Land Evaluation and Site Assessment: A Guidebook

SOIL

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Foreword

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Acknowledgments

Journal of *Soil and Water Conservation* *Agricultural Land Evaluation and Site Assessment: Status* of *State and Local Programs* (1991),

A Decade with LESA: The Evolution of *Land Evaluation and Site Assessment* (1994),

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John Keller, Nancy Bushwick-Malloy, and Joyce Ann Pressley. We also thank Lynn Timmons, Lori Baer, and Sasha Valdez of Arizona State University for their help with the accounting management of the project. Graduate students who helped during the various phases of this project and whose work shows in many ways in this *Guidebook* are John C. Leach, Lyssa Papazian, Joyce Ann Pressley Christine Shaw, and Adam Sussman.

Our appreciation for their guidance and interest in our project is extended to the Soil and Water Conservation Society, especially to Sue Ballantine and Doug Snyder, the editors who worked closely with us. Finally, our sincere thanks for her skills, patience, and persistence to Janet Meranda, who did the word processing through many drafts of the manuscript and to Nancy Knowlton who helped Jan with layout and design, as well as word processing of the first draft. Without the help of all of these people, and others who contributed documents and other materials, we could not have completed this *Guidebook.*

James R. Pease
Corvallis, Oregon

Robert E. Coughlin
Philadelphia, Pennsylvania

ing into account not only soil quality but also other factors that affect agricultural practices and then rating farmland sites on a relative scale for decision making.

The Site Assessment criteria identified numerous social, geographic, and economic factors that affect land-use decision making, such as proximity to urban centers and the level of agricultural investments and agricultural infrastructure. By adding the Site Assessment portion to LESA, NRCS produced a tool which, when used properly, helps federal agencies make decisions for funding or project development that do not augment urban sprawl or convert prime farmland to other uses.

Pilot ***tests.*** Once the LESA concept had been drafted, NRCS tested the concept in 12 counties in six states in the United States. In each county, an NRCS district conservationist teamed up with the county planner and other local officials to create a locally focused Site Assessment system to accompany the local soil and agricultural productivity data in the Land Evaluation part of the system.

The pilot states represented different types of land use and land capability from around the United States. For example, in DeKalb County Illinois, 97 percent of the land was prime farmland in 1980, whereas in Whitman County, Washington, less than 10 percent of the land was prime-mainly because of highly erodible soils

At the end of the pilot test period, all participants in the test program attended a conference in Washington, D.C., to share information and their experiences and to make recommendations on developing a national model. From data collected at the conference and in the field, the 1983 National Agricultural Land Evaluation and Site Assessment Handbook was written to provide guidelines for implementing the LESA system in the rest of the nation.

Farmland Protection Policy Act of ***1981.*** In 1984, LESA criteria were included in the federal Farmland Protection Policy Act (FPPA) rule to help federal agencies determine which agricultural land should be protected from development. This marked the first time that federal agencies had guidelines that enabled staff to decide how their funds would contribute to land uses impacting agricultural lands. FPPA requires federal agencies to use LESA criteria to identify and take into account potential adverse effects of federal programs on the preservation of farmland. It also requires agencies to consider alternative actions, and as appropriate, to lessen such adverse effects and ensure that federal programs are coordinated

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Overview

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- Which farm sites should be given highest priority for purchase of development rights?

- What is the significance of highway project impacts on farmland?

- Should a zoning permit be given to partition farm land or to allow a non-farm use?

- Which site among development project alternatives least impacts agricultural lands?

The primary subject of this Guidebook is the development of agricultural LESA systems for state or local use. However, LESA can be adapted to a number of other resources, such as forestland, rangeland, aggregate sites, riparian zones, and wetlands, as well as evaluating land suitabilities for urban or rural development. The application of LESA to forestlands is discussed in Appendix B. Other applications are discussed in Appendix C.

This Guidebook builds on the LESA experiences of state and local governments over the past dozen years and on a number of research studies of LESA systems. It addresses the range of topics a state or local government committee will encounter in developing a local LESA system, beginning with the question of whether a LESA system is needed or not. Once it is determined that a LESA system is needed, the Guidebook outlines steps for the following:

- appointing a LESA committee,

- specifying one or more factors measuring soil quality for the Land Evaluation component,

- specifying another set of factors relating to non-soil site conditions for the Site Assessment component,

- developing a rating scale for each factor,

- assigning weights to each of the factors,

- tallying the weighted factor ratings to obtain a LESA score, and

- preparing score thresholds for decision making.

The factors and weights will be accepted only if they and the resulting LESA scores make sense to local farmers and officials. Therefore, involvement of knowledgeable local people in formulating a LESA system is vital.

With the help of the LESA committee, a proposed LESA system should be thoroughly field checked and adjusted accordingly before it is adopted. After adoption, it should be reviewed periodically to make sure it continues to provide acceptable results.

This is organized into the following nine chapters by steps in the LESA development process:

- Chapter 1 sets out the basic concepts and procedures of the LESA system.
- Chapter 2 outlines the procedures for assessing potential users and types of applications for a LESA system.
- Chapter 3 presents process options for working with local committees to formulate a LESA system.
- Chapter 4 addresses the selection and scaling of Land Evaluation factors.
- Chapter 5 addresses the selection and scaling of Site Assessment factors.
- Chapter 6 discusses ways to combine and weight LE and SA factors.
- Chapter 7 explains ways to test a draft LESA system before approving it for general use.
- Chapter 8 explores the problems encountered in setting LESA thresholds for various types of decisions and suggests methods for establishing thresholds.
- Chapter 9 summarizes the key points discussed in the

The Bibliography directs the reader to more detail on certain topics. The Glossary defines certain terms used in the The appendices provide supporting material for the text, as well as supplemental information on various topics. Appendix A provides

the legal framework for LESA in federal administrative rules, including the generic LESA scoring system used for federal projects. Appendix B provides guidelines and examples for forest LESA systems. Appendix C gives examples and references for LESA applications to riparian areas, wetlands, sand and gravel sites, and rural residential suitability. Appendix D discusses the use of computer spreadsheets and geographic information systems in developing and administering LESA systems. Appendix E provides supplemental information for the Land Evaluation component. Appendix F lists LESA contacts by state.

Readers are encouraged to use or adapt any of the ideas presented in this Guidebook. Users are also encouraged to consult the following two other recent LESA reference books: *Agricultural Land Evaluation and Site Assessment: The Status of State and Local Programs,* which provides profiles and contacts for LESA systems developed between 1981 and 1993; and *A Decade With LESA: The Evolution of Land Evaluation and Site Assessment,* which contains research papers on various aspects of LESA. Both are cited in the Bibliography section.

Chapter 1

Concepts for LESA development

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The Land Evaluation and Site Assessment (LESA) system helps decision-makers compare sites on the basis of their agricultural value. This is done by quantifying soils and other site factors, then systematically combining them to produce a score for each site. LESA also makes it possible to group sites with similar scores and establish thresholds as a basis for action.

This chapter will discuss briefly the concepts related to developing and using a LESA system. Each of these concepts is elaborated in subsequent chapters. First, it may be helpful to define certain terms used in this *Guidebook.* The term **factor** is used to label a group of attributes, such as soil potential, size, compatibility, or scenic quality. Factor scale or **scaling** refers to the way points are assigned to a factor. For example, farm size may be scaled by assigning points from 0 to 100 to a series of size groups. The number of groups and the method of scaling is left to the local committee, although this *Guidebook* outlines examples for many factors. Factor **rating** refers to the number of points assigned to a factor for a particular site, before weighting. **Weighted factor rating** is used to denote the factor rating after weighting. **Ranking** refers to the relative importance of a site compared to other sites. **Score** is used for the total of all weighted factor ratings, i.e., a LESA score. **Weighting** refers to assigning a weight (for example, O-1.0) to each factor in order to recognize the relative importance of the factor in the LESA system. **System** refers to all the factors, weights, and scales used in the evaluation of soils and other site conditions.

