METHODOLOGICAL CONSIDERATIONS FOR IMPLEMENTING THE U.S. SOIL CONSERVATION SERVICE LAND EVALUATION AND SITE ASSESSMENT (LESA) SYSTEM IN OREGON, WITH SPECIAL REFERENCE TO MARION COUNTY, OREGON

by

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Abstract

Oregon land use specialists believe that the present definitions of farm and forest land in the state planning goals are too broad. This results in poor quality resource lands being as strongly protected as those of top quality. With persistent growth pressure on rural lands, a means to distinguish among primary, secondary and nonresource lands must be developed so that these areas may be zoned for the uses for which they are best-suited.

The Oregon Land Conservation and Development Commission established a Rural Lands Advisory Committee in 1985 to study the resource lands problem. The committee is considering using a form of the U.S. Soil Conservation Service Land Evaluation and Site Assessment System to make the distinction among resource categories. Based on the experience of Marion County, Oregon, such an application of the system appears to be feasible. At least five other states have adopted some form of a statewide evaluation system, but, such a system could be more difficult to develop in Oregon because of the state's size, agricultural diversity and complex land use planning process.

There are several ways in which the Land Evaluation and Site Assessment System can be used in the Oregon land use program. To be most effective, the system should be developed and implemented at a regional or county level with close supervision by the Department of Land Conservation and Development. No matter what level of government is responsible, there are a number of technical and political issues that must be resolved before the system can be used in the Oregon program. Resolution of the problems hinges on thoughtful guidance by the Department and is necessary for consistent and justifiable results.

I. INTRODUCTION

Geographers have long been concerned with land use management. Throughout the development of the discipline, geographers have considered land a finite resource to be used wisely. George Perkins Marsh, an American geographer of the late 19th century, saw mankind as an unprecedented power "able to build or destroy civilization;" a power that should be used to "keep dominion over nature by careful control and intelligent planning" (Marsh 1874, p.viii). Marsh fostered the growth of what Pattison (1964, p.214) has termed the "man-land tradition" in geography.

Where Marsh was a prophet crying out for intelligent planning, those that followed became actively involved in the business of managing land use. John Wesley Powell and Carl Sauer pioneered efforts in surveying land capability. Their work was founded on a belief that different combinations of land characteristics made certain areas better-suited for particular uses. Likewise, O.E. Baker (1921, p.46) warned that the negative effects of growing population pressure on the American agricultural resource base could be reduced by using land "for the purpose most favored by the physical conditions." Charles Colby held a similar belief and saw a need for survey and classification of land. His four phase planning process which consists of: "survey and classification, appraisal, design and effectuation," is still useful in planning today.

Just as Baker predicted, pressure on the U.S. land resource base continues to increase, causing many land use conflicts. With the advent of a new environmental consciousness in America in the early-middle 1960's and early 1970's, many states (California, Delaware, Florida, Maine, New York, Vermont, Hawaii and Oregon, to name a few) implemented planning programs which attempted to minimize the negative impacts of population pressure on the land base. This growing state involvement in land use planning became known as a "quiet revolution in land use control" (Bosselman and Callies 1971, p.1).

The state of Oregon, concerned by unprecedented population growth, quickly became a leader in the "quiet revolution." Oregon's land use program particularly addresses resource preservation problems. Just as Powell, Sauer, Baker, Colby and other geographers suggested, the majority of Oregon legislators believed that intelligent planning--based on detailed resource inventory and appraisal--could help channel different land uses to the areas best-suited for those uses. Currently, Oregon is reassessing its resource land policies. The state is seeking a means for separating lands of marginal agricultural and forest productivity from those of high productivity. By doing this, rural growth can be directed to areas of little resource value while lands of high resource value can be more strongly preserved.

One technique being considered by Oregon's Land Conservation and Development Commission (LCDC) is statewide application of the U.S. Soil Conservation Service (SCS) Land Evaluation and Site Assessment (LESA) system. The system provides a methodology for rating the resource potential of different soil types. This paper attempts to:

(1) review the history of Oregon's "marginal lands" problem,

(2) provide an understanding of the LESA system using Marion County, Oregon, as a case study,

(3) identify the major technical and political problems with using the system and recommend ways of mitigating the difficulties.

II. BACKGROUND

Since World War II, Oregonians have become increasingly concerned with land use management. This concern was prompted by rapid population growth, nearly 40% between 1950 and 1970. The majority of the growth occurred in the Willamette Valley which contains 80% of the state's population as well as Oregon's most fertile soils. Increasing losses of farmland prompted the passage of Senate Bill 10 in 1969. This bill established the precedent for statewide planning but provided no financial assistance to planning jurisdictions and had limited provisions for enforcement (Bureau of Governmental Research and Service 1984, p.8).

Oregon's interest in land use management resulted in the 1973 passage of Senate Bill 100, the Oregon Land Use

Act. The Act, which mandated comprehensive land use planning, was an attempt to direct Oregon's rapid growth to areas best-suited for development while minimizing environmental impacts. It consists of a framework which (Bureau of Governmental Research and Service 1984, p.11):

> -established the Land Conservation and Development Commission, appointed by the governor,
>
> -created the Department of Land Conservation and Development (DLCD) to provide fulltime staff and coordinate functions for LCDC,
>
> -directed LCDC to establish statewide (planning) goals,
>
> -required all cities and counties in Oregon to prepare and adopt comprehensive plans consistent with statewide goals,
>
> -required state agencies' plans and actions to conform to LCDC goals and to city and county comprehensive plans,
>
> -directed LCDC to review all local comprehensive plans and implementing ordinances for conformance with statewide goals,
>
> -required widespread citizen involvement in the planning process at state and local levels,
>
> -allowed for appeals of local decisions alleged to violate state goals.

In the ensuing years, nineteen statewide goals have been developed to direct land use planning. Of particular importance to this paper are goals 3 and 4, which aim to protect agricultural and forest lands through exclusive use zoning. The goals define farm and forest lands and provide guidelines for zoning these areas.

