended. The LESA handbook provides little guidance for this process; however, officials in other parts of the country are tackling this problem (Sizemore, 1983). Latah County is using random sampling techniques to determine the statistical distribution of each site characteristic in the formula and to identify the effect of factor variations on the final scores. Unless test sampling is done, one highly variable factor could swamp the more uniform factors, yielding a system dependent upon that factor.

Latah County's formula is being tested on real parcels to determine if the LESA rating of a parcel approximates the commission's intuitive rating. If it does, then the planning staff will be able to rate parcels independently to identify sites more or less suitable for farming.

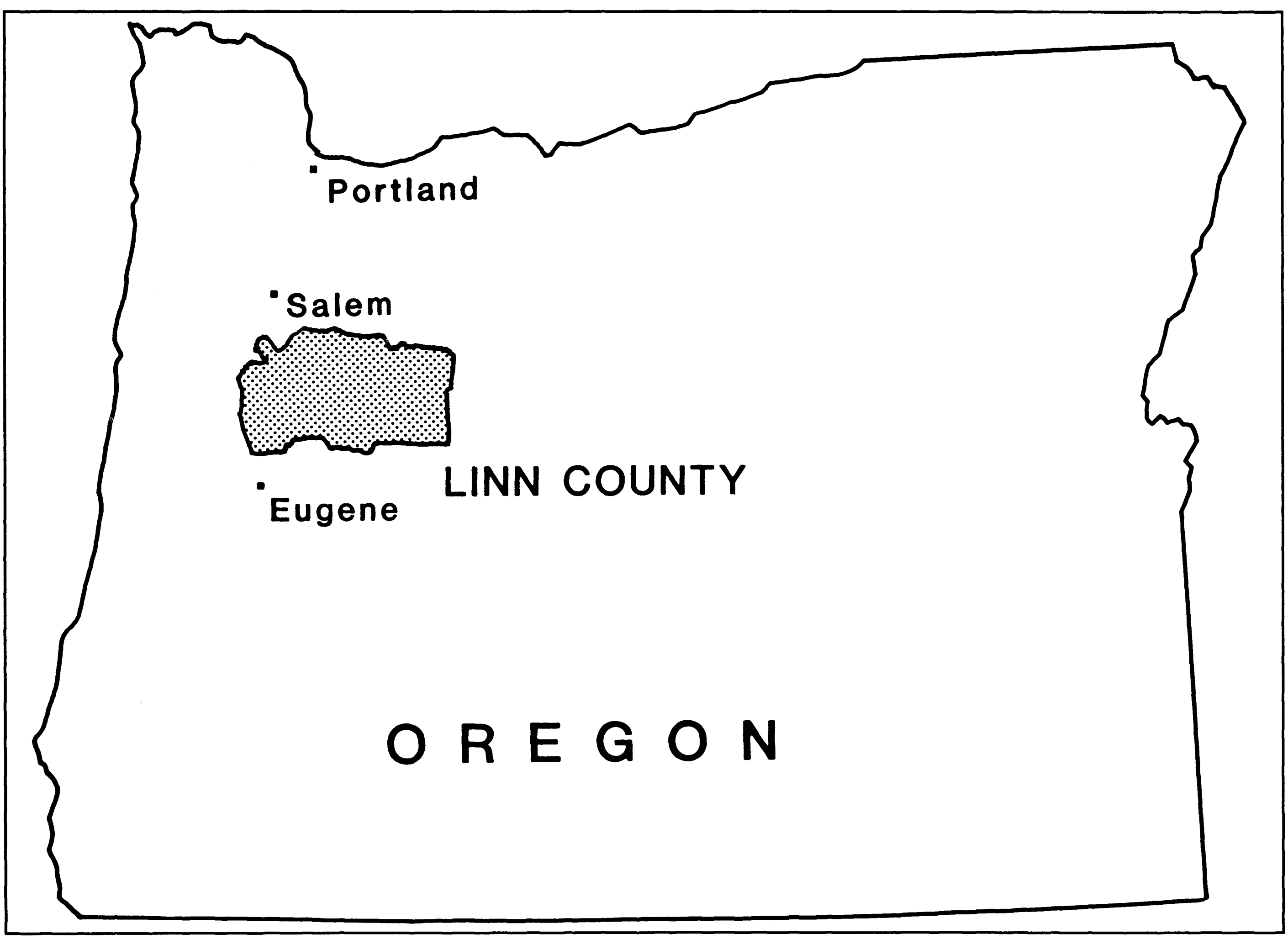

Figure 3. Location of Linn County, Oregon.

Linn County, Oregon

Linn County is located in the Willamette Valley of western Oregon (Figure 3). It stretches from the crest of the Cascade Mountains westward to the Willamette River. The western third of the county is predominantly agricultural land on nearly level river bottoms and terraces. The eastern half of the county is predominantly forest land on steep mountain slopes. Between these two regions is a transitional zone of rolling foothills, which are used for both agriculture and forestry.

Oregon Land-Use Law

Application of the LESA model in Oregon requires consideration of the statewide legal structure for agricultural land-use decisions. This legal structure consists of two interrelated parts: statutes outlining permitted uses and other conditions of exclusive farm use (EFU) zones, and Statewide Planning Goal 3, the agricultural goal (LCDC, 1975). Goal 3 is one of nineteen land-use goals under the statutory authority of the Land Conservation and Development Commission (LCDC).

The relevant laws were enacted in 1973 and are identified as Senate Bill (SB) 100, the state planning act (codified as *Oregon Revised Statutes* (ORS) 197); and SB 101 (ORS 215.203)), the tax deferral act. Among its provisions, SB 100 directs LCDC to prepare, adopt, and administer statewide land-use planning goals on a number of planning issues, including agricultural lands.

LCDC adopted Goal 3 in 1975. Goal 3 requires counties to inventory agricultural lands using the SCS land capability class system (SCS, 1961). Except for lands already committed to urban or rural nonfarm uses, all land within capability classes I-IV in western Oregon and classes I-VI in eastern Oregon shall be designated "agricultural land" in the comprehensive plan.

The county must then zone the agricultural lands for exclusive farm use (EFU) in accordance with the provisions of SB 101 (ORS 215.203). The law specifies the type of uses permitted outright and the type of uses permitted only after a public hearing, as well as conditions for granting approval of land divisions. To provide some zoning flexibility for farmers, a nonproductive parcel of land may be sold for nonfarm residential use, but only after a public hearing and findings that the proposed nonfarm dwelling: 1) will not interfere with agricultural operations; 2) will not alter the stability of the overall land-use pattern of the area; 3) is situated on land unsuitable for the production of crops or livestock, considering physical conditions, parcel size, and location; and 4) the dwelling is compatible with farm uses.

Farm-related dwellings and/or proposed divisions of land within EFU zones must meet a separate test. This test is based on a commercial agricultural criterion stated in Goal 3: "...such minimum lot sizes as are utilized for any farm zones shall be appropriate for the continuation of the existing commercial agricultural enterprise within the area" (LCDC, 1975). This general criterion has been interpreted in an administrative rule by LCDC as follows:

> *A commercial agricultural operation is one which will:*
>
> 1. *Contribute in a substantial way to the area's existing agricultural economy; and*
> 2. *Help maintain agricultural processors and established farm markets. Therefore, when determining whether a farm is part of the commercial agricultural enterprise, one should consider not only what is produced, but how much and how it is marketed (LCDC OAR, 660-050-000, 1982).*

Other uses, such as gravel excavations and golf courses, are permitted within the EFU zones. These other uses may come under the purview of a LESA review, but the majority of cases involve land divisions and/or residential building permits.

This legal framework for agricultural lands establishes certain prerequisites for a LESA model. For example, the emphasis on commercial agriculture in the state land-use standards must be reflected in the LESA criteria. The compatibility of a proposed residential use with the existing land-use pattern must also be evaluated in accordance with the statutory provisions previously noted.

The LESA model has several potential applications within the Oregon land-use program. It can be used as an evaluation tool to review applications for nonfarm dwellings and/or land divisions within the EFU zones. It can be used to review applications for other uses permitted within the EFU zones. Although it is unlikely that an Oregon county will adopt an ordinance requiring the use of a LESA model to provide binding, quantitative findings, it does provide a systematic process for evaluating soil quality and other important criteria. In Oregon, land-use decisions must be documented by written findings which link the facts of the case to established policies and standards. In this sense, LESA becomes part of the information base for a decision. If a decision is appealed, the LESA evaluation will provide a focus for the appeal.

The land evaluation (LE) part of LESA may also provide an alternative to the SCS land capability classification system now used to identify and designate lands suitable for agriculture. LESA provides a direct evaluation of soil potential for crop production, instead of susceptibility to damage as does the capability system. When the data are available for each county, this approach will provide a marked improvement over the land capability system now used for inventorying agricultural land.

In 1983, the Oregon Legislature adopted a marginal lands bill (SB 237), to provide flexibility for small farm development on marginal lands. Marginal lands are defined in the bill on the basis of land capability classes, parcel size, and gross farm income. Another bill, House Bill (HB) 2965, directs the 1985 legislature to consider the LESA model as an alternative to SB 237. With experience gained over the next 2 years, we will be in a position to make recommendations on statewide application of the model.

Linn County LESA Model

Overview. The LESA handbook (USDA, 1983) contains suggested procedures and criteria for developing a LESA model. As we developed and tested our model, we made several departures from the guidelines given in the handbook. The handbook proposes an allocation of 100 points for soil quality (LE) and 200 points for site quality (SA). We have chosen to retain the 300 point total; however, extensive discussions and field testing made it clear that in Linn County, soil quality had to receive more emphasis. Thus, we weight soils and site equally, allocating 150 points each to LE and SA.

We have also used a different approach to determine the agricultural quality of Linn County's soil resources for land evaluation (LE). First, we chose to develop ratings of overall soil potential for agriculture rather than to manipulate existing ratings of productivity, capability, and prime farmland. Second, we chose to calculate an agricultural soil potential rating for each individual mapping unit of agricultural soil in the Linn County soil survey, rather than to create 8 or 10 agricultural groups for the soils. In this way, calculation of the LE score for any given parcel requires nothing more than a determination of the number of acres of each soil in the parcel, from which a weighted average rating for the entire parcel can be calculated. This weighted average rating provides a number between 0 and 150 that accurately characterizes the parcel's soil quality for agriculture.

As we developed and tested the site assessment (SA) part of the model, we determined that two criteria can accurately measure agricultural value: extent of conflicting land use, and parcel size. Other agricultural criteria, while adding to the model's complexity, do not change the relative value or point total to any great extent. For clarity and simplicity, we omitted factors that pertain to site quality for development value, such as suitability for septic fields or development hazards. We suggest that these factors confuse the agricultural rating and should be measured in a separate model.

Our criteria for assigning points are spelled out clearly and referenced to a data table or data sources. Thus, any two people applying the model should be able to produce the same result.

After testing the model on several parcels, we found that we could propose cut-off points to distinguish between good agricultural land, "marginal" agricultural land, and nonagricultural land. Our use of the term "marginal" is not the same as the definitions contained in Oregon SB 237. For our LESA applications, "marginal" implies that neither soil quality nor site quality are sufficiently limiting to preclude agricultural use altogether, but either the level of agricultural production will remain low, or the difficulty of carrying out agricultural operations will remain higher than desirable. The term also implies that, should the parcel be converted to nonagricultural use, there would probably be little or no loss to the agricultural economy. Put in the language of Oregon's commercial agriculture standard, the parcel's agricultural value may not be high enough to make a *substantial* contribution to the agricultural economy, nor may it be essential for the maintenance of agricultural processors and established farm markets. This determination must consider soils, conflict, and parcel size separately as well as the total LESA score. Otherwise, parcels that have very low or very high scores for one factor may be misclassified.

The model has two primary applications. One use is to determine the relative agricultural value of a given parcel for permit consideration or to compare alternative sites for development. The other application for the model is to determine the impact of a land-use change on neighboring parcels of land. In this way, the potential effects of any nonfarm development on the agricultural enterprises within an area can be objectively evaluated.

Land Evaluation (LE). Our procedure for land evaluation was to derive four single-crop soil potential ratings and combine them into an overall rating of agricultural potential. Soil potential ratings are relative measures of net return to soil management for the production of a given crop. For each soil under consideration, data must be assembled for crop yields, current prices for specific crops, management practices required to achieve those yields, and costs associated with each management practice. Once the data are assembled and the calculations are completed, the net returns are arrayed from high to low. The highest net return is set equal to 150, and all others are expressed as a percentage of the highest one. The result is a set of soil potential ratings on a scale of 0 to 150.