LESA committees

The LESA system is flexible and can easily be adapted to state or local conditions. As Chapter 3 explains, this is usually done by a LESA committee appointed by elected officials. Figure 1 .1 illustrates the general process discussed in this *Guidebook* for developing a local LESA system.

A person trained in LESA procedures can be very helpful in coordinating project activities and assisting the LESA committee. The role of a trained LESA advisor or other LESA project coordinator is discussed in Chapter 3.

It is important that state officials (for a state system) or local officials (for a local system) appoint the members of the LESA committee in order to provide political legitimacy. If it has not been determined whether a LESA system would be useful, assessment

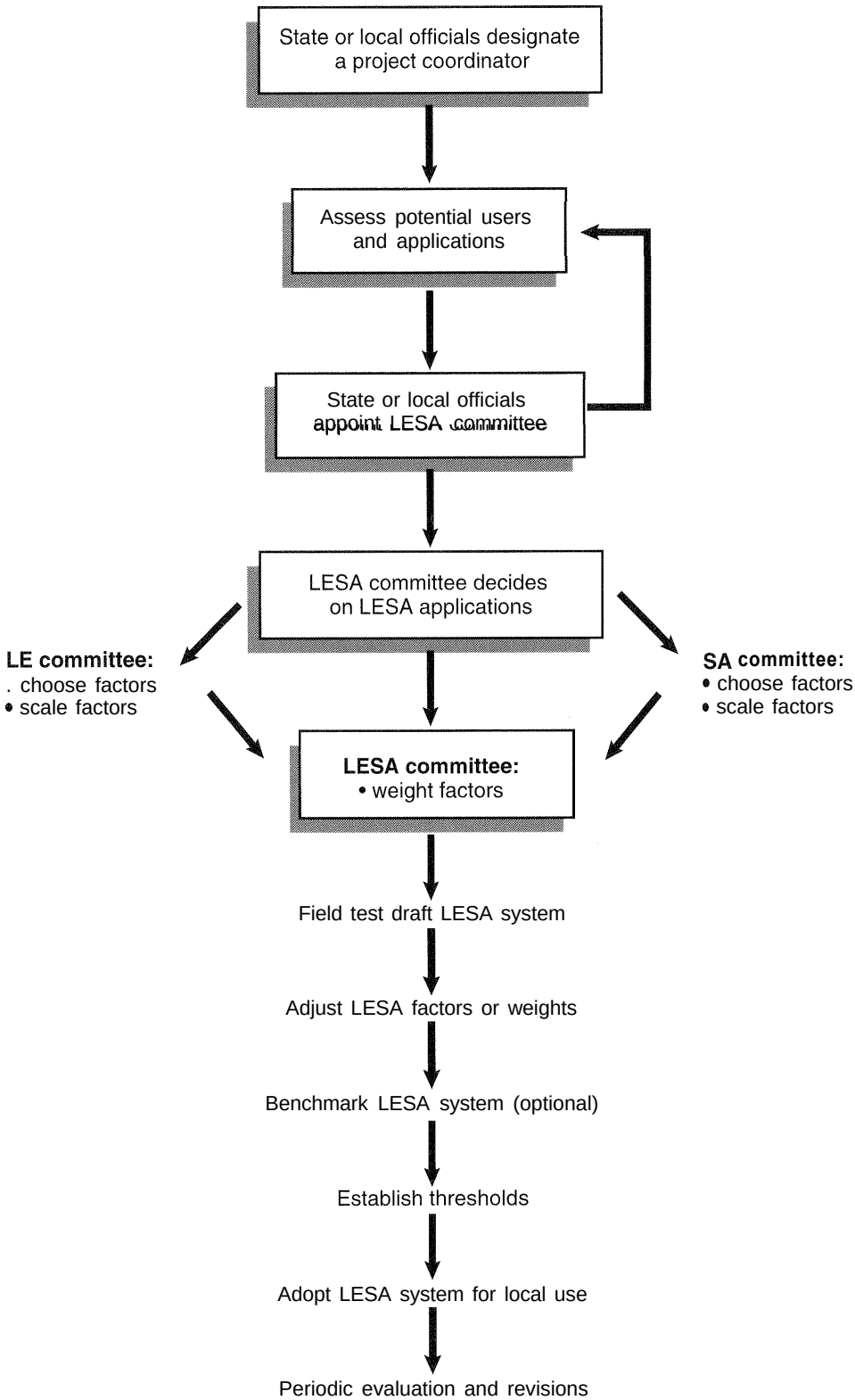

Figure 1.1. Flow chart for developing a local LESA system

of the potential users and types of applications may be done before appointment of a committee. The results can be used to decide whether to proceed with LESA development. If it has been determined, or seems likely, that a LESA system will be useful, the LESA committee could initiate the assessment of potential users and applications. In either case, the committee may need to set priorities or make other decisions on the needs of potential users and the specific applications for which the LESA system will be designed.

The committee may work on both LE and SA as a full committee or have LE and §A subcommittees. To set up the LESA system, factors are selected and defined and a rating scale developed for each factor. The factor scale ranges from 0 to 100, as discussed in the examples in Chapters 4 and 5. While LE factors are based on established methods of assessing soil quality, such as soil potentials or land capability classes, SA factors cover a wide variety of site characteristics. Selection of SA factors will vary according to local needs.

LESA structure

LESA is a system for combining soil quality factors with other factors that affect the importance of the site for continued agricultural use. Soil quality factors are grouped under Land Evaluation (LE). The other factors are grouped under Site Assessment (SA). The SA factors are of three types: non-soil factors related to agricultural use of a site, factors related to development pressures, and other public values of a site. Thus, an agricultural LESA system may contain some or all of the following components:

Land evaluation

- Soil-based factors.

Site assessment

- SA-1: Factors other than soil-based qualities measuring limitations on agricultural productivity or farm practices.
- SA-2: Factors measuring development pressure or land conversion.
- SA-3: Factors measuring other public values, such as historic or scenic values.

This classification is presented in Table 1 .1, which shows how LESA scores are computed using arbitrary values for some typical factors. This LESA site is illustrated in Figure 1.2. Table 1.1 is simplified to show a site with one soil type and two LE factors. In actual practice, most sites will have more than one soil type. Soil potential ratings could be used as the sole LE factor or two or more soil factors could be used. The SA factors can be combined in several ways-as discussed in Chapters 4, 5, and 6.

Factor weighting

The committee that formulates the LESA system will typically conclude that some factors are more important than others. Accordingly, the committee will assign a relative weight to each factor (Column 3 in Table 1.1). The approach used in this Guidebook is to use a weight range of 0 to 1.00, so that all weights add up to 1.00 for a particular factor.

Once the system is set up, each site is rated for each factor on a scale from O-100 (Column 2). Then, each factor rating is multiplied by the corresponding factor weight (Column 3) to obtain a weighted factor rating (Column 4).