Farmland, under goal 3, is "land of predominantly Class 1-4 in western Oregon and Class 1-6 in eastern Oregon as identified in the Soil Capability Classification System of the SCS" (Land Conservation and Development Commission, p.6). Capability classes are designated "according to the limitations of soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment" (U.S. Soil Conservation Service 1972, p.11). Classes are ranked from 1 to 8 with 1 being the soils with the least limitations and 8 being those with the greatest.

The LCDC's definition of forest land is somewhat less specific than its farmland definition. In fact, "it encompasses almost every area where trees are growing, have grown, or could be grown" (Leonard 1983, p.80). Using these definitions, planning jurisdictions are required to inventory their resources and, based on specified planning guidelines, zone their lands accordingly. Adjacent lands deemed necessary to maintain the integrity of resource lands also can be included in exclusive use zones.

With Senate Bill 100 in place for over a dozen years now, LCDC's initial directives (i.e., formulating goals and reviewing comprehensive plans) have, for the most part, been completed. Efforts in more recent years have dealt with refinement of the statewide planning program. For example, in May of 1982, Governor Atiyeh appointed 12 citizens to a Task Force on Land Use in Oregon and requested that they "conduct an impartial evaluation of both the positive and

negative impacts of Oregon's land use planning program" (Governor's Task Force 1982, p.4).

In reference to goal 3, the Task Force made a number of recommendations, two of which suggested that agricultural land be more specifically identified and that rural development be allowed on marginal agricultural land (Governor's Task Force 1982, p.20). These recommendations reflected "two major problems facing Oregon's nationally recognized farmlands protection program:

> (1) how to stop the steady flow of nonfarm residences into supposedly 'exclusive farm' zones, and
>
> (2) how to respond to criticism that LCDC's Agricultural Lands Goal is too broad - protects land of little or no agricultural value" (Benner 1983, p.3).

Similar criticisms have been expressed concerning LCDC's Forest Lands Goal.

The state's most direct attempt at dealing with these problems was the passage in 1983 of Senate Bill 237, the Marginal Lands Bill. This law provides a method by which counties can reclassify resource lands as marginal land if they fall below a specified annual gross income standard and meet one of three tests which are based on degree of parcelization and soil capability class or forest site index (Oregon Revised Statutes 197.247<1>). Use of the method is optional and, because of unrealistic and unclear marginal lands standards, only a few counties have attempted to apply it. When Lane County did a marginal lands review they found

the criteria to be "too rigid, ambiguous and difficult to empirically verify" (Burns 1984, p.1-3). Similar conclusions were reached by a Marginal Lands Committee of the Association of Oregon County Planning Directors (AOCPD). This committee felt that "the present legislation cannot meet the needs of most Oregon counties" and, should the law be revised, incorporation of "major features" of the SCS LESA system might be useful (Association of Oregon County Planning Directors 1984, p.1).

Since the consensus among Oregon's land use professionals is that Senate Bill 237 is ineffective in dealing with the marginal lands problem, LCDC in October of 1985 established a Rural Lands Advisory Committee to study the issue. The committee has met several times and has reached general agreement on the following aspects of the problem (Department of Land Conservation and Development, p.1,2):

1) The current definitions of agricultural and forest lands under goals 3 and 4 are too broad and include lands with limited resource value. This results in the best (primary) resource lands not receiving appropriate protection while the less valuable (secondary) lands are overprotected.

2) The land evaluation part of LESA appears to provide a practical means to rate the soil potentials for cropland, woodland and rangeland which is more useable for identifying agricultural and forest lands than the SCS capability system.

3) Secondary resource lands cannot be identified based solely upon soil potentials. Additional factors such as parcelization need to be considered.

4) Primary resource lands should receive more protection than existing exclusive farm and forest zones provide while secondary lands should have less restrictions than currently required.

5) A rural development goal may be required to establish the appropriate planning, use, density and service standards for nonresource and rural residential, commercial and industrial areas.

Based on these five conclusions, the Rural Lands Advisory Committee is trying to assess the potential of the LESA system for identifying resource classes. Consequently, the committee is studying various methods for applying the system.

III. THE LAND EVALUATION AND SITE ASSESSMENT SYSTEM

The LESA system is a methodology devised by the SCS to assist land use managers in evaluating the relative resource potential of various parcels of land. It is implemented in two parts: the LE, which gives a numerical rating for physical soil characteristics, and the SA, which rates the economic viability of a parcel. Combining the ratings provides a resource assessment more locally-specific and comprehensive than the SCS capability/woodland classes and the SCS prime and unique farmlands designations. The LESA system can be adapted for use at any level of government but

has "most meaning for county or township level planning" (U.S. Soil Conservation Service 1983, p.601-2).

The SCS field tested the system in 1981 in twelve counties in six different states. Reactions to the system were generally favorable and it was included in the implementation procedures of the 1981 National Farmland Protection Program (Subtitle I of Title XV of the Agriculture and Food Act, Public Law 97-98). Recently, a few Oregon counties, namely, Linn, Josephine and Marion, have developed LESA systems for use in planning.

The LESA system was designed to be "flexible and consistent" and to "include local values and objectives" (U.S. Soil Conservation Service 1983, p.600-2,3). Consequently, each jurisdiction utilizes a unique approach to implementation. In the National LESA Handbook, the SCS outlines a basic procedure for developing the system but allows for local variation.

Land Evaluation

Two approaches to land evaluation (LE) are presented in the handbook. One determines a soil productivity rating which is an estimate of optimum crop yield based exclusively on existing soil survey data, and the other produces a soil potential index which is calculated using current, localized agricultural data in conjunction with soil data. The major differences between the two are the amount of generalization involved and the recency of the data. "When they are available, soil potentials are used in place of soil

productivity because these ratings enable planners to consider the local agricultural industry" (U.S. Soil Conservation Service 1983, p.601-7).