We developed separate soil potential ratings for winter wheat, annual ryegrass seed, permanent pasture, and irrigated sweet corn. Linn County professional agriculturists, including SCS district conservationist William Forrest, SCS soil scientist Russell Langridge, and Linn County Extension agent Hugh Hickerson, formulated ratings criteria and assembled the necessary data. Other resource people, including farmers who keep good records of yields and costs, tile-drain installers, well drillers, and OSU Extension specialists, were called upon as necessary to provide information on the costs of specific management practices.

Our procedure for assigning soil potential ratings is illustrated in Table 6. Yield data are estimates made by knowledgeable agriculturalists supported by farm records. Prices are those prevailing in 1982.

Tile drainage costs were based on soil characteristics, appropriate spacings for drain lines, and the corresponding linear feet of tile lines per acre. A drainage contractor provided installation costs associated with each spacing. We amortized those costs over 25 years at 18 percent interest to derive the annual per-acre drainage costs. Those costs ranged from $85 for 60-foot spacings to $155 for 30-foot spacings.

Field drainage costs assumed 1320 linear feet of ditch per 40 acres, with half a cubic yard of soil to be moved per linear foot. At $.50 per cubic yard, the total cost for 40 acres, amortized over 10 years at 18

Table 6. Yield, price, and management cost data assembled for soil potential ratings for four major crops on four soils common in Linn County, Oregon.

Soil	Yield	Gross Return	Management Costs ($/Acre/Year): Tile Drain	Field Drain	Land Smoothing	Cross-Slope Farming	Sub Soiling	Cover Crop	Irrig.	Net Return ($)
			Winter Wheat ($3.85 per bushel)							
Amity	100 bu.	$385	99							286
Bellpine 3-12%	70	270				10				260
Dayton	50	193	155	2						36
Willamette 0-3%	110	424								424
			Annual Ryegrass ($.14 per pound)							
Amity	1800 lb.	$252								252
Bellpine 3-12%	900	126				10				116
Dayton	1800	252		2	9					241
Willamette 0-3%	1800	252								252
			Permanent Pasture ($10.00 per AUM)							
Amity	10 AUM	$100								100
Bellpine 3-12%	6	60								60
Dayton	8	80		2						78
Willamette 0-3%	12	120								120
			Irrigated Sweet Corn ($65.00 per ton)							
Amity	9 tons	$585	99				10	25	146	305
Bellpine 3-12%	7	455				10	10	25	181	229
Dayton	6½	423	155	2			10	25	146	85
Willamette 0-3%	9	585					10	25	146	404

percent, is about $2.00 per acre per year. Land smoothing was estimated to cost $25 per acre. Amortized over 4 years at 18 percent, the annual cost is about $9.

Cross-slope farming is recommended for wheat, ryegrass, and corn on soils having slopes of more than 7 percent. Our best estimate was an annual cost of $10 per acre. Subsoiling is recommended for soils on which row crops are grown. We estimated an annual cost of $10 per acre. Winter cover crops are recommended when row crops are grown on soils subject to occasional flooding and on soils having slopes up to 12 percent. The average annual cost was estimated to be $25. Row crops are not recommended on soils steeper than 12 percent.

Irrigation costs were based on the cost of a wheel-line sprinkler system, the cost of electricity, and the cost of a well. Local information indicated that a wheel-line system serving 40 acres would cost about $20,000. Amortized over 10 years at 18 percent, the annual cost is about $111 per acre. Calculation of electricity costs assumed an average irrigation requirement, given the climate of western Oregon and the water-holding capacity of Linn County soils. Electricity calculation also took into account irrigation efficiency, the amount of lift, the pressure desired, and the cost per kilowatt hour. Overall electricity costs ranged from $17.59 to $42.65, depending on the lift. Some soils can be irrigated directly from the Willamette River with small but variable lifts. Others require a well. The cost to drill a 150-foot well serving 160 acres was placed at $4875 by an experienced well-driller. Amortized over 50 years at 18 percent, the well would cost about $5 per acre per year. Overall irrigation costs ranged from $129 to $181, depending on the need for a well and the amount of lift.

Table 6 illustrates how we allocated costs of drainage, conservation, and irrigation to each soil for each major crop. Deducting all costs from gross returns gives the net returns shown. Clearly, several additional factors could affect the absolute values of the net returns; for example, we deliberately excluded costs associated with standard tillage and fertilizer practices. We assumed these costs would be about the same for all soils and would not affect relative values. We also recognized that different circumstances could call for different choices of yields, prices, interest rates, and amortization lengths. Again we assumed, however, that once we had made our choices, the *relative* ratings would not change significantly as long as we applied our criteria consistently to all soils and crops.

The procedure illustrated in Table 6 was used to calculate net returns for each of the four index crops on all agricultural soils in the county. For each index crop, the maximum net return was set equal to 150, and the net returns from that crop on all the rest of the soils were expressed as an equivalent proportion of 150. The resulting numbers give a set of soil potential ratings for each index crop (Table 7).

Because of Linn County's agricultural diversity, land evaluation requires more than a rating of a soil potential for a given crop. Table 7 shows why we cannot use soil potential ratings based on any one crop as a measure of overall agricultural value. Had we used wheat, the Dayton soil would appear to have practically no agricultural value; had we used annual ryegrass, the Dayton soil and the Willamette soil would appear to have practically equal agricultural value. The fact is that the Dayton soil has some very severe limitations for agricultural use, such that many kinds of agricultural enterprises are not economically feasible. But as long as grass seed farming remains stable in Linn County, Dayton soils will continue to be an important agricultural resource. Soil potential ratings calculated for a single crop fail to account for this fact. Clearly, some kind of combined rating is necessary.

We could have taken the simple arithmetic average of the single-crop soil potential ratings. That would have given each crop equal weight in the overall average. However, because a farmer can make considerably more money growing wheat or corn than ryegrass or pasture, it seemed to us that the more valuable crops should receive heavier weighting in the overall average.

Our solution was to go back to the absolute values of net return for each crop, determine the most profitable crop (MPC) for each soil, array the net returns for the most profitable crop from high to low, and scale them between 150 and 0. Results of this process are illustrated in Table 8. Net returns from the most profitable crop for all the agricultural soils in Linn County ranged from $427 to $60. Each MPC net return was then expressed as a percentage of the maximum MPC value to derive the final agricultural potential rating.

Table 7. Single-crop soil potential ratings for four soils common in Linn County, Oregon.

	Soil Potential Ratings			
Soil	Winter Wheat	Annual Ryegrass	Permanent Pasture	Irrigated Sweet Corn
Amity	101	150	125	107
Bellpine 3-12%	92	69	75	81
Dayton	12	144	98	30
Willamette 0-3%	150	150	150	143

Table 8. Summary of net returns and overall agricultural potential ratings for four soils common in Linn County, Oregon.

	Net Returns				Most	Agricultural
Soil	Winter Wheat	Annual Ryegrass	Permanent Pasture	Irrigated Sweet Corn	Profitable Crop	Potential Rating*
Amity	286	252	100	305	305	107
Bellpine 3-12%	260	116	60	229	260	91
Dayton	36	241	78	85	241	85
Willamette 0-3%	424	252	120	404	424	149

*The maximum net return was $427 for irrigated sweet corn on Chapman soils.

Table 9. Site assessment (SA) for Linn County, Oregon.

1. CONFLICT EVALUATION

A. Number of Residences

Count the number of residences on tax lots that are smaller than typical field size and that are within 1/4-mile of, but not adjacent to, the parcel in question. Typical field sizes are: Bottomlands, 30 acres; Terraces, 40 acres; Hills, 20 acres.

Number	*Points*	*Number*	*Points*
0	30	6	15
1	29	7	12
2	27	8	9
3	24	9	6
4	21	10	3
5	18	11 +	0

B. Percent of Perimeter in Noncompatible Uses

Count as *conflicting* any tax lot smaller than typical field size that has a residence on it, or any tax lot zoned for rural or urban residential use. Count as *somewhat conflicting* any industrial, commercial, or other use which poses less of a conflict than residential uses. Other land uses, such as golf courses or schools, may be classified as conflicting or somewhat conflicting, depending on the use and type of agricultural practice. Divide the percent of somewhat conflicting use by two, then add it to the percent of conflicting use.
Determine the number of points for this sum using the table:

% Perimeter	*Points*	*% Perimeter*	*Points*
0	45	50-60	16
0-10	38	60-70	12
10-20	32	70-80	8
20-30	28	80-90	4
30-40	24	90-100	0
40-50	20		

2. PARCEL SIZE (ACRES) IN RELATION TO TYPICAL FIELD SIZE AND FARM UNIT SIZE

Bottomlands	*Terraces*	*Hills*	*Points*
>100	>120	>120	75
90-100	100-120	100-120	72
80-90	90-100	80-100	68
70-80	80-90	60-80	64
60-70	70-80	50-60	60
50-60	60-70	40-50	56
40-50	50-60	30-40	52
30-40*	40-50*	20-30*	45
20-30	30-40	15-20	30
10-20	20-30	10-15	20
5-10	10-20	5-10	10
<5	<10	<5	0

*Typical field size.

There are 61 soil mapping units in the Linn County soil survey that are potentially agricultural soils. We have calculated agricultural potential ratings for each of these soils. Each rating is a number that falls between 0 and 150. These ratings are used as the measure of soil resource quality required for the land evaluation part of the LESA model.

Site Assessment (SA). Several criteria were considered and tested for site assessment, including those suggested in the SCS LESA handbook. Approaches to classification of agricultural land, using soil quality and site location criteria, have been developed and used in several Oregon counties since 1974. The Oregon State University Extension Service has sponsored a number of workshops and studies on the topic. William Rogers, under the direction of Herb Huddleston, developed and tested a system for rating agricultural lands which was adapted for use in several counties (Rogers, 1980). There is, then, considerable experience in Oregon with rating systems for agricultural lands.

The criteria and weighting factors used for site assessment are displayed in Table 9. Based on the conclusions of previous studies, on the legal framework in Oregon, and on the specific conditions in Linn County, we decided to test a model with two primary criteria: compatibility of surrounding land uses and parcel size.

Two elements of compatibility were evaluated:

1. the number of nonfarm dwellings within 1/4-mile of the parcel being evaluated; and
2. the proportion of the perimeter of the parcel that adjoins conflicting land uses.

Data on the size and spatial arrangement of tax lots are available from section maps in the county planning department. These maps can also be used to determine the number of dwellings on a tax lot and the nature of land use on adjoining parcels.

The *number of residences* criterion was used to measure the degree of conflict between residential development and agricultural practices. Low-density populations are less likely to object to agricultural practices or to cause conflicts than high-density populations (McDonough, 1982). A higher population density also implies greater nonagricultural development pressure. In determining the number of residences, a 1/4-mile radius from the parcel's boundaries was used. The only residences counted were those sited on tax lots smaller than the field size typical of the kind of agriculture associated with the landform on which the parcel in question occurs. Other residences were assumed to be farm related and therefore unlikely to cause conflicts. To avoid double-counting between the number of residences criterion and the perimeter criterion, tax lots adjacent to the parcel in question were excluded from this calculation.

The *perimeter* criterion was developed as a measure of the compatibility of adjacent uses. We defined "conflicting use" either as a tax lot of less than typical field size with a residence, or as any tax lot zoned for rural or other residential use. We defined "somewhat conflicting use" as any tax lot used for commercial, industrial, recreational, or other nonagricultural use which poses less of a conflict than residential use. When assessing site quality, somewhat conflicting uses were not penalized as heavily as fully conflicting residential uses.

Two elements of parcel size were also evaluated:

1. parcel size in relation to field sizes used in typical commercial agricultural enterprises; and
2. parcel size in relation to the size of typical commercial farm units within the area.

Because of wide agricultural diversity in Linn County, we divided the county into three landform units: bottomlands, terraces, and foothills. Within each landform unit we first determined the three dominant types of agricultural enterprises; then we selected one or two of those types as representative of that landform. In Linn County, vegetable farms are typical on bottomlands, ryegrass and seed farms and general crop farms are typical on terraces, and livestock farms are typical on foothills. Data on field size and farm unit size for each kind of agricultural enterprise were obtained from a mail-out survey of Linn County farmers.