Weighted ratings are summed to yield the total LESA score, which

Table 1 .1. An example of computing a LESA score

(1) Factor name	(2) Factor rating (O-l 00)		(3) Weighting (Total = 1 .00)		(4) Weighted factor rating
Land evaluation (site with one soil):					
1) Land capability	68	x	0.30	=	20.4
2) Soil productivity	62	x	0.20	=	12.4
Subtotals			0.50		32.8
Site assessment-l (agricultural use factors):					
3) Acreage of farm	100	x	0.15	=	15.0
4) Farm investment	80	x	0.05	=	4.0
5) Surrounding uses	60	x	0.10	=	6.0
Subtotals			0.30		25.0
Site assessment-2 (development pressure):					
6) Protection by plan or zoning	90	x	0.06	=	5.4
7) Distance to sewer	70	x	0.05	=	3.5
Subtotals			0.11		8.9
Site assessment-3 (other factors):					
8) Scenic quality	50	x	0.09	=	4.5
Subtotals			0.09		4.5
Total of factor weights (must equal 1 .OO)	//////////		1.00		
Total LESA score (sum of weighted factor ratings)	//////////		//////////		71.2

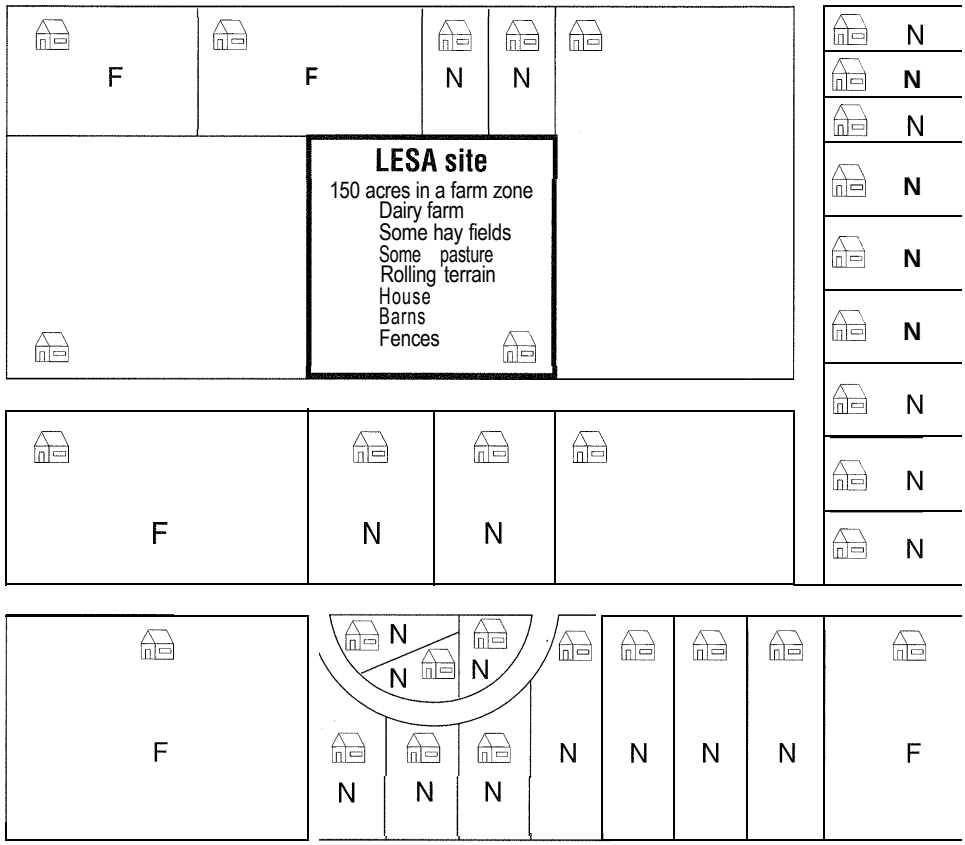

Figure 1.2. Illustration of a farm rated in Table 1.1

100.[1]

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Field testing and thresholds

[1] 100-point *Guidebook* *Handbook,*

rankings ranking of sites (bench-
be LESA system. Field

The focus of the system addresses the question, "What are we trying to learn from a LESA score?"

LESA design criteria

Focus.

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cultural use of the land include parcel size, percentage of the site suitable for agriculture, and compatibility with surrounding land uses. Incompatible land uses may limit farm practices, as a result of vandalism or complaints about noise, odors, dust, and farm chemicals from nearby residents or users of public or commercial facilities. SA-2 factors such as availability of public water, sewer, or fire protection services, or quality of road systems do not directly affect agricultural practices or production but instead are factors related to the pressure for conversion to other uses.

SA-3 factors, such as scenic or historical values, may represent other important public objectives in preserving agricultural lands. As outlined in Chapter 6, several options are possible for incorporating these factors into a site evaluation for a particular application. If a jurisdiction intends to use its LESA for review of zoning permit applications in a farm zone as well as for purchase of development rights, the LE + SA-1 factors and weights may remain the same for both applications. However, the SA-2 or SA-3 factors may be used differently in each application. For example, SA-2 factors may be omitted from zoning permit review, while for purchase of development rights, they may be used as a separate rating system or built into the LE + SA-1 LESA system as a third set of factors and weights. If the latter approach is used, the committee may wish to set separate LE and SA-1 factor thresholds at levels to assure a desired level of productive capacity regardless of the conversion pressure measured by SA-2 factors. Methods for setting these thresholds are discussed in Chapter 8. More discussion of the question of focus can be found in three chapters contained in the book *A Decade with LESA* (Pease and Sussman, 1994b; Huddleston, 1994; Bowen and Ferguson, 1994).

Data sources. Data sources for factors and their point scaling should be explicit for each factor. As an example of data sources for the factor parcel size, a sample of ownership parcel sizes from assessor rolls can be used to determine the range of parcel sizes and the appropriate size threshold for maximum points (e.g., over 100 acres). Data and maps from other sources, such as local planning or development offices, state departments of agriculture, Census of Agriculture, or Cooperative Extension Service can be helpful in deciding on the point allocation scale for several SA factors. Data may include primary sources, secondary sources, expert opinion, or special surveys. Documentation for some SA factors may be a problem. The LESA committee may decide not to use those SA factors with inadequate data available or to adjust the factor scale to reflect available data.

Data sources for factors and their point scaling should be explicit for each factor.

While the relative rankings of sites may not change significantly, dropping redundant LE factors will simplify the procedures.

Redundancy.

high-

(1994b)

Reproducibility.

used. The use of unambiguous tables to assign points will help assure consistency. Examples of unambiguous tables are given in Chapters 4 and 5.

Replicability. Different sites with the same or similar factor characteristics should yield the same or similar factor ratings. If ratings are reproducible, in most cases they should also be replicable. Replicability can be evaluated during field testing.

Summary

This chapter discussed LESA terminology, the process for developing a LESA system, a computation model for assigning weights to factors, and key concepts and procedures. More detailed guidelines are presented in other chapters of this Guidebook.

Chapter 2
Assessing needs: Users and applications

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The user assessment identifies the needs of all potential users of a LESA system and the applications for which it will be used.

Initiating LESA development

Hawaii

Conducting an assessment of users and applications

Identifying the local and state policy framework

(NRCS)

Dear _____

We (identity) are currently considering the development of a Land Evaluation and Site Assessment (LESA) system for use in (jurisdiction). LESA is a numerical system for rating the quality of farmland, using both soils and site conditions. All ownership parcels in (jurisdiction) can be given a score on a O-100 scale. Initially, we intend to use the LESA system to (intended use). However, we would like to design the system so that other potential users will find it useful. Please help us by answering the following questions:

Your agency: _____ Date: _____

Your name: _____ Your position: _____

Please check the following types of applications you might make of a LESA system and indicate estimated frequency of use (A = more than 5 times/year; B = l-5 times/year; C = once every 2 years; and D = other).