"The soil potential index (SPI) can be expressed by the equation (U.S. Soil Conservation Service 1983, p.601-7):

SPI = P - (CM + CL), where,

P = index of performance or yield as a locally established standard,

CM = index of costs of corrective measures to overcome or minimize the effects of soil limitations, and

CL = index of costs resulting from continuing limitations."

Basically, soil potential can be determined in five steps: (1) choose an indicator crop (or crops) representative of the local agricultural industry, (2) estimate crop yield on all soil types or soil groupings and calculate the gross income return on each, (3) calculate management costs for the crop on each soil unit used, (4) subtract management costs from the gross return to get a net return, and (5) convert the net return to a convenient point scale.

Site Assessment

Developing site assessment (SA) ratings requires the "identification of factors, other than soils, that affect the economic viability of a site for agricultural use" (U.S. Soil Conservation Service 1983, p.602-1). The criteria are given a point value (or range) based on the relative significance of their impact on the agricultural use. Since

site factors are chosen and weighted subjectively, a committee of various local experts is essential to this process. The SCS (U.S. Soil Conservation Service 1983, p.602-5,6) gives the following major categories of SA criteria: "current land use, agricultural economic viability, land use regulations and tax concessions, alternatives to the proposed use, impact of the proposed use on surrounding lands, and compatability with comprehensive development plans and available infrastructure." Any combination of these factors, or other locally important ones, can be used in the assessment.

Because of the flexibility allowed in the use of a LESA model, few planning jurisdictions follow the same development procedure. Criteria unique to each jurisdiction are generally included. For this reason, the following example is presented to help understand how a particular Oregon county developed and applied the system.

IV. EVALUATING MARGINAL LANDS: A CASE STUDY IN MARION COUNTY, OREGON

During the summer of 1985, the planning division of Marion County, Oregon, oversaw the development of the LE system for that county. From the outset, the planning division's concern was for an application of the system to marginal lands. Since the SA portion of LESA rates parcel specific characteristics, it can be quite time-consuming to apply to an entire county. Due to time and financial

constraints, the Marion County planning division did not produce SA ratings. The LE, on the other hand, was based on soil mapping units (regions of homogeneous soil productivity) as opposed to individual parcels. Consequently, the agricultural potential of Marion County's soils was evaluated for each of its 88 soil mapping units (as delineated in the SCS county Soil Survey) and not for a multitude of individual parcels.

Developing Agricultural Potential Ratings

The LE process involved a series of meetings by a committee consisting of the SCS district conservationist, SCS area soil scientist, several Oregon State University extension agents and a representative of the county planning division. The first meeting focused on the selection of indicator crops. Because of the number and diversity of crops grown in Marion County, selection of indicators was not a simple task.

To facilitate effective land evaluation, indicator crops should represent as many of the county's agricultural practices as possible. Therefore, indicators were selected to: include each of the county's crop types, cover the spectrum of soil classes (and geomorphic units) and include the greatest revenue producers and land users. Based on these criteria, five crops were chosen: fine fescue, winter wheat, irrigated sweet corn, filberts and nonirrigated permanent pasture. Fine fescue was chosen, for instance, because it represented grass crops, was grown on hillslopes,

brought in a large amount of revenue and covered a large land area. Irrigated sweet corn represented row crops, was grown on valley bottomlands, was economically important and also covered a large land area. In similar fashion, the remaining indicator crops were selected. These five crops were believed to represent most of Marion County's agricultural industry.

Since the necessary data were available, and because the county planning division desired current, locally specific information, the LE committee chose to develop SPI's for each of the county's soil mapping units. This required that crop yield and management information be specified for each indicator crop on each soil type.

By combining the experience and informed opinion of extension service crop specialists with the soils knowledge of SCS scientists, yield estimates were prepared for each soil mapping unit assuming a high, but achievable, level of management. Likewise, descriptions and costs of crop management practices were identified. A useful outline of this information can be found in enterprise data sheets prepared by the Oregon State University extension service. However, these sheets are not all current and required updating to provide consistent data.

Once these data were gathered, they were arrayed for each crop as shown in the example in table 1. Gross returns were calculated by multiplying the yield estimates by the current price. Total management costs were subtracted from

Table 1. Soil Potential Worksheet for Sweet Corn

Soil Mapping Unit	Yield* (tons/ac)	Standard Management Costs	Variable Management Costs					Total Variable Costs	Total Management Costs	Gross Return	Net Return	Soil Potential Index
			Lime	Supplement Fertilizer	Irrigation	Drainage	Picking					
AbA	10	288.66	23.00	61.25	34.45		80.00	198.70	487.36	760.00	272.64	99.4
AbB	10	288.66	23.00	61.25	34.45		80.00	198.70	487.36	760.00	272.64	99.4
Ad - not grown on this soil												
Am	9	288.66	23.00	61.25	35.78	70.00	72.00	262.03	550.69	684.00	133.31	67.6
Ba, Ca - not grown on this soil												
Ca	5	288.66	14.70	70.00	43.73		40.00	168.43	457.09	380.00	-77.09	19.5
CeC	7	288.66	23.00	61.25	34.45	86.00	56.00	260.70	549.36	532.00	-17.36	33.2
Ch	10	288.66	23.00	61.25	33.13		80.00	197.38	486.04	760.00	273.96	99.7
Ck	8	288.66	23.00	61.25	42.40	86.00	64.00	276.65	565.31	608.00	42.69	46.9
CLD - not grown on this soil												
Cm	10	288.66	14.70	70.00	31.80		80.00	196.50	485.16	760.00	274.84	99.9
Co	6	288.66	23.00	61.25	35.78	86.00	48.00	254.03	542.69	456.00	-86.69	17.4
Cu	5	288.66	23.00	61.25	43.73	86.00	40.00	253.98	542.69	380.00	-162.69	0
Da	6	288.66	23.00	61.25	43.73	86.00	48.00	261.98	550.64	456.00	-94.64	15.5
HaB, HaD, HcD2, HEE, HEF, HEG - not grown on these soils												
Ho	8	288.66	23.00	61.25	42.40	70.00	64.00	260.65	549.31	608.00	58.69	50.5
HRD, HSC, HSE, HTD, HTE, HTF, HuB, HuD - not grown on these soils												
JoB	8	288.66	23.00	61.25	38.43		64.00	186.68	475.34	608.00	132.66	67.4
JoC	8	288.66	23.00	61.25	38.43		64.00	186.68	475.34	608.00	132.66	67.4
JoD, JoE, KCD, KCF, KCG - not grown on these soils												
La	8	288.66	23.00	61.25	31.80	86.00	64.00	266.05	554.71	608.00	53.29	49.3
MaA	9	288.66	23.00	61.25	35.78	70.00	72.00	262.03	550.69	684.00	133.31	67.6
MaB	9	288.66	23.00	61.25	35.78	70.00	72.00	262.03	550.69	684.00	133.31	67.6
Mb	9	288.66	23.00	61.25	31.80	70.00	72.00	258.05	546.71	684.00	137.29	68.5
McB	6	288.66	23.00	61.25	37.10		48.00	169.35	458.01	456.00	-2.01	36.7
McC, McD, McE, MlD, MmE, MUE, MUF, MUG, MYB - not grown on these soils												
NeB	8	288.66	23.00	61.25	42.40		64.00	190.65	479.31	608.00	128.69	66.5
NeC	8	288.66	23.00	61.25	42.40		64.00	190.65	479.31	608.00	128.69	66.5
NeD, NeE, NeF, NkC, NsE, NsF - not grown on these soils												
:												
:												