The *field size* criterion was developed because leasability is a major determinant of a site's actual value for agriculture. In Linn County, over 40 percent of the land used for agriculture is leased. Parcels that are large enough to function efficiently as a single field should be recognized as having potentially significant value for agriculture. On the other hand, a field with very high soil potential has little value for agriculture if its small size prohibits the use of machinery. Because leasable field size varies with type of agriculture, the criterion was adjusted according to the size of a typical field for the representative type of agriculture on each landform.

The *farm unit size* criterion reflects Oregon's statutory policy of preserving agricultural land in large blocks (ORS 215.243) and the commercial agriculture criterion of Statewide Planning Goal 3 (LCDC, 1975). Larger land parcels also provide economies of scale and create more potential for diverse agricultural uses. As a practical matter, most permit applications in the county are for ownership parcels under 50 acres. The technical difficulty in this situation is to avoid providing an incentive for a farmer with an operating unit of several hundred acres, consisting of several tax lots, to submit applications separately for each tax lot. The individual lots would score lower on the LESA scale and provide support for a request to partition or build on the lot. We compensate for this problem, at least partially, by the importance we give to the field size criterion in the SA ratings. Also, some counties (but not Linn County) require landowners in EFU zones to submit contiguous-ownership parcels as one parcel. In these counties, to obtain a building permit on a tax lot, the applicant would have to obtain a partitioning permit if he also owned contiguous tax lots.

In Linn County, farm units may consist of contiguous or noncontiguous tax lots—owned or leased—operated as one farm unit. The farm unit size criterion was determined by deducting a percentage for rented or leased land (determined from survey data), and then setting the criterion to 50 percent of the owned land in an operating unit. The 50-percent reduction was intended to account for the common situation in which the owned portion of the farm consists of several tax lots. Since we did not have data on the size of these lots, we set the criterion at 50 percent of the owned land on a commercial farm unit. Interviews with county farmland assessors indicated that the range of numbers in the criterion was reasonable in terms of tax lot size distributions. In those counties that count contingous tax lots as one parcel, this 50-percent reduction would not be necessary.

In the Linn County LESA model, both of the parcel size factors were combined for simplicity into a single criterion with a common scale of point values. The points assigned, however, did take into account both field size and farm unit size.

Within the SA portion of LESA, we have weighted the two primary criteria equally: 75 points for compatibility and 75 points for parcel size. The two compatibility factors were not weighted equally, however. After examining several sites, we concluded that perimeter conflicts had greater adverse impact than nonfarm dwellings within a 1/4-mile radius. We therefore allocated 60 percent of the compatibility criterion (45 points) to perimeter compatibility, and 40 percent (30 points) to the number of residences criterion. Although the parcel-size factors were combined into a single criterion, the common scale of values was derived by assigning 60 percent of the value (45 points) to field size, and 40 percent (30 points) to farm unit size.

Certain factors such as field shape, natural obstacles, or access may warrant additional penalty to the LESA score. Other factors, such as irrigation or drain tile investment may warrant a bonus. Because these factors only occur in a small percentage of cases, we propose that they be covered in a planning department staff report rather than by complicating the LESA model with seldom-used criteria.

Combining the LE and SA Systems. A worksheet is used to simplify the LESA scoring procedure for land in Linn County (see case study worksheets, Tables 10-12). SCS aerial photo soil survey maps and tax lot or section maps are necessary. The LESA score is obtained by the following procedure:

Land Evaluation (LE):

1. Measure the area of each soil type in the parcel. Soil maps are available in local offices of SCS, Extension, and the county planning department.
2. Calculate the percentage of area occupied by each soil type in the parcel.
3. From the list of agricultural potential ratings available from Linn County SCS and Extension offices, determine the relative value for each soil type and multiply by the percent of area of each soil.
4. To obtain the overall LE score, sum the products from Step 3, and round off to the nearest whole number.

Site Assessment (SA):

5. Determine the dominant landform of the parcel. The list of agricultural potential ratings also shows the landform on which each soil occurs. For parcels on more than one landform, use field size criteria for the landform that occupies the greatest proportion of the area.
6. From the county section or tax lot maps, identify all tax lots within 1/4-mile of but not adjacent to the parcel, that are smaller than the typical field size for the landform. (Typical field sizes are given in Table 9.)
7. Count the number of dwellings on the tax lots identified in Step 6. Award points from 0 to 30, according to the scale on the worksheet.
8. From the county section or tax lot maps, measure the perimeter of the parcel. Then measure the perimeter segments adjoining conflicting and somewhat conflicting uses. (Criteria for conflicting uses and somewhat conflicting uses are given in Table 9.)
9. Calculate the percent of conflicting perimeter and the percent of somewhat conflicting perimeter. Add the percent of conflicting perimeter to one-half of the percent of somewhat conflicting perimeter. Use the sum to award points from 0 to 45, according to the criteria in Table 9.
10. Compare the size of the parcel with the appropriate scale according to landform in Table 9, and award points from 0 to 75.
11. To obtain the overall SA score, sum up the points awarded in Step 7, Step 9, and Step 10.

LESA Score:

12. Add the LE score (Step 4) to the SA score (Step 11) to obtain the overall LESA score.

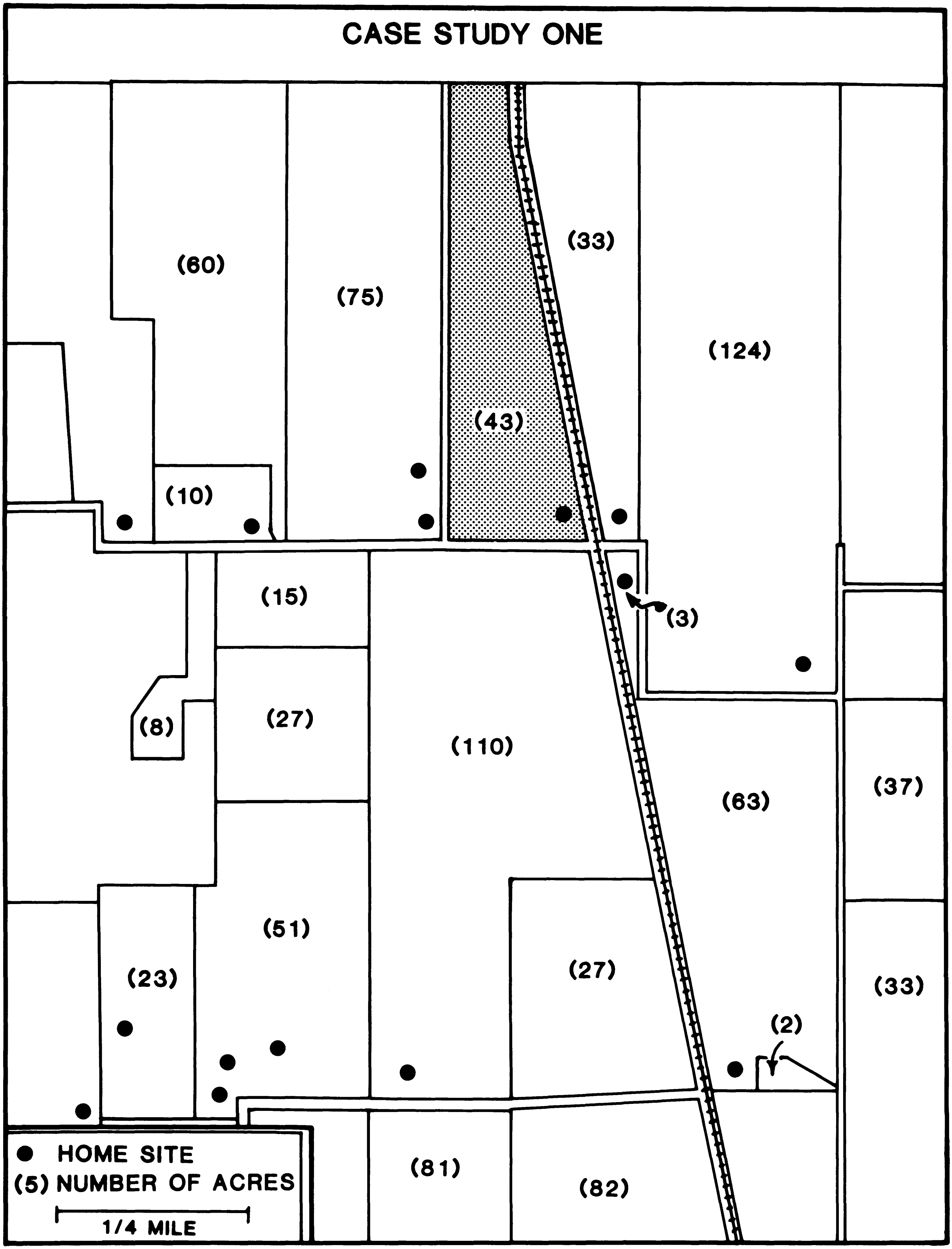

Figure 4. Simplified tax lot map for Case Study 1, Linn County, Oregon.

Table 10. LESA worksheet for Case Study 1, Linn County, Oregon.

Property Owner: .... *Case Study 1*
Location: .... *T10S, R3W, Section 6*
Tax Lot Number: *200*
Acreage: *43.46*
Landform: .... *Bottomland*

Part I: LAND EVALUATION

Soil Types	% of Parcel Area x Soil Potential Rating = Relative Value
Cloquato silt loam	*100% x 149 = 149*

TOTAL PART I: *149*

PART II: SITE ASSESSMENT

A. Number of Conflicting Residences Within 1/4-Mile: *2*

Number	*Points*	*Number*	*Points*
0	30	6	15
1	29	7	12
2	27	8	9
3	24	9	6
4	21	10	3
5	18	11+	0

Points Awarded: *27*

B. Percent of Perimeter in Non-Compatible Uses: *0*

% Perimeter	*Points*	*% Perimeter*	*Points*
0	45	50-60	16
0-10	38	60-70	12
10-20	32	70-80	8
20-30	28	80-90	4
30-40	24	90-100	0
40-50	20		

Points Awarded: *45*

C. Parcel Size *43.46* Acres

Bottomlands	*Terraces*	*Hills*	*Points*
>100	>120	>120	75
90-100	100-120	100-120	72
80-90	90-100	80-100	68
70-80	80-90	60-80	64
60-70	70-80	50-60	60
50-60	60-70	40-50	56
40-50	50-60	30-40	52
*30-40	*40-50	*20-30	45
20-30	30-40	15-20	30
10-20	20-30	10-15	20
5-10	10-20	5-10	10
<5	<10	<5	0

Points Awarded: *52*

TOTAL PART II: *124*
LESA SCORE: *273*

*Typical field size.

Case Studies

The LESA model was tested on 23 separate parcels for which requests had been made for rural residential building permits or for partitions of ownership parcels. We present three of these test cases to illustrate the procedure and results of the LESA model.

Case Study 1. Bottomland; 43.46 acres. Rating:

LE score = 149
SA score = 124
LESA score = 273

A simplified tax lot map is given in Figure 4 and the LESA worksheet is given as Table 10. The agricultural potential rating of 149 indicates that the parcel has very high soil quality. In fact, only 10 percent of all acreages farmed in the county score this high. The relatively large surrounding parcels and low density of residences provide a setting conducive to agricultural practices. The size of the parcel is above average for a practical field size (30 acres on bottomlands), indicating that it could be successfully leased or used as part of a larger farm operation. It is not large enough, however, to gain maximum points for a commercial farm unit (100 acres or more on bottomlands). The parcel receives only 52 out of 75 points, reflecting the state's goal of preserving agricultural land in large blocks. Nevertheless, the parcel would appear to have excellent agricultural value: both soil quality and site quality are favorable, and the overall LESA rating is quite high.