	Yes	No	Frequency
1. Designate farm zones	____	____	____
2. Designate farmland districts (voluntary)	____	____	____
3. Other designation purpose (describe briefly):	____	____	____
4. Permit review (list types of permits):	____	____	____
5. Purchase of development rights or conservation easements	____	____	____
6. Transfer of development rights	____	____	____
7. Property assessment for taxation	____	____	____
8. Property evaluation for lending	____	____	____
9. Assess environmental impacts of a project or program	____	____	____
10. Review actions of another agency	____	____	____
11. Program evaluation or other research application	____	____	____

If you have special considerations that you think need to be included in a LESA system, please list them here or attach extra sheets: _____

_____

Thank you for your help. Please contact (contact person) for more information.

Figure 2.1. Example of a form to identify potential LESA users and applications

Identifying potential LESA users and applications

If the farmland program is administered by a state agency, users may be state agency staff; for locally administered programs, users may be units of local government-land-use or development offices or administors of farmland districts or purchase of development rights programs. Users may also be assessors, lending institutions, or consultants retained by state or local governments for environmental impact assessments or land-use planning studies.

An important question to address at this stage is whether certification by NRCS of the local or state system is intended. The advantage of certifying the local or state system is that it would then be used in place of the generic LESA system (See Appendix A) for all federal environmental impact assessments under the National Environmental Policy Act of 1969 (NEPA) and would provide some degree of local or state influence on federal project decisions. The generic LESA system is contained in the Final Rule for the federal Farmland Policy Protection Act, which is given in Appendix A. To certify a LESA system, the state office of the NRCS will perform an evaluation and determine whether the state or local system meets specified criteria. The state or local NRCS office can provide more information on certification requirements.

While a LESA system may be initially developed for a specific purpose, such as designating agricultural zones or districts, there may be unanticipated other applications of the system after it is develbeseur-

Staffing and funding ESA applications

The information from the user assessment can be used to evaluate limitations on data collection and scoring procedures in a LESA system. For example, if LESA is to be used by a rural planning office with one staff person, the factors and scoring procedures probably have to be simple enough to be completed with minimum data collection or other case study research. If no one is available to interpret aerial photographs, as another example, then factor scoring cannot depend on such interpretation.

LESA's

Summary

Chapter 3

Setting up a committee for formulating a LESA system

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One of the key Land Evaluation and Site Assessment (LESA) system concepts is to include knowledgeable local people in formulating the local system. The expertise and experience of farmers and those working with farmers is essential in establishing a sound LESA system. A LESA committee can help establish public credibility and political acceptability for the system. It is best if the committee is appointed by elected officials. However, in some cases, formal appointment may not be necessary. Instead, a local government agency, such as the planning department or planning commission, or a private group, such as a farm bureau or soil conservation district, may provide the legal and political base for the effort.

The expertise and experience of farmers and those working with farmers is essential in establishing a sound LESA system.

The role of the LESA committee should be to provide a range of state or local expertise to help develop a sound LESA system. Committee members cannot be expected to be current on LESA research and technical problems with LESA development and application. This latter role could be performed by a trained LESA advisor, if available, or other LESA project coordinator.

The specific public policy objectives for farmland protection and the types of applications for which LESA will be used should be determined by an assessment of potential users and applications, as outlined in Chapter 2. This assessment will be helpful in deciding whether a single LESA committee will work best or whether LE and SA subcommittees should be used. It will also guide the committee in factor selection, scaling, weighting, SA factor combining, and setting thresholds for decisions.

The overall process for developing a LESA system is outlined in the flowchart in Figure 1.1. This chapter discusses options for organizing local committees, based on experiences of jurisdictions from a national LESA survey conducted in 1991 (Steiner et al., 1991) and user discussion at a national LESA conference held in 1992 (Malloy and Pressley, 1994). The chapter also suggests the use of a trained LESA advisor to assist the committee with technical aspects of LESA development and the use of structured processes to achieve consensus among committee members on issues of factor selection, scaling, and weighting. Local LESA committees must have competent technical assistance to produce a sound, defensible LESA system.

Role of a trained LESA advisor[1]

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Co appointments

The 1991 LESA survey (Steiner et al. 1991) found that committee members usually consist of NRCS staff, planning commissioners, local planners, county- or university-based Cooperative Extension Service staff, local farmers, people engaged in farm service activities, other citizens, non-NRCS soil scientists, and other college or university faculty with expertise in LESA or agriculture. The committee usually includes public agency staff knowledgeable about agriculture as well as farmers and others representing significant commodity groups and with a broad view of agriculture.

Committee tasks

As outlined in Chapter 2, the LESA committee may oversee the assessment of potential users and applications if it has already been decided to develop a LESA system, because of a legal requirement or other reason. On the other hand, this user assessment may have been completed before appointment of the committee to determine whether or not to proceed with LESA development. In either case, the committee has the important task of deciding how to use the information. It may not be practical to design a system to address all identified applications. The report may present alternatives that require a decision. In some cases, different types of applications may require variations of the basic system. For example, siting and environmental assessment of alternatives for linear corridor projects, such as highways or pipelines, may require a different set of SA factors than would designating lands for agricultural zoning. Illinois uses 16 SA factors for corridor projects and eight factors for site specific projects (Riggle, 1994). The first task of the committee, then, is to make decisions on LESA applications based on the user assessment report.

Another initial task of the local committee is to define the planning area for the land evaluation. If LESA is to be used to designate agricultural zones or agricultural sites of high priority, the planning area will be, in most cases, agricultural lands in the county, township, or state. Part of the jurisdiction may be occupied by urban land or other nonagricultural land uses, and cities may have adopted planned expansion policies (e.g., urban growth boundaries) that would affect important farmlands. Any such land in the proposed planning area that is known to be unavailable for agricultural uses may be excluded from further consideration. For example, urban lands and state and federal lands may be excluded if they are unavailable to agriculture. However, where state or federal lands are used for agriculture or where gov-

ernment land disposal for private agricultural use is a possibility, these lands may be included.

The planning area may also depend on the status of land-use planning in the jurisdiction. If a comprehensive, general, or master plan, zoning ordinance, or farmland district is already in place, LESA may be used to evaluate requests for land-use conversion on lands zoned or otherwise designated for farm use. In farmland purchase or conservation easement programs, the lands to be considered for purchase or easement may be even further restricted to lands within a portion of agricultural zones.

A third task is to decide whether to work as a single LESA committee or as separate LE and SA subcommittees. In many cases, it will be advantageous to have subcommittees, because the tasks of factor selection and scaling will be quite different for LE and SA. Often, there will be some overlap of subcommittee membership. For example, NRCS or Cooperative Extension Service staff could serve on both, as may county planners, planning commissioners, or certain farmers with a broad, countywide perspective.

In some cases, such as an area with a small population and relatively homogeneous characteristics, one LESA committee may prepare both the LE and SA components. However, subcommittees provide sharper focus to tasks and demand less individual time.

The various tasks of the committee are discussed in detail later in this Guidebook. Since a fundamental characteristic of LESA is to allow for local flexibility, the specific structure of a LESA system will vary according to state or local conditions and needs. However, the broad tasks the committee will need to address should include the following:

- evaluate the user assessment,
- define the planning area,
- determine LE factors, how the factors will be scaled, and the weights to be assigned (Chapters 4 and 6),
- determine SA factors, how the factors will be scaled, and the weights to be assigned (Chapters 5 and 6),
- field test and adjust the draft LESA system as discussed in Chapter 7,

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Committee options for LE formulation

non-

3),

example, the committee could include NRCS staff, Cooperative Extension Service county staff and university specialists, farmers with a broad knowledge of agriculture, farm supply dealers, well drillers, and farm improvement dealers such as those who install tile drains or irrigation works. One or more planning commissioners would also be valuable to have on the committee.