*price used is $76/ton

Source: Fastner 1985.

gross returns to get net returns. The net returns for each crop on each soil type were then arrayed as shown in the example in table 2. To derive a single index from these values, the most profitable crop on each soil was determined and its net return was converted to a 100 point scale to get an overall agricultural potential rating (APR).

Application of Agricultural Potential Ratings

LESA initially was designed to compare the agricultural viability of parcels of land. However, the SCS emphasizes that the system was developed to be flexible in its application so that local objectives could be met. In Oregon, county planners hope that this system will provide a means for identifying which lands, now zoned for farm or timber use, do not warrant protection.

The usual procedure for taking land out of exclusive use zoning is by the methods established in the Marginal Lands Bill. Consequently, even if the LE system meets Marion County's objectives, as yet, there is no legal precedent to use it for this purpose. Still, Marion County's application provides a test case that merits attention.

The first step in identifying soils of marginal productivity involved the elimination of 16 soil mapping units based on their SCS woodland site class. "To avoid evaluating prime commercial forest soils for their farm value, all units with an SCS site class rating of 1,2 or 3 were deleted" (Nebon 1985, p.7). Ideally these soils would

Table 2. Agricultural Potential Worksheet

Soil Mapping Unit	Winter* Wheat	Irrigated* Sweet Corn	Fine* Fescue	Filberts*	Non-irrigated* Permanent Pasture	Most* Profitable Crop	Agricultural** Potential Rating
Aba	174.75	272.64	217.23	340.89	36.02	340.89	86.5
AbB	174.75	272.64	217.23	340.89	36.02	340.89	86.5
Ad - not grown on this soil					-26.98	-26.98	4.0
Am	8.00	133.31	147.23	219.20	18.02	219.20	59.2
Ba	-173.00		-93.77		.02	.02	10.1
Ca	-122.25	-77.09			-26.98	-26.98	4.0
CeC	-25.00	-17.36	47.23	95.87	4.52	95.87	31.6
Ch	119.75	273.96	217.23	340.89	36.02	340.89	86.5
Ck	-124.00	42.69	97.23	100.04	.02	100.04	32.5
CLD - not grown on this soil					36.02	36.02	18.2
Cm	119.75	274.84	117.23	340.89	36.02	340.89	86.5
Co	-107.00	-86.89	+81.23		4.52	81.23	28.3
Cu	-173.00	-162.69	+81.23		.02	81.23	28.3
Da	-140.00	-94.64	+81.23		.02	81.23	28.3
HaB	-196.70		9.73	33.04	-8.98	33.04	17.5
HaD	-196.70		9.73	33.04	-8.98	33.04	17.5
HcD2			-40.27		-8.98	-8.98	8.1
HEE					-35.98	-35.98	2.0
HEF					-44.98	-44.98	0
HEG - not grown on this soil							
Ho	-58.00	58.69	147.23	196.37	18.02	196.37	54.1
HRD					9.02	9.02	12.1
HSC					9.02	9.02	12.1
HSE					9.02	9.02	12.1
HTD	-61.20		-84.73	120.89	36.02	120.89	37.2
HTE					36.02	36.02	18.2
HTF					27.02	27.02	16.1
HuB	-61.20		-84.73	120.89	36.02	120.89	37.2
HuD	-61.20		-84.73	120.89	36.02	120.89	37.2
JoB	21.30	132.66	184.73	328.57	18.02	328.57	83.7
JoC	21.30	132.66	184.73	328.57	18.02	328.57	83.7
JoD	4.80		134.73	328.57	.02	328.57	83.7
JoE			84.73		.02	84.73	29.1
:							

*crop values represent net returns per acre

**APR's are based on a 100 point scale

Source: Fastner 1985.

be identified by a forest land LE index but, due to time, technical and financial constraints, Marion County has not yet implemented such a system.

The 72 remaining mapping units were then arrayed in order of their APR (table 3). Of particular significance was the natural break in the ratings around 32. "Those above a 32 rating typically have one indicator crop that will produce a net revenue of $100 or more per acre (the standard for special tax assessment at farm value in a nonfarm zone)" and "in most cases they also have a second profitable indicator crop capable of producing $50 or more of net revenue per acre" (Nebon 1985, p.7,8). Because those soils with APR's between 25 and 30 were quite close to the $100 per acre threshold, the cutoff between farm and nonfarm soils was placed at 25.