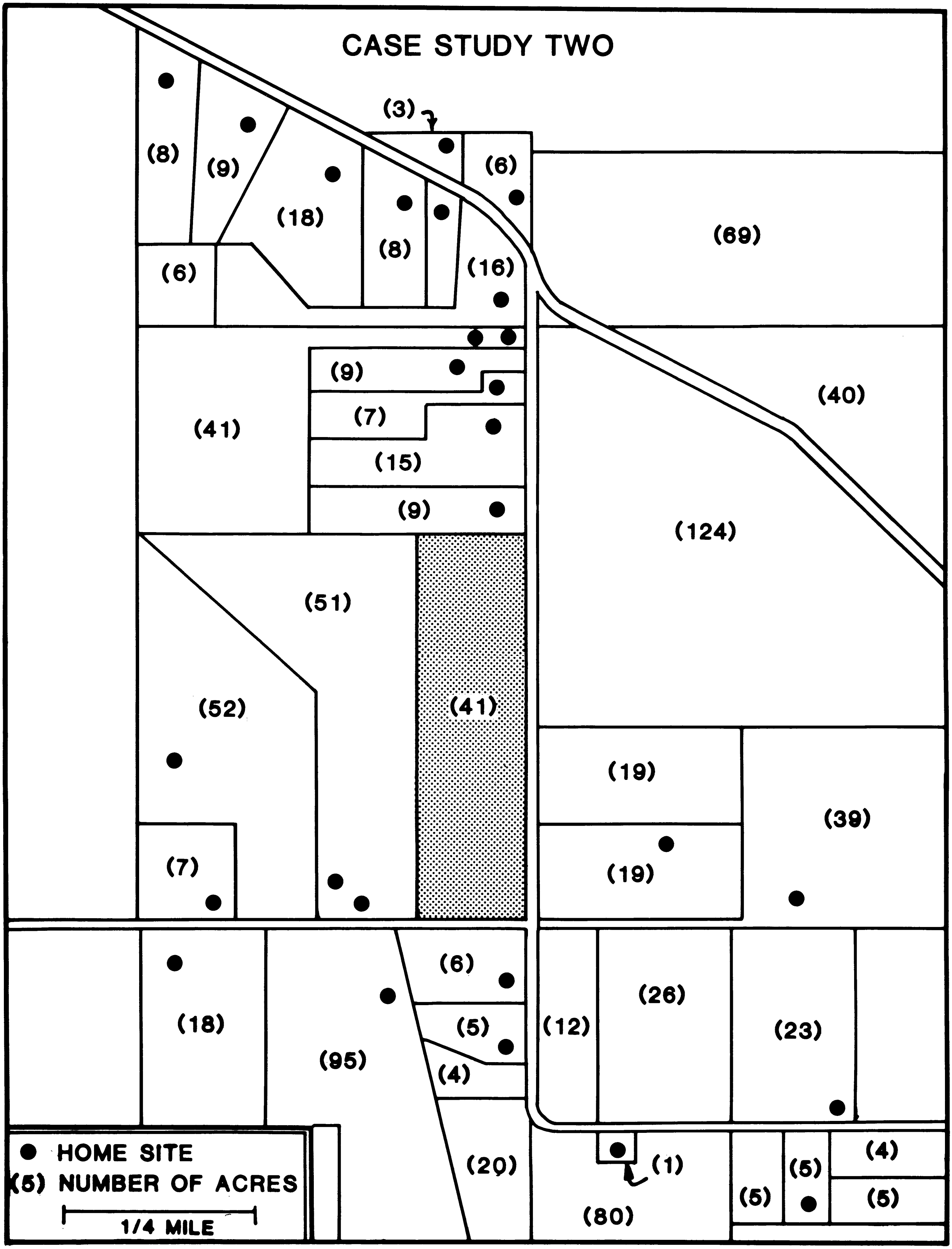

Figure 5. Simplified tax lot map for Case Study 2, Linn County, Oregon.

Table 11. LESA worksheet for Case Study 2, Linn County, Oregon.

Property Owner: .... *Case Study 2*
Location: .... *T11S, R1W, Section 11*
Tax Lot Number: *302*
Acreage: *41.3*
Landform: .... *Terrace*

Part I: LAND EVALUATION

Soil Types	% of Parcel Area x Soil Potential Rating = Relative Value
Courtney, 0-3%	*25% x 69 = 17.25*
Willakenzie, 2-12%	*23% x 98 = 22.54*
Clackamas, 0-3%	*52% x 78 = 40.56*

TOTAL PART I: *80*

PART II: SITE ASSESSMENT

A. Number of Conflicting Residences Within 1/4-Mile: *4*

Number	*Points*	*Number*	*Points*
0	30	6	15
1	29	7	12
2	27	8	9
3	24	9	6
4	21	10	3
5	18	11+	0

Points Awarded: *21*

B. Percent of Perimeter in Non-Compatible Uses: *33%*

% Perimeter	*Points*	*% Perimeter*	*Points*
0	45	50-60	16
0-10	38	60-70	12
10-20	32	70-80	8
20-30	28	80-90	4
30-40	24	90-100	0
40-50	20		

Points Awarded: *24*

C. Parcel Size: *41.3* Acres

Bottomlands	*Terraces*	*Hills*	*Points*
>100	>120	>120	75
90-100	100-120	100-120	72
80-90	90-100	80-100	68
70-80	80-90	60-80	64
60-70	70-80	50-60	60
50-60	60-70	40-50	56
40-50	50-60	30-40	52
*30-40	*40-50	*20-30	45
20-30	30-40	15-20	30
10-20	20-30	10-15	20
5-10	10-20	5-10	10
<5	<10	<5	0

Points Awarded: *45*

TOTAL PART II: *90*
LESA SCORE: *170*

*Typical field size.

Case Study 2. Terrace; 41.3 acres. Rating:

LE score = 80
SA score = 90
LESA score = 170

A simplified tax lot map is given in Figure 5 and the LESA worksheet is given as Table 11. The agricultural potential rating of 80 reflects a relatively low quality of soil for agricultural production. This rating is exceeded by 51 percent of the acreage farmed in Linn County.

The SA rating is also relatively low, partly because of the presence of some conflicting land uses in the area, and partly because the size of the parcel is too small to constitute an entire farm unit. Although the parcel is surrounded by relatively large parcels (10-124 acres), some rural development has already occurred within the general area. There are 4 residences within 1/4-mile, and nearly 33 percent of the perimeter adjoins land uses harboring potential conflicts. This situation creates a somewhat less favorable setting for agriculture than does Case Study 1. Although the parcel is not large enough to be used as a commercial farm unit, it is more than adequate in size to be used or leased as a field or a pasture in conjunction with a larger enterprise.

Ratings from both parts of the LESA model, as well as the overall rating, indicate that this parcel has considerably less agricultural value than the parcel in Case Study 1. There may be some justification for designating the agricultural value of this parcel as marginal.

The critical issue concerning parcels designated "marginal"

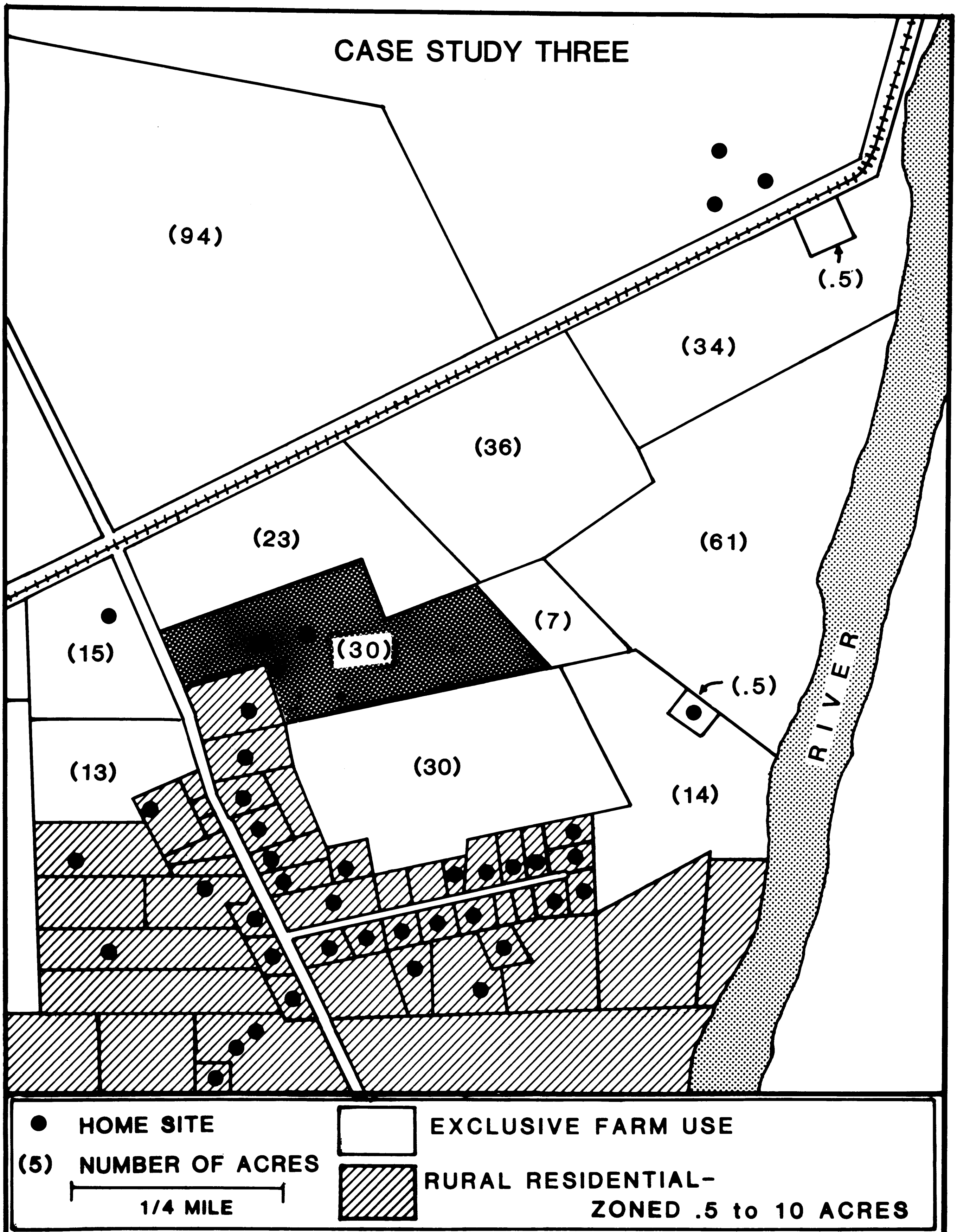

Figure 6. Simplified tax lot map for Case Study 3, Linn County, Oregon.

Table 12. LESA worksheet for Case Study 3, Linn County, Oregon.

Property Owner: .... *Case Study 3*
Location: .... *T10S, R3W, Section 14*
Tax Lot Number: *14*
Acreage: *30.5*
Landform: .... *Terrace*

Part I: LAND EVALUATION

Soil Types	% of Parcel Area x Soil Potential Rating = Relative Value
Coburg, 0-3%	*7% x 107 = 7.49*
Malabon, 0-3%	*83% x 146 = 121.18*
Dupee, 0-3%	*10% x 51 = 5.1*

TOTAL PART I: *134*

PART II: SITE ASSESSMENT

A. Number of Conflicting Residences Within 1/4-Mile: *17*

Number	*Points*	*Number*	*Points*
0	30	6	15
1	29	7	12
2	27	8	9
3	24	9	6
4	21	10	3
5	18	11+	0

Points Awarded: *0*

B. Percent of Perimeter in Non-Compatible Uses: *24*

% Perimeter	*Points*	*% Perimeter*	*Points*
0	45	50-60	16
0-10	38	60-70	12
10-20	32	70-80	8
20-30	28	80-90	4
30-40	24	90-100	0
40-50	20		

Points Awarded: *28*

C. Parcel Size: *30.5* Acres

Bottomlands	*Terraces*	*Hills*	*Points*
>100	>120	>120	75
90-100	100-120	100-120	72
80-90	90-100	80-100	68
70-80	80-90	60-80	64
60-70	70-80	50-60	60
50-60	60-70	40-50	56
40-50	50-60	30-40	52
*30-40	*40-50	*20-30	45
20-30	30-40	15-20	30
10-20	20-30	10-15	20
5-10	10-20	5-10	10
<5	<10	<5	0

Points Awarded: *30*

TOTAL PART II: *58*
LESA SCORE: *192*

*Typical field size.

farmland is the possible impact of conversion to nonagricultural uses on the agricultural value of adjoining and nearby parcels. The LESA model can be used to evaluate this situation, too. Each potentially affected parcel can first be rated by assuming the marginal parcel in question remains in agriculture. Then each affected parcel can be rated again assuming the marginal parcel is converted to another land use. If the ratings for affected parcels drop, it only remains to establish some threshold limit above which reductions in agricultural value cannot be tolerated. A county might decide, for example, that parcel ratings must not be reduced by more than 5 percent of their value at some point in time. One or two subsequent developments may fall within that tolerable limit, but further proposals may have to be denied because of the cumulative effect of conflicts on the continuing agricultural value of existing parcels. Thus it may well be decided that a parcel classified as marginal for agriculture may need to be kept in agricultural use simply to preserve the agricultural integrity of other, more valuable parcels in the vicinity.