Committee options for SA formulation

While NRCS staff may also be involved in SA formulation, the 1991 survey found that 78 percent of jurisdictions using LESA employed a broad-based committee, while 16 percent relied solely on NRCS for SA formulation. NRCS staff served on SA committees in 54 percent of LESA jurisdictions. In general, SA committees were larger than LE committees, to represent more groups. Certainly, local farmers with a broad view of agriculture and representing significant commodity groups should be included. Involvement of local planners, planning commissioners, or elected officials is essential to successful application of the SA component. Planning staff representation will help in determining the practicality of factor measurements, such as distance to sewer and water lines.

Representatives of those agencies or departments indicating interest in applying LESA in the user assessment should be invited to participate on the committee. Those who have knowledge of data that will be used in the SA component should also be invited to serve on the committee.

Local or university-based Cooperative Extension Service staff can often be very helpful in organizing the sessions and participating as committee members. Citizens representing local environmental groups or farming groups can bring different insights and broaden the political base of the committee.

Using a structured group process

The LESA committee may decide that a structured group process could help with factor scaling, weighting, or other tasks. In some cases, a group facilitator may be all that is needed. In other cases, a more structured group process may be desired. Help with setting up a structured process, such as the three outlined below, may be available through the local or regional planning department, the Cooperative Extension Service, or a nearby college or university.

Delphi.

computer-

percent

Other.

Summary

Chapter 4

Selecting and scaling Land Evaluation factors

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Preparing soil potential ratings. 48
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The Land Evaluation (LE) component of the Land Evaluation and Site Assessment (LESA) system rates the soil-based qualities of a site for agricultural use. The four most common kinds of classifications used for Land Evaluation are land capability classes, soil productivity ratings, soil potential ratings, and important farmland classes. These classification and rating systems are described in the next section. The Glossary also provides definitions of key terms.

It is important that local people with recognized knowledge of agriculture participate in and understand the LE component in order to provide political acceptability.

In most cases, Natural Resources Conservation Service (NRCS) staff or other soil scientists will play a major role in selecting and scaling LE factors. As discussed in Chapters 2 and 3, the intended applications will affect the composition of the LE committee with whom NRCS will work. Although much of LE formulation is technical in nature, decisions about relative weights of LE factors should be made by the committee. It is important that local people with recognized knowledge of agriculture participate in and understand the LE component in order to provide political acceptability.

The LE component should meet the following objectives:

- LE should be understandable to policy makers and other users.

- LE should establish relative classes of soil-based quality to assist decision makers in setting priorities for sites to be protected for agricultural uses.

- LE should be technically sound, based on the best available data, and in conformance with established NRCS procedures for soil classification systems.

- LE should give consistent results within a given area.

- LE should be appropriate for the level of government at which the Land Evaluation system will be used. For statewide policy planning, the land capability classification system and the important farmlands classes may be most useful since they are available in most states. However, soil potential ratings or soil productivity ratings may have more meaning for county or township planning since they provide finer distinctions in soil-based qualities. At the state level, it may be important to monitor the conversion of prime farmland classes and land in capability classes I

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Interpreting soil-based qualities

- ***Soil potential ratings*** 1).

- ***Soil productivity ratings***

Figure 4.1. Example of a soil survey map, Polk County, Oregon

- *Land capability classification* 1).

- *Important farmlands classification*

Soil potential rating

Soil productivity ratings

Land capability classes

up
irnportant farmlands classes

ryegrass

Locating soil data

Soil maps show locations of mapping units identified through the soil survey.

In many jurisdictions, a published soil survey will be the most important data source. A soil survey is an inventory and evaluation of the soil resources of an area. In the United States, soil surveys are made cooperatively by NRCS, USDA Forest Service, Department of the Interior, state land-grant universities, and state and local officials. Much of the United States has soil survey information available. Information on the availability of soil surveys can be obtained from NRCS state offices, listed in Appendix F.

Published soil surveys contain soil maps, soil descriptions, management information, and interpretations for different uses. The soil maps are published at various scales to fit local needs, mostly 1:20,000, 1:24,000, and 1:15,840. Soil maps show locations of mapping units identified through the soil survey. An example of a soil map is given in Figure 4.1. Each area of soil (mapping unit) is identified by an alphabetic or numeric symbol or a combination of both, i.e., DoB, 18, 20B2, etc. The number of soils in survey areas ranges widely, depending upon the size of the area, the complexity of geology and landscape, climatic differences, and types of vegetation.

Soil descriptions included in soil surveys contain information about soil texture, depth, drainage, structure, color, landscape position, flood hazard, rockiness, stoniness, droughtiness, and other properties useful for planning purposes. Interpretations of soil properties are presented for various uses such as cropland, forest land, rangeland, home sites, recreation, wildlife habitat, and septic tank filter fields.

Soil data for completed soil survey areas of the United States are stored in data bases at state NRCS offices. Using these databases, NRCS staff can help generate land capability classes, estimated soil yields, and important farmland classes for each soil mapping unit in a jurisdiction. Soil potential ratings will have to be prepared by a local committee.

Each state NRCS office generates the data for an individual county or area as requested by the local NRCS district conservationist or by a state or local government official. The NRCS district conservationist, together with the local committee, provides certain information for the state office, such as a list of soil mapping units, indicator crops, available water capacity,

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-

  cropland

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  (MLRAs).

  Land Resource Regions and Major Land Resource Areas of *the United States*

Selecting LE factors

About 50 percent of the jurisdictions currently using a LESA system rely upon soil potential ratings for the LE component of LESA.

Handbook

(SPRs)

If soil potential ratings are impractical, then a combination of land capability classification and soil productivity ratings may be used. A combination of the two is preferred since it captures both soil limitations and yield potential. For example, if soil productivity were used as the single factor, a class I soil on a O-3 percent slope might rate the same as a class IIe soil on a 3-8 percent slope, without considering the erosion hazard on the IIe soil. By including the land capability classification in the system, the yield is adjusted to account for costs of overcoming the erosion limitation by placing the soil in a lower group, similar to the ranking of a soil potential rating.

Because the land capability classification system is widely available and accessible by NRCS staff, some jurisdictions may wish to use it alone for LE ratings. It should be recognized, however, that land capability classes group some dissimilar soils together, and they do not account for costs of overcoming soil limitations. The land capability classification should be used as the sole LE factor only when time and funds require it.

In most cases, the important farmlands classification will probably not add new information to the rating. However, each jurisdiction should consider how the addition of the important farmlands groups could change a relative ranking. If soils classified as unique would otherwise be ranked lower than desired, then this classification system could be added to the LE component. For example, soils with essential slope and aspect characteristics for vineyards or orchards may be significant for these crops but not be classified as prime. Also, if the prime or unique farmland terminology, as defined in Appendix E, part 2, is used in policy statements, then the jurisdiction should consider using this classification system as part of LE.

For statewide or regional level LESA applications, important farmlands groups may be appropriate in order to recognize and incorporate legal requirements using these groups of soils, or to compare losses of prime farmlands in sub-areas; however, the relative rankings of specific sites may not change from those without using important farmlands groups.

Preparing soil potential ratings. As noted previously, land capability classifications and soil productivity ratings can be developed by NRCS staff. To obtain the soil potential rating, the LE committee prepares a table of yields, gross returns, management costs, and net returns as outlined in the example in Table

[redacted]

Crop	Yield t/ac	Yield MT/O.4 ha	Gross return ($)	Management costs* Tile drain	Field drain	Land smoothing	Cross-slope farming	Sub-soiling	Cover crop	irrig.	Net return ($/ac/yr)
Irrigated Sweet Corn: $65.00/ton ($71.65/MT)	9.0	8.2	585	99	N/A	N/A	N/A	10	25	146	305

* Management Costs-$/acre/year ($/0.4 ha/year)
Source: Adapted from Huddleston et al., 1987.