Using an APR of 25 as the farm/nonfarm cutoff left 29 soil mapping units as potential nonfarm soils. Of these units, seven were eliminated because of specific characteristics that would severely limit rural development (i.e., high water tables and location on floodplains), two were eliminated due to their unique productivity for a certain specialty crop (onions) and 14 were removed because of potential forest land status. This left six units for rural development consideration. "Should the state planning program be revised to allow use of APR's to identify nonresource lands, the next step would be to map these six soil units to determine how much is in cohesive units large

Table 3. Primary, Secondary Nonresource Soils

Soil Map Unit	Ag. Pot. Rating	SCS Cap. Class	Net. Ret. Most Profit.crop $/acre	Net. Ret. 2nd Most Profit. Crop $/acre	Slope In %	# acres in County
W1A	100.	I	401	275	0-3	9,730
W1C	100.	II	401	275	3-12	1,270
AbA	86.5	I	340	272	0-3	1,060
4AbB	86.5	II	340	272	3-5	408
Ch	86.5	I	340	273	0-3	5,730
Cm	86.5	II	340	274	0-3	20,165
JoB	83.7	II	328	184	2-7	9,970
JoC	83.7	III	328	184	7-12	7,425
JoD	83.7	III	328	134	12-20	3,709
WuA	73.9	II	284	273	0-3	61,230
WuC	73.9	II	284	273	3-12	9,577
WuD	73.9	III	284	217	12-20	4,490
SkB	60.0	II	222	184	2-6	1,467
SkD	60.0	III	222	134	6-20	420
SlB	60.0	II	222	184	0-6	4,977
Am	59.2	II	219	147	0-2	45,109
MaA	59.2	II	219	217	0-3	6,930
MaB	59.2	II	219	217	3-6	1,640
Mb	59.2	II	219	217	0-3	3,750
Nu	59.2	II	219	197	0-3	6,895
Nw	59.2	II	219	198	0-3	4,668
Sa	59.2	II	219	217	0-3	5,640
SuC	59.2	II	219	117	2-12	2,517
SuD	59.2	III	219	117	12-20	269
NeB	57.6	II	211	184	2-7	23,955
NeC	57.6	III	211	184	7-12	17,530
NeD	57.6	III	211	134	12-20	13,648
Bo	54.1	III	196	147	0-3	2,430
SnA	46.6	II	162	133	0-3	330
SnB	46.6	II	162	67	3-6	1,100
SnC	46.6	III	162	67	6-15	260
SwB	40.3	III	134	--	3-6	457
Ck	32.5	III	100	97	0-3	10,430
St	32.5	III	100	60	0-3	6,450
CeC	31.6	III	95	47	2-12	350
NkC	30.9	III	92	67	2-12	959
JoE	29.1	IV	84	0	20-30	995
NeE	29.1	IV	84	0	20-30	7,210
Co	28.3	III	81	4	0-2	14,980
Cu	28.3	IV	81	0	0-3	4,850
Da	28.3	IV	81	0	0-2	10,440
Wc	28.3	III	81	0	0-3	11,008
SvB	25.1	VI	67	--	0-7	1,710
La(U)	22.0	III	53	18	0-1	1,130
ClD(F)	18.2	III	36	--	2-20	2,408
SwD	17.9	IV	34	--	6-20	1,150
HaB	17.5	III	33	9	2-6	859
HaD	17.5	IV	33	9	6-20	750
Wa(W)	17.1	III	31	0	0-3	3,380
MyB(W)	14.1	VI	18	--	0-8	700
Ba(W)	10.1	IV	0	--	0-1	4,830
ScE	8.3	VI	--	--	3-40	3,318
HcD2	8.1	VI	--	--	2-15	605
NeF(F)	8.1	VI	--	N	30-40	2,910
KcD(F)	6.1	VI	--	N	2-20	11,020
NsE(F)	6.1	VI	--	N	2-30	2,005
Ad(W)	4.0	VII	--	N	0-3	2,790
Ca(W)	4.0	IV	--	--	0-3	5,815
KcF(F)	4.0	VI	--	N	20-50	22,395
MmE(F)	4.0	VI	--	N	2-30	2,615
NsF(F)	4.0	VI	--	N	30-50	2,910
WtE	2.7	VI	--	--	3-40	1,950
HeE(F)	2.0	VI	--	N	6-30	1,070
WhE(F)	2.0	VI	--	N	3-25	2,610
HeF(F)	0.	VI	--	N	30-55	2,640
WhF(F)	0.	VI	--	N	25-55	7,720
HeG(F)	N	VII	N	N	55-80	5,625
KcG(F)	N	VII	N	N	50-70	3,725
So(U)	N	III	N	N	0-1	1,190
Sy(X)	N	VII	N	N	0-80	720
Te(X)	N	VI	N	N	30-50	4,439
WhG(F)	N	VII	N	N	55-75	9,030

N = None
-- = Minus
O = No profit or loss
U = Unique crop
F = Forest Site Class 3
W = Wet
X = Unusable

Source: Nebon 1985.

enough to warrant development consideration" (Nebon 1985, p.9).

With the nonresource soils thus determined, it was necessary to determine the dividing line between primary and secondary resource soils. These soils do not appear to be as easily defined as nonresource soils. Basically, they represent areas where small-scale farming is the dominant land use. The chief planner has suggested five common characteristics of these lands in Marion County (Nebon 1985, p.9):

1) they do not require expensive drainage systems - typically lands with a 4 to 20 % slope,

2) they are within 5 to 10 miles of urban areas,

3) they are composed primarily of SCS capability class III and IV soils,

4) they are located in areas separated geographically from areas of large commercial farm operations, and

5) they are located in areas of fragmented ownerships with parcels predominantly in the 5 to 30 acre range.

The APR cutoff point for secondary resource soils was placed at 40. This point was chosen because of the characteristics of the lands and the break in the ratings.

From the five characteristics of small-scale farmlands identified by Nebon, it appears that the distinction between primary and secondary resource land is based mainly on site features other than soil ratings. Thus, the SA portion of LESA could potentially be employed in making this

distinction. To date, however, no attempt has been made to rate the SA criteria for Marion County.