Case Study 3. Terrace; 30.17 acres. Rating:

LE score = 134
SA score = 58
LESA score = 192

A simplified tax lot map is given in Figure 6 and the LESA worksheet is given as Table 12. The agricultural potential rating of 134 is exceeded by only 11 percent of the acreage farmed in the county, making the soil quality of the parcel quite valuable for agriculture. The soils are almost as good as the bottomland soils in Case Study 1, and they are certainly far better than the marginal soils of Case Study 2.

This parcel, however, has the lowest of the three scores for site quality. It suffers both from a high degree of residential development nearby and from a parcel size that is less than optimum for both field size and farm unit size. Although the residential development to the south of the parcel does not border the parcel, it still provides more than 10 dwellings on small lots within 1/4-mile of the parcel; therefore, no points can be awarded for this factor. The perimeter is only 24-percent conflicting, a value that is a little less serious than the parcel in Case Study 2. However, the combination of both factors in the compatibility assessment suggests that the agricultural value of this parcel has already been substantially reduced due to the potential conflicts between agricultural operations and rural residents who may object to noise, dust, odor, sprays, etc.

Analysis of Case Study 3 suggests that it is not sufficient to judge the agricultural value of a parcel only on the final LESA rating. Each of the three major factors—soils, compatibility, and size—needs to be evaluated separately. Here, the soils are quite suitable for agricultural use, and although the parcel is less than optimum for both field size and farm unit size, parcel size is not serious enough to preclude agricultural utilization of the soil resources. However, the existing conflict is a serious matter. The severity of the impact may well be sufficient to designate this parcel marginal in spite of the superior quality of the soil resources. Even if the parcel size were large enough to be optimum, the conflict would not lessen.

Unlike Case Study 2, loss of this parcel from the base of agricultural production might have some impact on agricultural processors and farm markets, but the additional constraints on agricultural use imposed by land-use conflicts may render it impractical to force continued agricultural use. Ultimately, the decision may rest on an evaluation of potential impacts from a change in land use on other agricultural land to the north. It may be desirable to retain this parcel in agricultural use primarily because of its value as a buffer between the residential developments on one side and the good agricultural lands on the other.

Another factor that may influence the final decision on the best use of this parcel is its susceptibility to flooding. Part of the parcel lies within a floodplain. This type of detractor for residential development could have been incorporated into the LESA model by a development hazard criterion. Such a criterion would increase a parcel's rating for agriculture if its development potential were reduced by hazards or site limitations. In our model, we chose not to include this type of limitation, because it does not directly relate to the parcel's value for agriculture. Instead, we propose that a separate suitability rating be applied for residential development. This rating would account for hazards, services, access, and a number of other factors. By applying both rating systems to a parcel, the decisionmaking body would have the pertinent factors focused on the site in a systematic fashion.

Using LESA to Classify Agricultural Land

Scores for each of the three major criteria are arrayed from high to low in Table 13. The order in which parcels appear in each array is quite different, which suggests that each factor is indeed measuring a different aspect of parcel suitability for agricultural use. In fact, correlation coefficients between pairs of factors are no higher than 0.44 (soils x conflict = −.21; soils x size = −.40; conflict x size = .44). Had we observed high correlations, then our model would have included more factors than necessary. We have concluded that it is preferable to keep the model simple by including as few factors as possible, and by restricting factors to those which have a direct effect on agricultural suitability.

The data in Table 13 also suggest that we can identify cut-off values for each criterion to distinguish between good agricultural land, marginal agricultural land, and nonagricultural land. For

Table 13. Rank order of parcels by each LESA criterion, Linn County, Oregon.

	Criteria							
Rank	Soils*		Conflict*		Size*		Total LESA Score	
1	Roy	(149)	Ski	(75)	Car	(75)	Roy	(273)
2	Sch	(149)	Lea	(75)	Ski	(75)	Sch	(266)
3	Naw	(149)	Roy	(72)	Gla	(72)	Naw	(261)
4	Alb	(149)	Smu	(72)	Sch	(64)	Alb	(253)
5	Fre	(149)	Luq	(72)	Eld	(64)	Car	(236)
6	Hil	(134)	Phi	(72)	Lea	(64)	Bay	(235)
7	Ead	(121)	Bay	(68)	Luq	(60)	Luq	(234)
8	Idl	(117)	Eld	(68)	Qua	(60)	Smu	(234)
9	Bay	(115)	Qua	(68)	Wel	(60)	Phi	(229)
10	Smu	(110)	Car	(67)	Lac	(56)	Eld	(229)
11	Bab	(107)	Naw	(61)	Phi	(56)	Ski	(224)
12	Luq	(102)	Lac	(58)	Smu	(52)	Lac	(215)
13	Phi	(101)	Alb	(53)	Roy	(52)	Lea	(202)
14	Lac	(99)	Gla	(51)	Mai	(45)	Hil	(194)
15	Smi	(97)	Ead	(51)	Bay	(45)	Wel	(188)
16	Wel	(96)	Mai	(45)	Alb	(45)	Fre	(183)
17	Eld	(93)	Sch	(41)	Naw	(45)	Gla	(179)
18	Gla	(93)	Idl	(40)	Smi	(45)	Mai	(176)
19	Car	(92)	Hil	(28)	Hil	(30)	Ead	(175)
20	Mai	(80)	Wel	(27)	Bab	(20)	Idl	(165)
21	Ski	(74)	Smi	(24)	Fre	(20)	Smi	(164)
22	Lea	(63)	Bab	(20)	Idl	(10)	Bab	(145)
23	Qua	(2)	Fre	(16)	Ead	(0)	Qua	(130)

*Number in parenthesis is the score for the individual LESA criterion.

soil quality, we have selected a value of 80 points on a 150-point scale as a threshold separating good agricultural soil from marginal agricultural soil. That leaves a wide range of quality within the class of good agricultural soil. Linn County, in fact, has large acreages of soils with ratings in the low 80s that support successful agricultural enterprise. This situation dictates that these soils be included in the agricultural group.

Soils with ratings between 50 and 80 are dominantly wet, clayey soils that are difficult to manage and are used mainly for pasture production. These soils are classified "marginal." Soils with ratings below 50 are very shallow, stony soils on steep slopes. These soils are generally not suitable for agriculture, although some of them may have very high quality for timber production.

We determined threshold values for conflict assessment somewhat more arbitrarily. The first question is: how much conflict can good agricultural land tolerate? We set the value at 52 out of 75 points. If there were no dwellings on small lots within 1/4-mile (30 points), then the parcel could tolerate up to 40-percent conflicting perimeter (24 points). If there were no perimeter conflict (45 points), then the parcel could tolerate as many as 8 houses in the vicinity (9 points). Alternatively, the parcel could tolerate up to 30-percent conflicting perimeter (28 points) and as many as 3 houses in the vicinity (24 points), and still remain good agricultural land.

The second question is: how much conflict does it take to completely destroy a parcel's agricultural value, no matter how good the soil is? We set that value at 18 points. Such a low number could be achieved only if there were more than 10 residences in the vicinity and over 50-percent conflicting perimeter, or if the parcel were totally surrounded by conflicting uses and there were more than 5 houses in the vicinity. Thus, only extreme conflict would be cause for declaring a parcel as having no value to agriculture.

The parcel size question is a little easier. Any parcel larger than typical field size qualifies as good agricultural land. For all three landforms, that threshold is set at 45 out of 75 points. Because even small parcels have some agricultural value, we set the boundary between marginal and nonagricultural land at 10 points. The only way a parcel can be designated "nonagricultural" is if it is so small that it scores 0 points for size, which indicates that it is smaller than the minimum field size required for agricultural use.

The sum of the three nonagricultural thresholds is 78 (50 soils + 18 confict + 10 size). The sum of the three marginal thresholds is 177 (80 soils + 52 conflict + 45 size). We could use these two sums as threshold points for total scores. It seems, however, that even if a parcel scores just above the threshold value for all three criteria, the overall agricultural quality may still be below the threshold. We propose, therefore, that the total LESA score should be more than 200 to be rated as good agricultural land and between 100 and 200 to be rated as marginal land. Below 100 points, the parcel would have no value to agriculture.

Using these threshold values to classify the agricultural value of each of the 23 parcels tested gives the results shown in Table 14. Good agricultural land must have a soils score of 80 or more, a conflict score of 52 or more, a size score of 45 or more, and a total score of 200 or more. Should one or more of those four scores fall into the marginal range, then the entire parcel has marginal value for agriculture. Should any score fall below the marginal threshold, then the parcel is classified as nonagricultural land.

Field inspection by a team of soil scientists, Extension agents, and planners generally confirmed

Table 14. Classification of agricultural value, Linn County, Oregon.

Parcel	Soils	Conflict	Size	Total
I. Good Agricultural Land				
Roy	149	72	52	273
Naw	149	61	45	255
Alb	149	53	45	247
Bay	115	75	45	235
Car	92	67	75	234
Smu	110	72	52	234
Luq	102	72	60	234
Phi	101	72	56	229
Eld	93	68	64	225
Lac	99	58	56	213
II. "Marginal" Agricultural Land—* indicates limiting factor(s)				
Sch	149	41*	64	254
Ski	74*	75	75	224
Gla	93	51*	72	216
Lea	63*	75	64	202
Hil	134	28*	30*	192
Wel	96	27*	60	183
Mai	80	45*	45	170
Idl	117	40*	10*	167
Smi	97	24	45	166
Bab	107	20*	20*	147
III. Non-Agricultural Land—*indicates limiting factor(s)				
Fre	149	16	20	185
Ead	121	54	0*	175
Qua	2*	68	60	130

Threshold Levels		Soils		Conflict		Size		Total
Good	=	≥80	or	≥52	or	≥45	or	≥200
Marginal	=	50-79	or	18-51	or	10-44	or	100-200
Non-Ag.	=	<50	or	<18	or	<10	or	<100

the validity of the agricultural classification shown in Table 14. Within the class of good agricultural land, there is a wide range of factor scores for soils, conflict, and size. Yet all of us agreed that none of the limitations affecting any of these parcels was serious enough to preclude agricultural use. All of these parcels should qualify for agricultural preservation in EFU zones.

The 10 parcels of marginal agricultural land are "marginal" for a variety of reasons. Two have soils of marginal value for agriculture. It turns out, however, that those soils are very good for forestry. Thus, rating these parcels using a similar model developed explicitly for forestry value would likely yield much higher ratings. Land-use conflicts affected 8 parcels seriously enough to begin to interfere with agricultural use. Classification as marginal is appropriate even though in every case the soils are good agricultural soils. Three of these sites were also too small to qualify as good agricultural land. The parcel in Case Study 2 is particularly interesting because all three factors have ratings very close to the threshold for good agricultural land. The parcel is marginal, partly because the conflict rating is marginal by 1 point. More importantly, the near marginality of all three factors causes the total score to fall well below the 200-point threshold for good agricultural land. The field inspection team agreed that marginal is the correct classification for all of the parcels in Group II, Table 14.

Of the three nonagricultural parcels in Table 14 , one has so much nonagricultural development around it that continuation in agricultural use is not feasible. One parcel has good soils, but it is so small that even use as a farm field is impractical. One parcel is in a good agricultural setting, but the soils are all very steep and shallow to bedrock so that it is not even suitable for livestock grazing. Again, the classification produced by the LESA model accurately reflects the conditions affecting the agricultural value of these parcels.

Comments

The LESA process, as described by SCS, calls for a substantial amount of local input. We found that such input was indeed essential in the development of both the LE and SA parts of the model. Another very important finding was that validation of the model through field inspections of test parcels is essential to revise the criteria, modify the weighting factors, and produce a useful and credible model.

We would suggest several desirable characteristics of a LESA model. First, it should be easy to use. There should be a minimum of factors to evaluate, and each factor should measure different aspects of a parcel's value for agricultural use. All factors included should relate specifically to the agricultural value of a parcel; factors that pertain more to a parcel's value for development, forestry, or any other use only add to the complexity of the model and confuse the issue of the basic agricultural value of land. Separate LESA models for residential value or forestry value should be developed, whereupon LESA ratings for the different uses can be compared.

The criteria should be based as much as possible on factual data. For example, we were able to use data from a survey of Linn County farmers to set appropriate field sizes and farm unit sizes. In other cases, it may be necessary to depend on estimates made by knowledgeable agriculturalists in a county.