4.1. Net return is defined by the LESA committee and may include adjustments for production costs, such as fertilizers, lime, and seed, as well as costs of overcoming soil limitations. Production costs are not included in the Table 4.1 example. Management data for this table are obtained from various sources, such as drain installers, irrigation suppliers, and contractors for land smoothing and sub-soiling. Costs are amortized to provide annual costs per acre. Tile drainage costs, for example, are amortized over a 25-year period at current interest rates to obtain annual per acre costs. Yield data are obtained from soil surveys or farm records. Commodity prices can be obtained from the USDA Agricultural Statistical Reporting Service state office or the Extension Service county or state offices. More detailed information on developing the management cost estimates for this example is given in Huddleston et al., 1987. In some states, state or local examples of SPR documentation may be available from the state NRCS office.

In some states, state or local examples of SPR documentation may be available from the state NRCS office.

Scaling LE factors

Scaling refers to assigning points on a 0 to 100 point scale for each unit of the land classification system or systems to be used as LE factors. The 1983 *Handbook* (USDA, 1983) proposed group-

Table 4.2. Land Evaluation for Latah County, Idaho

Ag. group	Capability class	Farmland importance	Productivity index	Percent of ag. soils	Thousands of acres	Factor scale
	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,IVe	Other	71-65	8.8	42	62
5	IVe,IVw	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

Source: Stamm et al., 1984.

ing soils into about 10 subgroups to obtain a relative rating for each group. This approach was originally developed for use by local assessors in New York state to obtain soil groups for property tax assessment. Many existing LESA systems use this approach. An example of this classification is given in Table 4.2. These procedures are given in the 1983 *Handbook* for jurisdictions that wish to use them. In most cases, it will be easier to compile and understand the ratings according to the general model presented in Table 1.1 of Chapter 1 and the Land Evaluation examples given in this chapter.

Soil potential ratings are determined on a 100-point scale by setting the highest net return equal to 100, and then determining the percentage of the highest represented by each soil mapping unit, as illustrated in Table 4.3. In this table, the Chapman soil had the highest net return for all soils in the jurisdiction; its SPR is set equal to 100. Ratings for each soil are then based on the percentage of the highest net return represented by each soil. Net return can be calculated by subtracting production costs, such as fertilizers, pesticides, labor, fuel, and equipment repairs, and the costs of initial and continuing limitations from gross returns. Addison County, Vermont, used annual production cost estimates of $225/acre for corn silage and $176/acre for alfalfa (SCS, 1983). In the SPR examples shown in Tables 4.1 and 4.8, production costs were not included because it was assumed they would be about the same for all soils and would not affect relative values. For clarity, the definition of net returns should be included in the LESA documentation.

With each soil assigned a rating in a table, it is then a simple matter to calculate the LE component for a tract by multiplying the percent of the tract in each soil mapping unit by the SPR, as shown in Table 4.4. The next step is to multiply the SPR by its weight to obtain an LE weighted factor rating, as given in Chapter 6. More detailed instructions and references for calculating SPR ratings are given in Appendix E, Part 1.

To scale land capability classes, the first step is to determine which land capability classes are present in the LESA applica-

Table 4.3. Example of converting net return from Table 4.1 to an SPR, Linn County, Oregon

Soil	Net return	SPR
Amity silt-loam	305	7-l
Chapman silt-loam	429	100
Dayton silt-loam	240	57

Table 4.4. Example of an SPR rating for a site with three soils

Soil	SPR	x	Proportion of site	=	Partial site SPR
Amity	71	x	0.20	=	14
[illegible]	100	x	0.50	=	50
[illegible]	57	x	0.30	=	17
			Total site SPR	=	81

tion area. In an area with diverse soils, all eight classes may be present. There is no single, best scale for land capability classes. The example given in Table 4.5 is intended only to illustrate the scale. The assignment of a rating to a class is a judgment made by the LESA committee or LE subcommittee. It will reflect the unique conditions of the LESA application area. For example, the committee may decide that a IIIw soil is locally better than a IIs and rate it accordingly.

A soil productivity rating is scaled by definition. If a O-l.00 scale is used, the rating for each soil mapping unit may be used. If another scale is used, then it is a simple matter to convert the numbers to a O-100 scale by setting the highest equal to 100 and determining the percentage all other soils are of the highest, as shown in Table 4.6.

Important farmlands groups are more difficult to scale in that there are only five groups. The example in Table 4.7 rates prime and unique farmlands as equal. LESA committee members may decide to weight unique soils higher or lower than prime soils. Ratings for soils of statewide or local importance will also reflect the values of these soil groups within the LESA application area.

The examples given in this section are for illustration only. The LESA committee will need to determine the rationale for scaling based on local soil characteristics and policy considerations. This local flexibility allows LE adaptation for conditions unique to each jurisdiction.

Table 4.6. Example of a soil productivitv scale

Soil	Soil productivity rating (150-point scale)	(100-point scale)
E		
C	150.0 142.5	100 95
B	135.0	90
A	90.0	60
D	82.5	55
etc.	etc.	etc.

Table 4.7. Example of an important farmlands scale

Group	Factor scale
Prime	100
Unique	100
Statewide	75
Local	50
None of the above	0

NOTE: The rating assigned to Important Farmlands Groups is determined by the local LESA committee.

Table 4.5. Example of [illegible]

Land capability class	Factor scale
I	
IIw	
IIe	
IIs	
IIc	
IIIw	
IIIe	
IIIs	
IIIc	
IVw	

The LE committee should begin by determining those groups of crops that produce the most revenue or use the most acreage. An indicator crop for each group can then be chosen on the basis of sensitivity to soil variations.

Choosing indicator crops

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Comparing yields for indicator crops

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One com p
indicator crop on a given soil as a perce
yield obtainable from all soils on which wn.
For example, a soil that rates in the 70th p ıld
might be considered equiv he

Anoth h
re. This method, however, disreg
ıd weights differences in market
It may proportionately downgrade soils that
he highest value crop but nevertheless are pro-
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agement. T roduce high yield
management gher than soils p

Table 4.8. Example of soil potential data for each of four indicator crops, Linn County, Oregon

Crop and Soil	Yield		Gross Return ($)	Management costs-$/ac/yr ($0.4 ha/yr) Tile drain	Field drain	Land smoothing	Cross-slope farming	Sub-soiling	Cover crop	Irrig.	Net return ($)
Winter wheat—											
$3.85/bu ($10.94/hl)	bu/ac	hl/0.4 ha									
Amity	100	35.2	385	99							286
Bellpine, 3-12%*	70	24.6	270				10				260
Chapman	100	35.2	385								385
Dayton	50	17.6	193	155	2						36
Willamette, 0-3%	110	38.7	424								424
Annual ryegrass—											
$0.14/lb ($0.31/kg)	lb/ac	kg/O.4 ha									
Amity	1800	817.2	252								252
Bellpine, 3-12%*	900	408.6	126				10				116
Chapman	1800	817.2	252								252
Dayton	1800	817.2	252		2	9					241
Willamette, 0-3%	1800	817.2	252								252
Permanent pasture—											
$10.00/AUM†	AUM/ac										
Amity	10		100								100
Bellpine, 3-12%*		60								60	
Chapman	12		120							120	
Dayton	8		80		2					78	
Willamette, 0-3%	12		120								120
Irrigated sweet corn—											
$65.00/ton ($71.65/MT)	t/ac	MT/0.4 ha									
Amity	9	8.2	585	99				10	25	146	305
Bellpine, 3-12%*	7	6.4	455				10	10	25	181	229
Chapman	9	8.2	585					10	25	129	427
Dayton	6.5	5.9	423	155	2			10	25	146	85
Willamette, 0-3%	9	8.2	585					10	25	146	404