V. PROSPECT OF STATEWIDE APPLICATION

Although the LESA system can be applied at any governmental level, Dosdall (1985, p.59,60) found that only Illinois, Hawaii, Delaware, Virginia and Utah have attempted to develop state systems. However, she points out that passage of the 1981 National Farmland Protection Policy Act provided an incentive for states to develop LESA systems because they can be used in place of the standardized federal system when considering the impacts of federal projects on farmland. Using a state developed system should provide more localized control over projects (Dosdall 1985, p.37).

Utilization of LESA in Other States

As LESA was designed to be flexible, both in development and application, each of the five states utilizing LESA has produced and used their ratings differently. Illinois uses a "high management grain crop index" based on corn, soybean, wheat and oat production and state SA criteria (Illinois Department of Agriculture 1983, p.3,7). Hawaii's system is still in the developmental stage and will be used to "identify important agricultural lands in the state" (Dosdall 1985, p.42). Delaware and Virginia have LESA's using basic soil productivity ratings and

county-specified SA criteria (Dosdall 1985, p.44,46). Utah's system was designed by the State Department of Agriculture but allows for county modification in the selection of indicator crops and SA criteria (Nellis and Nicholson 1985, p.271).

Each of the states' experience could be beneficial to the development of LESA in Oregon. However, because of the size, agricultural diversity and relatively complex land use planning process in Oregon, statewide implementation of LESA could be somewhat involved.

Statewide Application of LESA in Oregon

Because LESA is a relatively new tool, there is a variety of technical problems which must be addressed. And because statewide usage would affect Oregon farmland policy, there are several political issues that need to be resolved. Technical considerations fall into two categories: problems with methodology and problems with data. The next section of this paper will highlight key methodological issues, followed by a section presenting problems with data and one discussing political considerations. It is important to keep in mind that many of these issues are interrelated.

Technical Considerations - Methodology

Assuming that an Oregon LESA system would be based on APR's (this is the approach the Rural Lands Advisory Committee is considering), three problems immediately arise: (1) choosing indicator crops, (2) specifying a "high, but

achievable," set of crop management practices for each indicator, and (3) determining which management costs are to be included in the model. Choice of indicator crops is a problem because of the great diversity of crops grown in Oregon, particularly in the Willamette Valley. For instance, in Marion County, five crops were used as indicators of soil potential for an area that grows over 100 different crops.

Choosing Indicators. One solution to this problem is to set a threshold value for the amount of income generated by a crop; those crops which exceed the value would then be used as indicators. The chief planner of Marion County has suggested a threshold value of five percent of total county agricultural revenues. Thus, if a crop contributes more than five percent to a county's total agricultural income, it would be used as an indicator crop. If Oregon's objective is to maintain the commercial agricultural industry rather than just preserve prime land, a threshold based on generated revenue seems appropriate.

It is important to remember that the LESA system was designed to rate soils and not to prescribe management practices or specify which crops should be grown. Consequently, there is no need to evaluate every crop grown on every soil in the county. A group of representative crops is enough for LE purposes.

Choosing Management Practices. A second problem in using APR's is specifying the set of crop management practices to be used in the LE process. Since very few farmers follow exactly the same cropping procedures, a truly representative set of practices is difficult to specify. Additionally, it is hard to categorize management strategies as high, intermediate or low. It can only be done by consensus. Unfortunately this is somewhat subjective. The problem, however, can be minimized by clearly defining all assumptions made in establishing the management procedures and costs.

Choosing Costs. Similar to the problem of identifying management practices is the problem of determining which costs to include in the system. Marion County considered several costs (e.g., herbicide, fertilizer, harvesting) that Linn County did not (for a comparison see Fastner and Nebon 1985, and Steiner and others 1984). Presumably, the more costs that are built into the model, the more precise the result will be. It has been suggested by members of LCDC's Rural Advisory Committee that Marion County's LE is deficient in that it does not include land costs and property taxes, but including these would undoubtedly increase the complexity of the system.

A way of minimizing this problem would be to gather all the related costs and then to statistically analyze their importance to the final rating. A stepwise regression would indicate which of the independent variables (management

costs) are most statistically significant to the dependent variable (SPI). This would be an interesting statistical exercise but its practical value is questionable. It seems likely that the relative importance of the management costs would vary from county to county. Thus, each county would have to perform such an analysis. Although time-consuming, a statistical analysis could reduce the amount of data collection because the most statistically significant variables would be identified.

Other methodological problems that require attention are: techniques for evaluation of forest and range land, the influence of the market and specification of SA criteria. Besides developing a cropland LESA, SCS has prepared a procedure for evaluating forest land and is devising one for evaluating range land (as of the 1983 National LESA Handbook). To redefine all of Oregon's resource zones, a system must be developed that can estimate the relative worth of soils for each of these land uses. It is beyond the scope of this paper to address the technical problems of forest and range land evaluation, however, a few important points are worth mentioning.

Evaluating Forest and Range Lands. First, the handbook's procedure for evaluating forest land is based on woodland productivity ratings for an indicator tree species (U.S. Soil Conservation Service 1983, p.601-29). If it were used as presented, the level of specificity would not be consistent with that of the APR's (woodland ratings are

similar to capability classes which have been found to be too general in the context of Oregon's land use program). Second, at least two Oregon counties (Linn and Josephine) have recently attempted a forest evaluation. In Linn County the system was developed by the SCS area soil scientist and in Josephine County it was prepared by a private forestry consultant. Both evaluations are based on the SPI process.

Having a private firm develop indices might be cost prohibitive. It cost Josephine County approximately $12-13,000 to have a computerized methodology prepared and indices calculated (Bartow 1986). However, this same computer package is now available to other counties so using it would cost much less in future evaluations. Josephine County's forest soils rating has been sanctioned by both the SCS and the LCDC.

A third point on forest and range land evaluations is that Dosdall (1985, p.72) indicates that there is little experience across the country with either type of evaluation. An approach to range land evaluation could follow the example of Monroe County, New York, which combined corn and hay yields (the major crops in this dairy county) into an index of "total digestible nutrients" (Dosdall 1985, p.62). Application of this technique to Oregon would require data on the nutrient value of native forage crops as well as the approximate crop cover in the evaluated area. An adaptation similar to this was presented

to the Rural Lands Advisory Committee by Oregon's state SCS range land conservationist.