It is also desirable to establish criteria that can be measured and recorded in the office. In our model, soil potential ratings have been calculated for all agricultural soils in the county, and are available to the evaluator from a list. Information on parcel size, residences, and peripheral land use can be taken from tax lot or section maps. In addition, all criteria are spelled out precisely, so there can be no confusion in the assignment of points. Thus, the model can be applied with the confidence that different individuals rating the same parcel should be able to arrive at the same answer.

Although we have tested the model on only 23 parcels, we were able to refine the criteria sufficiently to propose cut-off values for classifying each parcel's agricultural value as good, marginal, or nonagricultural. As more experience is gained with the model, further refinements of point values or of the threshold values between classes are likely to occur. Such changes can only improve the model's usefulness as an aid in making policy and land-use decisions. In testing the model, we discovered that some parcels may be affected by unusual circumstances relating to location, previous commitments, or special topographic features. We do not feel that it is necessary to add more factors to the model to account for these few instances. Rather, some guidelines may need to be given to enable adjustments to the ratings. These refinements await more extensive experience.

We expect that any LESA model will require adjustments over time. The agricultural potential ratings may change with market and interest rate fluctuations and new crop varieties. The site assessment ratings may change as more insights are gained from research and experience with the model. This dynamic aspect of land evaluation and site assessment is, we believe, one of its strengths.

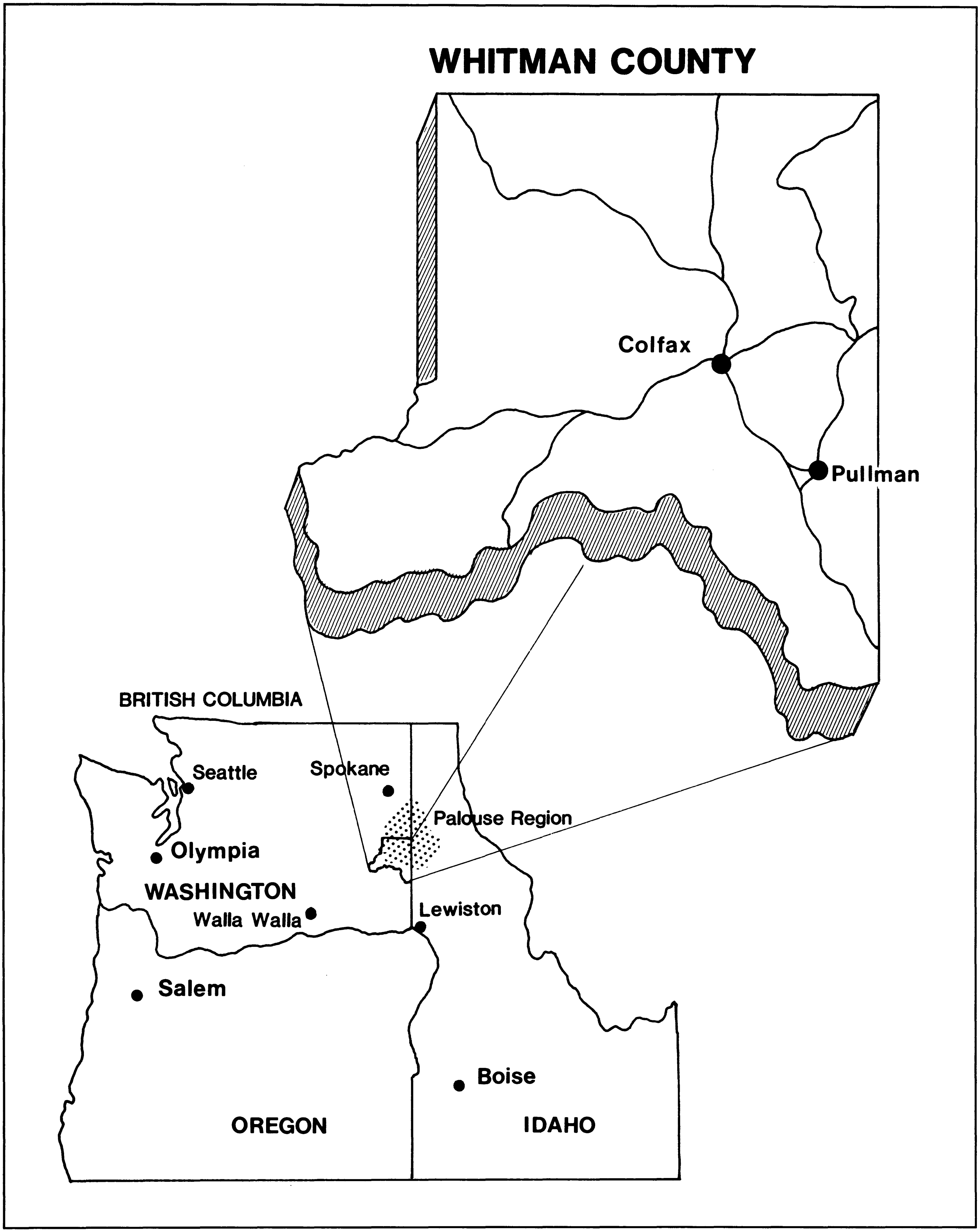

Figure 7. Regional location of Whitman County, Washington.

Whitman County, Washington

Whitman County lies in the southeastern corner of Washington State. It borders the state of Idaho to the east, while its southern border is approximately 40 miles north of the state of Oregon (Figure 7). Like many western counties, Whitman County is large; for example, it is larger than the state of Delaware, the state of Rhode Island, and about half the size of the state of New Jersey.

Peas, lentils, barley, mustard, grass seed, and sunflowers are grown in Whitman County, but winter white wheat is the major crop. Wheat also ranks as the top cash crop in the state of Washington, and Washington ranks fifth of the nation's wheat producers. Whitman County produces more bushels of wheat than any other county in the nation, and its soils have the nation's highest yield of winter white wheat per acre. Since the United States produces 14 percent of the wheat in the world, Whitman County wheat production is important to the national economy.

Washington Laws with LESA Implications

There are a number of laws in the state of Washington with possible implications for LESA. These include: the three state planning enabling acts, the State Environmental Policy Act (SEPA), the subdivision law, the Open Space Act, the Shoreline Management Act, and annexation laws. (A complete review, although a bit outdated, is provided in Planning and Community Affairs Agency, 1977.)

Washington State has three separate planning enabling acts: the Planning Commission Act (Revised Code of Washington (RCW) 35.63), the Optional Municipal Code (RCW 35A.63), and the Planning Enabling Act (RCW 36.70). The Planning Commission and Planning Enabling Acts are directed toward counties and have the most direct bearing on agricultural lands. Both are more or less based on the Standard Planning Enabling Act developed by the U.S. Department of Commerce in the 1920s, and they give counties the authority to plan and zone. If a county chooses to use the Planning Enabling Act for its planning and zoning, its plan must include a land-use element. LESA offers a system for determining agricultural land use in such an element.

The State Environmental Policy Act (SEPA) (RCW 43.21) is "a set of procedures to govern other procedures" (Planning and Community Affairs Agency, 1977). Under SEPA, an environmental impact statement (EIS) must precede all government actions which will significantly and adversely affect the environment. An EIS must be prepared on any private development having a significant adverse effect on the environment if the development requires discretionary approval (such as an amendment to the comprehensive plan or zoning ordinance). The impact of a proposed development on farmland certainly may be considered in the EIS process, and LESA could be used to assess those impacts.

The state subdivision law requires planning commission review of any division of land into five or more parcels if any parcel is 5 acres or less. The purpose of this law is to try to ensure that the type of planning authorized in the enabling legislation will occur. In most counties in the state, platting is a 2-step process: preliminary approval by the planning commission and the county commissioners, then final approval by the legislative body (Planning and Community Affairs Agency, 1977). As a result, local officials have much discretionary authority for subdivision review. LESA could be incorporated into the subdivision review procedure. For instance, only lands with certain LESA scores might be permitted to be platted.

The Open Space Act (RCW 84.34), passed in 1970, established that it was the state's policy to "maintain, preserve and otherwise continue in existence adequate open space lands for the production of food, fiber, and forest crops." This was to be accomplished by providing preferential tax assessments for property owners who agreed to keep their lands in agricultural, forestry, or open-space use. The act allows local governments to designate lands that fall into these categories. Local officials have much discretionary authority in deciding what is farmland and what is not. LESA could be used for determining what lands could receive preferential tax assessments. Unlike states such as Oregon and Wisconsin, preferential taxation is not explicitly tied to local planning and zoning in Washington.

The Shoreline Management Act (RCW 90.58) involves the state's marine coastal areas and shorelines along rivers, streams, and lakes. Again, much authority is given to local governments which must establish a system of administration and enforcement for development permits along shorelines (Planning and Community Affairs Agency, 1977). As agriculture is a major use in river and stream valleys, LESA could be incorporated into the local shorelines permit procedure.

Finally, state laws governing annexation may potentially affect agricultural use. There are several ways boundaries can be changed in Washington State. The boundary review board is one way that has been devised to cope with the often conflicting jurisdictional views concerning annexations. These boards certainly may consider a proposed annexation's impact on farmland, and LESA could be used for making such determinations.

The LESA system has the potential to be used in conjunction with each of these state laws.It can be used in determining land-use categories for plans and zones permitted by the enabling acts. The system can be used in the EIS process. LESA could be a tool for considering subdivision or shoreline permit requests, determining assessed value for taxation, and reviewing annexation proposals. All of these potential applications need further study.

Farmland Protection Efforts in Whitman County

Concern about farmland protection began in Whitman County about a decade ago. After damming the Snake River and making Lewiston, Idaho, a world port, the U.S. Army Corps of Engineers decided to build a pumped storage reservoir in Whitman County. Area farmers supported the damming of the Snake River because of the access to world markets and because of the inexpensive hydroelectric power that would be generated. They were, however, quite upset about the proposed pumped storage reservoir, which would flood 10,000 acres of productive wheatland. In addition, the area to be flooded included the farm of an influential county commissioner. The farm community organized and successfully opposed the reservoir project.

During the same period the county was experiencing rather rapid growth. The county is the location of Washington State University, the state's Land Grant school and the adjoining Idaho county (Latah) is the location of the University of Idaho. Both schools were growing during the 1960s and 1970s. University personnel and students sought rural living situations. While newcomers wanted to live in the country, they expected urban services. Some of them also threatened farmers with lawsuits concerning the use of farm chemicals.

This situation led to the first attempts to plan for the county's agricultural lands. In 1969, a transitional zone was established around the city of Pullman, the location of Washington State University. When this failed to curb development in agricultural areas, a large-lot zoning policy was adopted in 1974. In addition to establishing a 20-acre minimum, the new policy prohibited all residential subdivisions outside incorporated areas of the county.

Large-lot zoning also failed to halt the conversion of important agricultural lands. The protection of agricultural lands was the central issue when county officials began to revise their comprehensive plan in 1977. In 1978, the new plan was adopted and the county's top goal was the preservation of "productive agricultural land and the family farm as the prime economic and social resources of Whitman County by preventing land from being taken out of production by indiscriminate or excessive changes in land use" (Whitman County Regional Planning Council, 1978).

At this time a grant was obtained from the U.S. Office of Environmental Education, through Washington State University and the Whitman County Regional Planning Council, to explore ways to implement the plan. The grant enabled county officials and planners to study farmland protection efforts nationwide and to provide educational materials about farmland protection to the county's citizens and decisionmakers. Considerable time was devoted to an attempt to devise a method to classify the county's agricultural land for planning. No method was found that was both accurate and politically acceptable.

The result was the adoption of an exclusive agricultural district for the whole county. Residential subdivisions continued to be prohibited except in incorporated—and a few specially designated unincorporated—communities. Light commercial land use was restricted to the same area. The 20-acre minimum was rescinded and replaced with special provisions for rural housing. These provisions are based on an explicit set of environmental performance standards that rural housing must meet.

Overall, this plan has been effective and enjoys wide support. But there is some concern about two groups of land-use regulations in the comprehensive plan: those regulating light industrial use and those regulating heavy commercial use. Current planning guidelines restrict such uses to areas of thin soils, near flood plains, in the urban periphery, and in the same vicinity as other nonagricultural uses (Whitman County Regional Planning Council, 1978). There is concern that the first two of these criteria—thin soils and flood plains—may be inappropriate. The LESA system was explored as a means to evaluate light industrial and heavy commercial uses while maintaining the goal to protect agriculture. Since housing and light commercial uses have been regulated successfully, these uses were not evaluated.