* Numbers indicate range in slope gradient on which the soil occurs. Soils lacking numbers are nearly level.
† AUM, animal unit month.
Source: Adapted from Huddleston et al., 1987.

same for all soils and were not included in this example. Unit price is obtained from Extension Service commodity estimates, from processors, the USDA Agricultural Statistics Reporting Service state office, or from other state or local sources. To account for price fluctuations, prices per unit can be calculated over a five-year period and adjusted for inflation. In obtaining a unit price, prices can be averaged or, alternatively, the three middle values can be averaged, discarding the highest and lowest values

Management costs are subtracted from gross returns to obtain net return figures. The net return figures, as given in Table 4.9, provide the basis for calculating SPR. At this point, at least two options are available. In the first option, the soil mapping unit with the highest net return among all indicator crops is set equal to 100 points, such as shown in Table 4.10. The highest net return for other soil mapping units are then assigned a point value by calculating their

Table 4.9. Example of net returns for five soils and four indicator crops, Linn County, Oregon

Soil	Winter wheat	Annual ryegrass	Permanent pasture	irrigated sweet corn
Amity	$286	$252	$100	$305
Bellpine, 3-12%	260	116	60	229
Chapman	385	252	120	427
Dayton	36	241	78	8.5
Willamette, 0-3%	424	252	120	404

Source: Adapted from Huddleston et al., 1987.

Table 4.10. Two methods [redacted]s on a 100-point scale for five soils, Linn County, Oregon

In specifying yields of indicator crops, a "high" sustainable management regime is usually assumed, since this more closely represents the soil's potential than yields obtained under less intensive manage-

ryegrass

use of the high

ryegrass

sustainable man-

$100/acre/year

$385/acre/year

wheat, say Dayton, in Table 4.8. Dayton has a gross return of $80/acre/year for pasture, which is 80 percent of the Amity gross return. Applying the 80 percent to the 26 bushels obtained above gives 21 bushels of wheat ($81 gross sales) in a yield adjusted for the secondary crop,

The LE committee should consider carefully both the selection of indicator crops and the method of combining them for a rating scale. Choice of method will depend on the agricultural characteristics of the jurisdiction. Expert opinion of NRCS staff will be valuable in selecting a method. Field tests, as outlined in Chapter 7, will be helpful in refining these procedures.

Summary

The selection and scaling of LE factors are important tasks for the LESA committee or LE subcommittee. The choice of factors will depend on policy objectives, the user assessment, and time constraints. Scaling of LE factors should reflect state or local conditions and the purpose of the LESA system.

The choice of one or multiple indicator crops for soil productivity or soil potential ratings is determined by state or local agricultural commodities, soils, and subclimates. If more than one indicator crop is used, they may be combined in several ways. Chapter 6 discusses combining and weighting LE factors.

Chapter 5
Selecting and scaling
Site Assessment factors

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SA-

Scaling refers to the way points are assigned to units of a factor.

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100-point

Table 5.1. Adams County, Pennsylvania, scale for proximity to protected farmland

	Original	Revised
Adjacent	100	100
Within 1/8 mile		90
Within 1/4 mile	80	70
Within 3/8 mile		50
Within 1/2 mile	60	40
Within 1 mile	40	30

NOTE: Numbers from the original table were converted to a 100-point scale.
Source: Adams County, Pennsylvania, LESA System, 1990.

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(FSA)

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1.1),

0, 20, 40, 60, 80, 100)

This option could be used for some or all §A factors.

- Be aware that, for some factors, factor scales might correspond linearly (as in Curve A in Figure 5.1) with distance, area, or whatever variable affects the factor. Other factor scales might increase linearly and then level off at some threshold point (as in Curve B in Figure 5.1). For still other factors, scales might start flat, increase rapidly, and then level off (as in Curve C in Figure 5.1). Other curve shapes are possible. Point allocation will vary according to the way each factor affects agricultural use of a site.

For example, consider the proximity factor (Table 5.1), used in the Adams County, Pennsylvania, LESA system. Proximity to farmland protected by perpetual easements or restrictive covenants is used to evaluate proposals for purchase of agricultural conservation easements. Originally, Adams County scaled this factor so that points assigned would drop off more or less linearly up to 1/2-mile from the nearest property under easement. In reviewing this factor, the Adams County Agricultural Land Preservation Board observed that the value of preserving a site is greatly enhanced if it is directly adjacent to land that is already under easement, but drops off rapidly after easement land is not adjacent and levels off at 3/8 1 mile from the site, as shown in Curve D of Figure 5.1. Therefore, the board revised the scaling to more closely resemble an S-shaped curve.