Baker County, Oregon, is now being used as a test site by the SCS for development of a range evaluation system but the results of this experiment are not yet available (Eber and Rupp 1986). Obviously, the range and forest systems need to be more clearly outlined to be useful in Oregon's resource preservation program.

Effect of Market on LESA. Another methodological issue which needs clarification concerns the influence of the market on APR's. One of the underlying assumptions in the development of these ratings is that the local economy affects what is classified as high quality soil. Ratings based on net returns per acre obviously include market as well as soil information.

The relative importance of a crop is a function of market demand. When a crop is in high demand, land with the particular combination of soil constituents most conducive to the growing of that crop will be considered prime. Thus, changes in the market can cause changes in the definition of prime farmland. Likewise, changing prices influence market demand and thereby affect the definition. For these reasons, a LESA system and any land use regulations based on that system may require periodic updating. In attempting to use the LESA system to reevaluate resource lands, LCDC should not assume that there is a "one-time, cure-all" solution.

Specifying and Weighting SA Factors. The last methodological issue to be discussed here is specifying and rating SA criteria. This could be the "weakest link" in LESA because it contains elements of subjectivity. On the other hand, once the SA criteria are defined and an acceptable weighting method is devised, the LESA system could greatly improve the consistency of decision-making by providing a replicative procedure for evaluation.

Because of Oregon's size and agricultural diversity, it would not be effective to use one set of statewide SA standards. Specific criteria need to be specified at the county or regional level. However, LCDC could set parameters and have final approval over the selection of site factors.

It already has been suggested that the SA system is important for separating secondary from primary resource lands. Therefore, the first step in choosing SA factors would be to consult planners in various regions and utilize their experience to construct a list of characteristics common to secondary lands within the regions. Most planners have a good knowledge of which lands in their jurisdiction are the less productive resource lands. From the list of characteristics, those factors most significant and representative should be chosen for the SA process. The more easily measured the criteria are, the more consistent the assessment would be. For example, in Linn County the three site factors employed were the number of residences

within 1/4 mile of the parcel, the compatability of adjacent land uses (with compatability being specifically defined) and field size (Steiner and others 1984, p.23,24). As Dosdall (1985, p.68) points out, with precisely defined factors such as these, "there is no room for subjective judgement on the part of the scorer."

After the SA criteria are specified, a means of weighting each must be prepared. This can be done using a relative point scale or, as the planning director of Josephine County has suggested, the criteria could be given dollar values (Bartow 1986). This would entail calculating the impact of adjacent uses, number of peripheral residences, etc., on land value. Such a rating methodology would be useful but also quite complex and time-consuming to develop. For the sake of simplicity the use of a relative point scale might be more appropriate. Two sources that would be useful for SA specification are the National LESA Handbook, which gives a detailed list of pertinent criteria, and Dosdall's paper (1985, p.64) which lists other commonly used criteria.

As mentioned previously, the SA process was designed to be applied to individual parcels. It would be impossible to assess the site constraints of every parcel in a county. Therefore, as Nebon suggested (1985, p.9), potential secondary resource lands--identified by their LE rating--could be mapped, and those in large enough blocks to

be rezoned for rural development could be given an SA rating to determine their primary or secondary classification.

Technical Considerations - Data

The final technical constraint to be considered here is the availability of consistent soil data. The most recent SCS information (October 1984) on the status of Oregon soil surveys shows that there are published surveys for approximately 21% of the state, that surveys are finished but awaiting publication in 12% of the state, that surveys are in progress for 23% of the state, and that surveys have not been done for 45% of the state (obtained from a U.S. Soil Conservation Service map). Much of the land without soil surveys is in federal ownership and not regulated by local governments. Still, there are many areas of private land that require modern soil survey data. The SCS was hoping to complete these surveys by the late 1990's but funding is uncertain. Consequently, collection of the data within an acceptable time frame for LCDC's purposes would most likely require additional money from the state (Latshaw 1986).

Another avenue the Rural Lands Advisory Committee is pursuing would require the use of existing, but less detailed, soil data for the development of LE systems in these areas. Whether these systems would be the final, or merely an interim step, needs to be decided. Although the problem of data availability is less involved than the methodological issues, it can be a definite constraint to

the development of a LESA system. Without data there can be no system and, without consistent data, the validity of the system would be questionable.

Political Considerations

Since use of LESA would lead to changes in Oregon's resource land policies, political problems abound. The key issue is defining primary, secondary and nonresource lands according to LESA indices. Interrelated problems involve determining the most effective level of jursdiction for developing and implementing the system and for bearing the associated costs. Finally, a better means for enforcing the accompanying land use regulations must be devised or the effort put into developing LESA will have been in vain.

Defining Primary, Secondary and Nonresource. At the very heart of the marginal lands problem is an issue that has no totally satisfactory resolution: that is, how to define primary, secondary and nonresource lands. The SCS has attempted to define prime farmland based on entirely objective criteria. It has set specific standards for prime soils' moisture regime and water-holding capacity, temperature regime, pH level, water table level, salt and sodium content, flooding potential, erodability potential, permeability rate and texture (U.S. Soil Conservation Service 1978, p.4030-4032). The SCS requires its state offices to map these soils along with unique soils (which are qualitatively defined) and additional lands of statewide importance (defined by state SCS officials).

Although the prime and unique criteria are more definitive than the capability and woodland classes (on which current farm and timber zoning is based), they are still too generalized to be used in Oregon's land use planning process. For instance, well over 90% of the soils in the western half of Marion County are designated prime, unique or of statewide importance. Despite these classifications, there are several small areas in the western half of the county that qualify as nonresource soils according to their LE rating.