The LESA system has one other relationship to the county's comprehensive plan. One of the implementation guidelines of the agricultural land-use goal "require(s) that all levels of governments and their agencies consider the impact which their programs and projects may have on agricultural activities, and seek to minimize any impacts which threaten the viability of agricultural activity and the family farm" (Whitman County Regional Planning Council, 1978, p.26). LESA will be used by federal agencies to measure the impact of programs on farmland, and local adoption of LESA will better protect the farmland in the county against actions by federal agencies.

Site-Specific Review of LESA

One area in Whitman County that has received some attention for light industrial and heavy commercial development is the 8-mile corridor between Pullman, Washington, and Moscow, Idaho. This corridor was also designated a "light industrial opportunity area" in the county's comprehensive plan. Five areas in the corridor were chosen for a site-specific review of LESA (see Figure 8).

Land Evaluation (LE). Since Whitman County was one of the 12 counties chosen by the SCS to test LESA, county officials and conservationists have some experience with the system. A slightly different approach to land evaluation has been taken in the county—one similar to the approach taken in Linn County, Oregon. Soil potential ratings exclusively are used for LE. The soil potential ratings are based on a soil potential index (SPI) for each soil unit:

$$SPI = P - CM - CL$$

where:

P = performance measure (in dollars);

CM = relative costs of corrective measures to overcome or minimize soil limitations;

CL = relative costs resulting from continuing limitations (and costs of production).

The performance measure used in the SPI reflects the gross revenues which can be obtained by growing a particular crop on a particular soil unit using good management practices. (In the western United States, where rainfall and other climatic conditions may vary widely within a given county, there may not be just one crop typically grown in the county.) Most modern soil surveys list average yields for crops normally grown on each soil unit. This yield multiplied by the net price for the crop results in a measure of average gross revenues that could be expected on that soil unit. For example, Palouse silt loam, 7-25 percent slope will yield about 70 bushels of winter wheat per acre in Whitman County. A price of $4.25 per bushel results in a gross income of $297.50 per acre. Thus, P equals $297.50 from Palouse silt loam, 7-25 percent slope.

The corrective measures (CM) component reflects the cost of conservation practices needed to maintain the soil, such as grassed waterways, terraces, and hillside drainage systems. Corrective measures needed depend on slope, degree of wetness, and the available water capacity of soil. The total cost of these improvements is then estimated and amortized to get an annual CM cost.

As a general rule, in Whitman County, a 1000-foot strip of grassed waterway is needed on each 100 acres of Palouse silt loam, 7-25 percent slope. This would cost approximately $36 per acre. Amortizing this over 10 years at 15 percent interest produces an annual CM cost of $7.17 per acre.

The continuing limitation (CL) component of the SPI reflects recurring annual cost of maintaining the soil. In Whitman County, the universal soil loss equation was used to determine the tillage system required to overcome CL. The cost of the tillage system was then estimated using crop budgets available from the Cooperative Extension Service or AGNET, an agricultural computer network. It was assumed part of a "typical" farm. These crop budgets included machine costs (fixed and variable), input and service costs, overhead, interest on operating capital taxes on the land, and crop insurance (Hinman and others, 1981a and 1981b; Mohasci and Hinman, 1981). Other annual CL costs, if any, were added to tillage costs (e.g., costs of divided slopes, foregone income from crop production on land seeded to grass, and summer-fallow costs). The annual CL cost on Palouse silt loam, 7-25 percent slope was estimated at $165.61 per acre for Whitman County.

The SPI yields the average net income per acre from crop production using a management system which maintains the long term productivity of the soil. In the case of Palouse silt loam, 7-25 percent slope, the SPI is $124.72. An SPI is calculated for each soil unit; all the SPIs are then arrayed from lowest to highest and converted to a 0-100 soil potential rating, with 100 being the best soil potential rating. The capability class and important farmland ratings are noted in addition to the soil potential rating for each of the

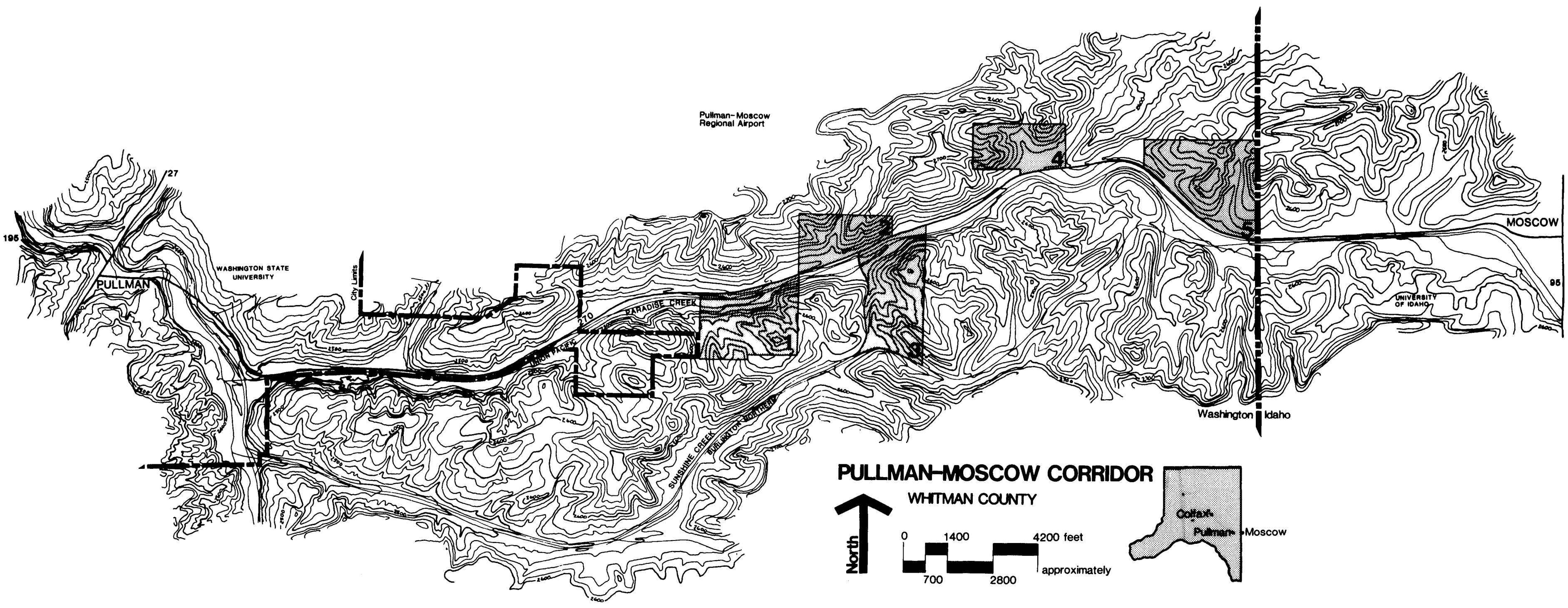

Figure 8. *Map of 8-mile corridor between Pullman, Washington (Whitman County) and Moscow, Idaho (Latah County). Numbers 1-5 indicate locations for site-specific review of LESA.*

113 soil units in the county. Generally, the soils with the highest capability class and important farmland ratings also have the highest soil potential ratings. In Whitman County, the soil potential ratings are used as the relative values for the LE rating.

A slightly different procedure than this one for determining the LE rating is recommended by SCS. Specifically, SCS suggests the capability class, important farmland classification, and either soil productivity or soil potential ratings be used to divide the soil units into approximately 10 groups. Each group contains 6-15 percent of the farmland. A relative value for each farmland group is then determined by converting each group's average productivity or soil potential rating to a 0-100 scale, with the best group having a relative value of 100. Since Whitman County has no class I land, very little class II land, and little prime farmland, the preferred approach was modified by calculating the relative values directly from the soil potential indexes. (The LE scores obtained from SPIs have been compared with those using the method suggested in the LESA handbook. The relative ranking of the soils was the same, but the SPI process was simpler in Whitman County.)

Table 15 summarizes land evaluation for five sites in the Pullman-Moscow Corridor. The calculations were made by the Whitman County SCS staff. The five sites varied in size from 56 to 160 acres. The LE scores ranged from 68 for Site 1 to 82 for Site 2. Most of the soils on all five sites are excellent for agriculture, but Sites 1, 2, and 3 have gravel pits and other excavation activities which reduce their LE scores.

Site Assessment. The attributes included in the SA system come from the seven groups suggested by SCS: agricultural land use; agricultural viability factors; land-use regulations and tax concessions; alternatives to proposed use; compatibility of proposed use; compatibility with and importance to comprehensive development plans; and urban infrastructure. In Whitman County, the following specific attributes were tested for this project and have since been modified:

Table 15. Agricultural land evaluation (LE) scores for five states in Pullman-Moscow Corridor (index values, prorated by acreage determined by planimeter).

Site	Soil Type	% Slope	Acres	Scaled Value	Composite Weighted Value
Site 1 (approximately 160 acres)					
19	Caldwell silt loam	—	34	88	2992
38	Garfield silty clay loam	3-25	9	23	207
39	Gwin-Linville complex	30-65	15	0	0
40	Gwin-Tucannon complex	3-30	1	0	0
59	Naff silt loam	7-25	14	81	1134
65	Palouse silt loam	7-25	59	87	5133
71	Palouse-Thatuna silt loam	25-40	12	43	516
104	Thatuna silt loam	7-25	10	81	810
105	Thatuna silt loam	25-40	6	20	120
					68
Site 2 (approximately 76 acres)					
59	Naff silt loam	7-25	17	81	1377
60	Naff silt loam	25-40	3	20	60
65	Palouse silt loam	7-25	51	87	4437
94	Staley silt loam	7-25	2	63	126
104	Thatuna silt loam	7-25	3	81	243
105	Thatuna silt loam	25-40	Trace	20	0
					82
Site 3 (approximately 112 acres)					
19	Caldwell silt loam	—	2	88	176
40	Gwin-Tucannon complex	3-30	2	0	0
44	Konert silt loam	—	3	63	189
54	Latah silt loam	—	1	50	50
59	Naff silt loam	7-25	8	81	648
60	Naff silt loam	25-40	2	20	40
64	Palouse silt loam	3-7	14	96	1344
65	Palouse silt loam	7-25	34	87	2958
66	Palouse silt loam	7-25	5	35	175
71	Palouse-Thatuna	7-25	16	87	1392
94	Staley silt loam	7-25	3	63	189
104	Thatuna silt loam	7-25	21	81	1701
105	Thatuna silt loam	25-40	1	20	20
					79
Site 4 (approximately 56 acres)					
19	Caldwell silt loam	—	7	88	616
59	Naff silt loam	7-25	8	81	648
65	Palouse silt loam	7-25	26	87	2262
94	Staley silt loam	7-25	8	63	504
104	Thatuna silt loam	7-25	5	81	405
113	Tucannon silt loam	7-25	2	48	96
					81
Site 5 (approximately 136 acres)					
19	Caldwell silt loam	—	6	88	528
38	Garfield silty clay loam	3-25	6	23	138
43	Konert silty clay loam	—	3	38	114
54	Latah silt loam	—	4	50	200
64	Palouse silt loam	3-7	9	96	864
65	Palouse silt loam	7-25	42	87	3654
66	Palouse silt loam	7-25	9	35	315
104	Thatuna silt loam	7-25	40	81	3240
107	Thatuna-Tilma silt loam	7-25	2	68	136
108	Thatuna-Tilma complex	25-40	12	28	336
113	Tucannon silt loam	7-25	3	48	144
					71

1. Percent of area in agriculture within 1 mile.
2. Land use adjacent to the site.
3. Wasting of agricultural land.
4. Availability of nonagricultural land for proposal.
5. Compatibility with existing plans.
6. Availability of public services.
7. Compatibility of proposed use with surrounding use.
8. Environmental factors.
9. Open space taxation.

A score ranging from 0 to 10 is assigned for each of these attributes. For example, the greater the amount of farmland in proximity to the site (Attribute 1) the closer the attribute score to 10. A high score, such as 8, for Attribute 2 indicates a high concentration of farming adjacent to the site. Alternatively, a low score for Attribute 5 indicates that much of the site and/or surrounding land is zoned for nonagricultural use.

In Whitman County, the attribute scores are summed to obtain an aggregate SA score, with 100 being the maximum value. The percent of land in agriculture within 1 mile (Attribute 1) is weighted double; this helps encourage the protection of farmland by recognizing surrounding agricultural use.