The problem with classifying soils by quality is that the concept of "quality" is very subjective. It is "relative to some defined population, varies according to the dictates of the market, is both time-bound and space-bound," and, in the end, "the subjective judgements of the planners, legislators, and the public must be the ultimate arbiters of value or primeness" (Skold 1975, p.158; Raup 1976, p.181; Wood 1976, p.911; and, Coughlin and others 1977, p.269). The SCS's definitions include none of these considerations. The LESA system, on the other hand, can incorporate market variations and time and space limitations. Still, as Coughlin and others point out, the difficult task of identifying prime lands falls to land use managers.

Because of Oregon's diverse agricultural industry, definitions of primary, secondary and nonresource lands must be made at least at a regional level. This would require

that the state be divided into homogeneous agricultural regions. Then a committee of resource and land use planning experts could designate standards.

Choosing the Level of Jurisdiction. An issue much related to the definitional problem is who should develop, pay for and implement a statewide LESA system. Should DLCD produce a system and require that counties use it, or should counties develop their own systems based on LCDC guidelines? Because of the time and cost involved, it would probably be easiest to develop LESA at the state level. However, it seems probable that Oregon counties would desire more control over the development of a system which could lead to rezoning certain of their lands.

Under the Oregon land use program, counties are responsible for the planning of most non-urban areas. Consequently, LESA systems would most likely be applied at the county level. However, to maximize consistency in APR's LESA should be developed at a regional level.

Regional development of the LE portion of the system would be most effective for several reasons. First, it would reduce the workload on the SCS and extension service by eliminating redundancy that would occur when they help agriculturally similar counties prepare LE ratings. Second, regional development would ensure that counties using the same indicator crops include the same price, yield and cost estimates. Third, even if counties used different indicators, by developing LE ratings at the regional level

they would be assured that the process for developing those ratings is consistent.

For similar reasons, it would be most effective to produce SA criteria at the regional level. However, since each county has unique planning concerns and procedures, regional SA factors would probably be more difficult to establish. The factors would need to be common to all counties in the region and a standard rating system devised. Counties with unusual site problems would have to produce their own criteria. Further study is necessary to determine whether or not the site characteristics of neighboring counties are similar enough to be developed into regional SA criteria.

In order for a statewide LESA program to be effective, LCDC would have to amend the goals to require county compliance by a certain date. The compliance process would would be similar to comprehensive plan acknowledgement. Use of LESA could be made optional as was done with the Marginal Lands Bill. But, like this Bill, allowing optional use might not provide enough incentive to be effective. Whichever implementation strategy is followed depends on the extent of the resource lands that need reclassification.

Need for Stronger Enforcement. One of the major criticisms of Oregon's farmland policy by the watchdog group 1000 Friends of Oregon is that counties have frequently misapplied planning criteria when making land use decisions

in resource zones (Benner 1985, p.9). Thus, it would be necessary for DLCD to supervise counties during the LESA implementation phase. If the intent of reclassifying resource lands is to preserve large blocks of land and to channel growth to nonresource lands, then stricter enforcement of land use regulations must accompany the use of LESA. Once lands are reclassified, the Rural Lands Advisory Committee has suggested that land use regulations be tightened on primary lands, loosened on secondary lands and rewritten entirely for nonresource lands (Eber and Rupp 1986). A step has been taken to improve enforcement with the passage of a 1983 bill (Oregon Revised Statutes Chapter 197.060) which requires counties to report their EFU decisions to DLCD for review. The intent of this legislation is to make counties more accountable for their decisions. Justifiable and well-enforced land use regulations are necessary for LESA to have any impact on the present resource policy.

VI. SUMMARY AND CONCLUSIONS

Oregon is currently reassessing its land use program. One area targeted for change is farm and forest resource protection. In the dozen years or so since the Legislature passed the Oregon Land Use Act, it has become apparent that the procedure set down in the law for identifying and zoning resource lands is not as effective as desired. It encompasses some lands that have no resource value and makes

no provisions for varying degrees of value. This broad approach to resource preservation does not reduce enough of the development pressure on prime lands.

The state has tried to remedy the situation by passing a Marginal Lands Bill, which provided a method for separating lands of marginal resource value from those of high value. Because of "ambiguity and rigidity" in the methodology, this legislation has found little support among planners. Consequently, LCDC has put together a Rural Lands Advisory Committee to address this resource reevaluation issue. The committee is seriously considering statewide use of the SCS LESA system to help reclassify lands.

LESA is a systematic procedure for evaluating a parcel's potential resource productivity based on its physical soil properties and site characteristics. The system is designed to be adaptable to local needs. At least three Oregon counties have developed LESA models, and one of these (Marion County) has tried to assess the value of LESA for distinguishing nonresource from primary resource lands. Marion County's experience indicates that nonresource areas are so designated because of low soil ratings, whereas site criteria such as parcel size, neighboring land uses, etc., generally separate secondary from primary lands. As yet, Marion County has not used the numerical site rating (SA) to assess the site value of its suspected secondary resource lands.

If LCDC were to incorporate a LESA-type system into the state land use program, it would have to first resolve several technical and political problems. Generally, LCDC would have to: (1) identify the types of soil and site data to be used in the system, (2) refine the forest and range LE systems which are not as well-developed as the agricultural LE, (3) require some form of periodic updating, (4) decide at which level of planning the system would be developed and paid for, (5) specify consistent criteria for defining primary, secondary and nonresource land, and (6) strengthen enforcement of land use regulations so that these lands are preserved for their designated uses. Other difficulties would undoubtedly appear as the system was used, but these six represent the major categories of problems that would need addressing.

Several other states have used LESA and found it useful. Though they have developed their ratings by different processes and for different purposes, their experience could be beneficial to Oregon. The LCDC would probably benefit from consulting these states before implementing a statewide system.

The LESA system has potential for use as a tool in reclassifying Oregon's resource lands. However, producing a state level system presents some major obstacles. The steps in developing and implementing LESA must be very well outlined by the DLCD, otherwise, it is quite possible that the LESA system will be no more effective than the Marginal Lands Bill for identifying different classes of resource lands.

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