Table 16 summarizes SA for the five sites in the Pullman-Moscow Corridor. The calculations were made by the Whitman County Regional Planning Council staff and faculty from Washington State University. The SA scores ranged from 43.5 for Site 5 to 64.0 for Site 3.

Site 1 is located adjacent to the western border of the city of Pullman (this border is further east than the built-up portion of the city). The site includes a relatively flat area beside the Pullman-Moscow Highway in the flood plain of Paradise Creek. There is also a steep area where basalt rock has been excavated, beyond which is rolling farmland. About 85 percent of the land within 1 mile is in agricultural use (score 8.5 x 2 = 17). About 65 percent of the adjacent land use is agriculture. No farmland adjacent to this site, or any of the other four sites, would be made unusable by converting the site to another use. A portion of the site lies in the "light industrial opportunity area" designated in the comprehensive plan, whereas the rest is in the agricultural zone. An excellent state road and railroad provide access to the site, but there are no water or sewer lines or public transit. These same conditions exist on the other sites as well. There is some nonagricultural land available in the area for light industrial and heavy commercial use—but not much, according to a Whitman County Regional Planning Council study (1983). Such use has some compatibility with surrounding uses. According to a Washington State University (WSU) study, a good portion of the site is environmentally sensitive (Cohen and others, 1982). All of the site currently receives preferential tax benefits through the state's Open Space Act.

Site 2 is about 3/4-mile from the Pullman city limits. The site is hilly and generally south-facing. There was once a gravel pit on the site. About 85 percent of the land within 1 mile is farmland, whereas 75 percent of the adjacent land use is agriculture. A portion of this site is in the light industrial opportunity area, and the rest is in the agricultural zone. As mentioned above, all of the sites possess the same public services as Site 1. The same opportunities exist for Site 2 for light industrial and commercial use as do for Site 1. According to the WSU study, about half of the site is environmentally sensitive (Cohen and others, 1982). All of the site currently receives preferential, open-space taxation benefits.

Site 3 is about 1 mile from the Pullman city limits. It is similar to the first site in several respects; for instance, basalt rock has been quarried on both. About 95 percent of the land within 1 mile is farmland, as is the adjacent land use. Like the other sites, a portion of Site 3 is in the light industrial opportunity area and the rest is in agriculture, according to current planning and zoning. Such use, however, has less compatibility with surrounding uses than did the first two sites. According to the WSU study, 75 percent of the site is environmentally sensitive (Cohen and others, 1982). A portion of the site is not enrolled in the open-space taxation program, but the bulk of it is enrolled.

Site 4 is about 2 miles from the Pullman city limits and a little over 1 mile from the Idaho border. It possesses some of the same characteristics as Site 2: it is hilly and south facing. About 80 percent of the land within 1 mile is in farm use, as is 90 percent of the adjacent use. According to the WSU study, half the site is environmentally sensitive (Cohen and others, 1982). One noteworthy area of sensitivity is a spectacular view of Moscow Mountain. All of the site receives preferential taxation for its agricultural use.

Site 5 adjoins the Idaho border, 3 miles from the Pullman city limits. About 50 percent of the land within 1 mile is in agricultural use, as is 45 percent of the adjacent land. This is partly because of extensive commercial development across the state line

Table 16. Agricultural site assessment (SA) scores for five sites in Pullman-Moscow Corridor.

Attribute	Site 1	2	3	4	5
1. % Area in agriculture within 1 mile (weighted double)	17.0	17.0	19.0	16.0	10.0
2. Adjacent land use	6.5	7.5	9.5	9.0	4.5
3. Wasting agricultural land	0	0	0	0	0
4. Planning compatibility	7.5	7.5	8.5	7.5	7.5
5. Public service availability	2.5	2.5	2.5	2.5	2.5
6. Nonagricultural land availability	5.0	5.0	5.0	5.0	5.0
7. Surrounding-use compatibility	2.5	3.5	4.5	4.5	1.5
8. Environmental factors	7.5	5.0	7.5	5.0	2.5
9. Open space taxation	10.0	10.0	7.5	10.0	10.0
	58.5	58.0	64.0	59.5	43.5

in Idaho and a large agribusiness facility across the highway. As a result, nonagricultural use would be more compatible for Site 5 than for the other sites.

Combining the LE and SA Systems. Table 17 lists the combined scores for the five sites in the Pullman-Moscow Corridor. For each site, the average LE score is added to double the SA score. Site 5 received the lowest LESA score (158), whereas Site 3 scored highest (207). Of the five, Site 5 would be considered best for light industrial or heavy commercial land use.

Table 17. Agricultural land evaluation and site assessment (LESA) scores for five sites in Pullman-Moscow Corridor.

Site 1:	Average LE rating	=	68
	(2 x SA Score) (2 x 58.5)	=	117
	LESA Score	=	185
Site 2:	Average LE rating	=	82
	(2 x SA Score) (2 x 58)	=	116
	LESA Score	=	198
Site 3:	Average LE rating	=	79
	(2 x SA Score) (2 x 64)	=	128
	LESA Score	=	207
Site 4:	Average LE rating	=	81
	(2 x SA Score) (2 x 59.5)	=	119
	LESA Score	=	200
Site 5:	Average LE rating	=	71
	(2 x SA Score) (2 x 43.5)	=	87
	LESA Score	=	158

Officials in Whitman County have not adopted the site assessment system outlined here. Several revisions to the system have occurred, and a final version is still being developed. The county's comprehensive plan goal concerning heavy commercial development has been amended to allow use of a LESA system in evaluation of zone change proposals. Local officials anticipate using LESA as an advisory tool to support land-use decisions, perhaps establishing thresholds for guidelines.

Analysis

Latah County, Idaho

Through their hands-on experience with the system, officials in Latah County have identified certain strengths and weaknesses in the LESA program. The major strength of LESA lies in *local* control and the ability of *local* officials to fit the system to *local* conditions and planning goals. The problems commonly associated with national definitions of prime farmlands are thus avoided. Also, the expertise and assistance in local planning provided by the SCS is invaluable.

Most of the weaknesses in the LESA system are shared by other numeric systems for rating land-use suitability. The need to clearly define each factor and assign a value limits options for individual judgment and discretion. As mentioned, the LESA handbook provides little guidance for testing the final formula to determine what a score really means. Each jurisdiction is left to its own devices. It would also seem more difficult to apply this type of system to an area with a wide variety of crops or isolated areas of small and unique—but locally important—farmlands.

Latah County identified a few pitfalls associated with LESA. There exists a potential for designing a LESA formula for ranking sites that does not reflect local planning goals. Planners must also guard against becoming enamored with the numbers and depending upon the LESA index instead of good judgment. Confusion resulting from terminology is another hazard. Long debates over terms—such as operability, farmability, suitability, and feasibility—may be avoided by clearly defining the terms and purpose of each portion of the LESA project.

A broad and reliable information base is a necessity for developing an agricultural suitability index. Without accurate and complete data, no planning process can yield useful results. Similarly, the system must be designed to fit the intended use, whether regulatory or advisory. Latah County intends to utilize the LESA agricultural index as one guideline for an established decisionmaking and land-use regulation system. As an advisory planning tool, the scoring criteria can be less definite and more discretionary. If LESA were to be used as a principal part of a regulatory system, more detail would be required since the system would be subject to all of the usual legal tests for unreasonableness and vagueness. In either case, some provision should be made for individual challenges to the information and decisions which result from a particular LESA score.

In summary, Latah County officials and planners have been satisfied thus far with the LESA system. Although they encountered problems in applying it to a relatively diverse county, LESA was flexibile enough for these problems to be overcome. The system was also compatible with the advisory function intended for it by the county. With the necessary refinement in the design and the development of comparable suitability indexes for other land uses, the formal adoption of the LESA system as a tool for guiding farmland preservation and protection seems to be in Latah County's future.

Linn County, Oregon

The Linn County case studies were quite revealing as to the practicality of LESA evaluation. Several changes in the criteria were made to simplify measurement and make the model more systematic. Criteria were defined in a way that permitted data acquisition from soil maps, section maps, or tables. For this reason, all individuals completing the LESA evaluation forms should be able to produce the same results.

Certain data problems do exist and will require some background preparation. For example, data on field size and commercial farm unit size were obtained from original surveys in Linn County. These data could be estimated from published reports or by agricultural experts in a county if surveys are not realistic. In Linn County, the size of a commercial farm unit averages 350-500 acres, according to survey data. However, 43-50 percent of this land is leased or rented. The remaining owned acreages of 175-250 acres may consist of several tax lots. If the size category for maximum points were set at 200 acres, as originally tested, then very few tax lots in the county could qualify for the maximum points. To account for this problem, researchers assumed that the more typical large agricultural lot consisted of 100-150 acres, and set the standard for maximum points at 100 acres or larger. As indicated previously in the Linn County section, some counties treat contiguous tax lots as one parcel for permit procedures. In this case, perhaps the 200-acre standard would more accurately reflect the number of owned acres in a commercial farm unit.

Measurement of small soil areas may introduce some error in the ratings. Using a planimeter to measure the number of acres of each soil type incurs some unavoidable error. This problem may be compounded when the parcel itself is quite small (less than 20 acres). However, these measurement problems probably don't affect a parcel's soil potential rating by more than a few percentage points. The Linn County research team did not view this potential error as a significant problem.

Researchers looked at all the sites with the county agricultural Extension agent, who is often called upon by the planning department to make evaluations of proposed land division or building permits in terms of impact upon agriculture. These field investigations revealed certain problems, as discussed in the Linn County section of this report. For example, nearby residential development is assumed to represent a land-use conflict in the model. In reality, the degree of conflict will vary with terrain, wind direction, and other variables. However, these variables cannot be completely evaluated without a site inspection for each case, which is impractical given zoning administration, staff, and financial limitations. Consequently, the LESA score may be best used as background information in preparing findings of fact for a given case.

The LESA model needs extensive case study testing to reveal other potential problems and refinements of the criteria. These studies are currently in process and may lead to adjustments in the point system. However, the basic model appears to work quite well within Oregon's planning system.

Whitman County, Washington

The general feeling of planners in Whitman County is that existing land-use controls are doing a good job regulating residential and light commercial land use. Thus the LESA system will probably not be helpful for controlling those uses. However, LESA does potentially provide a mechanism to maintain the county's strong commitment to protecting farmland, while reforming regulations for light industrial and heavy commercial development. In many ways, it is a parallel system to the performance standards already used to regulate rural residential land use.

A possible additional benefit is the local control LESA provides for federal activities. For two decades, there has been concern about the impact of federal programs and projects on farmland in the county. Since the federal government is now using LESA for evaluating impacts on farmland as national policy requires, local officials can have a greater say in how those impacts are evaluated.

LESA is not a panacea. There are important issues still to be resolved. Even if LESA is used to regulate land use, special attention still must be given to environmentally sensitive areas. Such authority is available to local officials through the State Environmental Policy Act. In the Pullman-Moscow Corridor, there are a number of environmentally sensitive areas such as flood plains, steep slopes susceptible to erosion, wildlife habitats, and spectacular landscape views.

How the LESA scores are evaluated is yet another issue. What is a "good" LESA score? What is a "bad" one in Whitman County? No one knows for sure yet. Should various components of SA be weighted more than others? Should SA be given double weight, as SCS advises? There is no consensus on the weighting system yet; in fact, perhaps LE should receive double-weight in order to best protect farmland.

It can be agreed LESA is a straightforward, logical system. It is consistent with local policy and Washington State law. As a result, it deserves serious study and consideration.

Comments

The landscapes and ecosystems of the Pacific Northwest are diverse. Idaho, Oregon, and Washington have a variety of laws regulating land use. These range from the very explicit statewide controls in Oregon to the laissez-faire local-based approach in Idaho, with Washington somewhere in between. The strength of the LESA system is its adaptability to local conditions. Attention should also be given to state-enabling legislation, because it frames the parameters in which land-use planning can take place.

From the case studies in the three states, several observations can be made. LESA is a good system, but much work remains to adapt it to local situations. LESA does seem to achieve its goal of flexibility to site-specific conditions while providing a consistent approach to land evaluation. Of the two components of LESA, LE appears more straightforward and easier to implement. This is probably because it is based on a number of existing USDA land classification systems with proven ability. Soil potential ratings appear to be an especially useful tool for land evaluation. SA has been developed more recently and has not yet been subjected to as much rigorous testing. As a result, local officials should be judicious in their use of SA and seek to share their experiences with others.

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