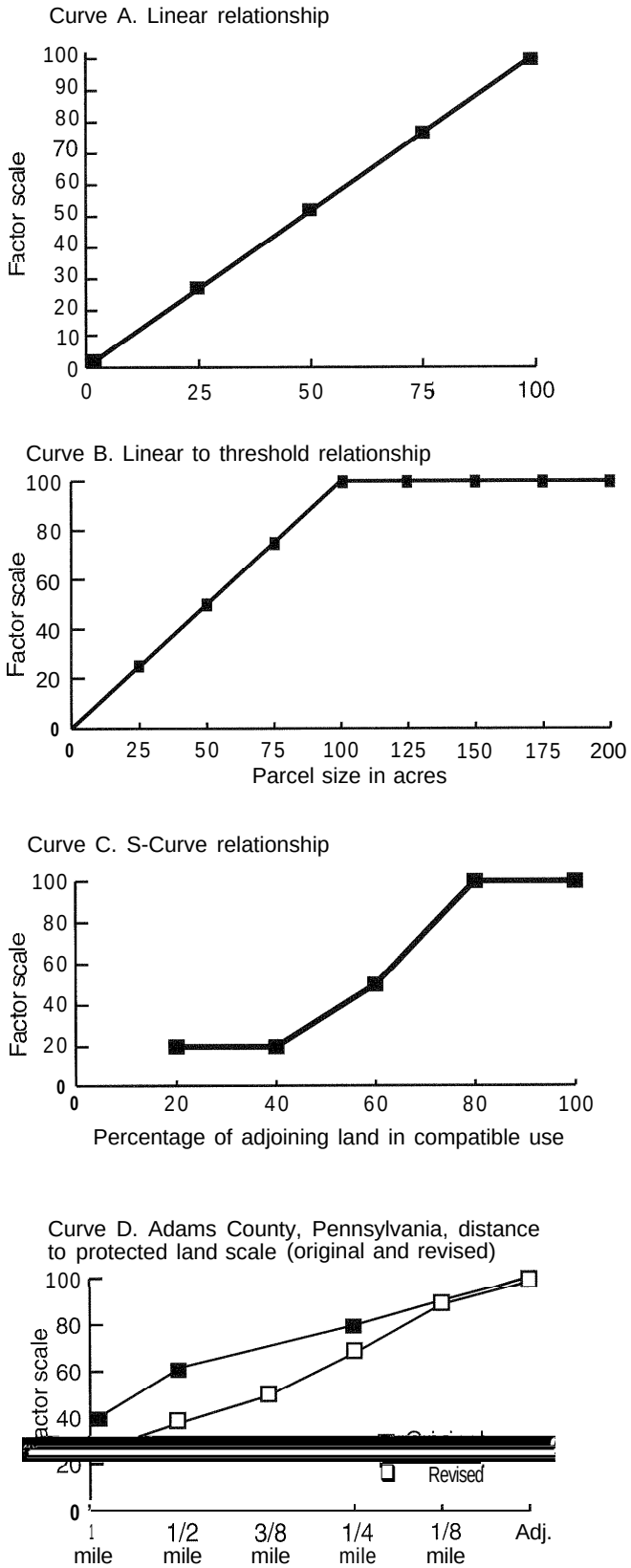


Figure 5.1 (a,b, c, and d). Examples of factor plots

Selecting and scaling SA factors

Tbcmf 5.2 mjtut uzqjdbmSA gbdupst. Ti f mjtujt n fbouup cf jnnvtusbujwf, opu fyi bvtujwf. Tbcmf 5.2 pn jut b ovn cfs pg gbdupst ui bu x fsf jodmvefe jo ui f 1983 *Handbook* (SDA, 1983), tvdi bt ui ptf ui bu n fbtvsf ui f offe jo ui f sfhjpo up efwfmpq beejujpobmmboe jo psefs up bddpn n pebuf qspkfdufe qpqvmbujpo boe fn qmpzn fou boe ui f bwbjmbcjmjuz pg tvggjdjfou mbtt qspevdujwf mboe gps vscbo efwfmpq-n fou Svdi gbdupst bsf opusfdpn n foefe cfdbvtf ui fz ep opun fb-tvsf tjuf rvbmjujft ps mjn jubujpot gps dpoujovfe bhsjdvmuvsbmvtf. Ti ftf vscbo efwfmpqn fou efn boe gbdupst ti pvme cf dpotjefsfe tfqbsbufmz.

SA beesfttft b n vdi cspbefs sbohf pg dpotjefsbujpot ui bo epft LE. Bfux ffo ui sff boe ufo SA gbdupst n bz cf ofdftt bsz. Cpn n jufft gpsn vmbujoh SA ti pvme cf bx bsf ui bu ui f n psf gbdupst ui fz jodmvef, ui f n psf dptuzn jujt up bqqmz ui f LESA tztufn up b tjuf boe ui f n psf ejggjdvmujujt up fyqmbjo ui f tztufn up djuj fot. Artp, gpsn vmbupst ti pvme ubl f dbsf ui bu ux p ps n psf gbdupst bsf opu jobewfsufoum n fbtvsjoh ui f tbn f voefsmjoh dpodfso jo ejggfsfou

SA factors

- Size of site
- Compatibility of adjacent uses
- Compatibility of surrounding uses (impact on farm practices)
- Shape of site
- Percent of site in agricultural use
- Percent of site feasible to farm
- Level of on-farm investment
- Availability of agricultural support services
- Stewardship of site
- Environmental limitations on agricultural practices
- Availability and reliability of irrigation water

SA-2

- Land use policy designation
- Percent of surrounding land in urban or rural development use
- Distance to public sewer
- Distance to public water
- Distance to urban feeder highway
- Distance to urban center or urban growth boundary
- Length of public road frontage of site
- Proximity to protected farmland

- Open space strategic value of site (e.g., urban greenbelt)
- Educational value of site (e.g., for sustainable agriculture)
- Historic building or site
- Site of significant artifacts or relics
- Wetlands and riparian areas
- Scenic values
- Wildlife habitat
- Environmentally sensitive areas
- Floodplains protection

SA-1 Factors: Agricultural productivity

ber in a series ordered from smallest to largest; Mean = total values divided by the number of units; Mode = most frequently occurring number in a series.

site.

U.S.

(NRCS)

However,

Note: All factor scales in the examples given are "before weighting."

Table 5.3. Example of parcel size scaling by landform (adapted from Linn County, Oregon, LESA system)

Bottomland (in acres)	Terrace (in acres)	Foothills (in acres)	Factor scale
>100	>120	>160	100
90-100	100-120	140-160	95
80-99	90-99	120-139	90
70-89	80-89	100-119	85
60-69	70-79	80-99	80
50-59	60-69	70-79	70
40-49	50-59	60-69	65
30-39"	40-49"	50-59*	60"
20-29	30-39	40-49	30
10-19	20-29	30-39	20
<10	<20	<30	0

* Median field size could be determined from county survey. Fractions are rounded up or down.

by using the Census data for rented and leased acreage to adjust average farm size. Since ownership units may include non-contiguous fields, size of contiguous ownership units cannot be estimated from Census of Agriculture data; however, local assessor maps and databases can usually be used to provide these data. In some jurisdictions, CFSA maps and data also can be used for this purpose. Fields make up a farm unit. A farm may consist of one or many fields, growing the same or different crops. The typical (e.g., median) field size is an important benchmark in setting up a scale, because it represents a size that is economical to farm. In Table 5.3, field size represents a substantial break in point scaling, with points falling off rapidly below the median field size. Data for field sizes can, for some jurisdictions, be obtained from CFSA records. If not available from this source, they can be obtained from original survey or from expert opinion of local USDA field staff and farmers.

For many applications, there is little rationale for awarding additional points for farms larger than the minimum commercial size. Therefore, the scale should be set so that maximum points are awarded for a site of this size or larger. In the Table 5.3 example, this size is 100 acres, 120 acres, and 160 acres for bottomlands, terraces, and foothills, respectively.

In purchase of development rights or conservation easement programs, it is generally preferred to choose a larger farm than a smaller one, because the continuation of farming on a small site may be put at risk when surrounding land is developed for non-farm uses. A major objective, in most cases, is to place easements on large blocks of land rather than on scattered sites. This can be done either by choosing many small sites or fewer large ones.

Compatibility with adjacent

LESA

(1987),

Table 5.4. An Example of a scale for perimeter compatibility

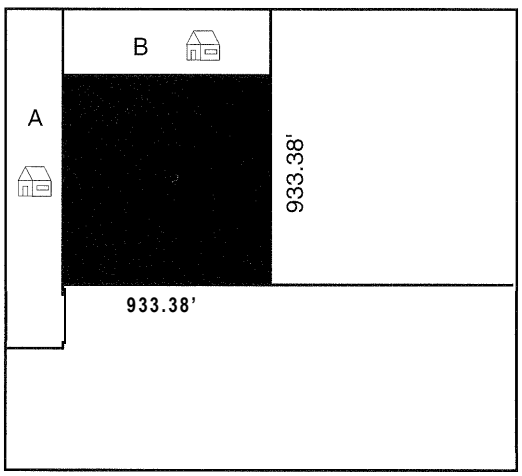
% of Perimeter in conflict	Factor scale
Ø	100
up to 10	90
11-20	80
21-30	70
31-40	60
41-50	50
51-60	40
61-70	30
71-80	20
81-90	10
91-100	0

NOTE: Fractions are rounded up or down.

In measuring compatibility with adjacent or surrounding (non-adjacent) uses, the percent of compatible uses or of conflicting uses may be used in the scale. In these examples, the percent of conflicting (incompatible) uses are scaled instead of the percent of compatible uses, because this approach allows for incorporating density factors and for distinguishing among uses that may be fully conflicting and those that may be somewhat conflicting. To illustrate, let us assume that all lettered parcels in Figure 5.2 are on five-acre or smaller homesites and are considered incompatible uses. The unlettered adjacent uses are in agriculture. If the percentage of the perimeter in compatible use were calculated, the perimeter of both LESA sites would be 50 percent compatible with agriculture and both would receive the same points. There would be no differentiation between the sites. However, the site in example B is clearly subject to more potential problems with neighbors than is the site in example A.

To overcome this measurement problem, a benchmark can be established for totally conflicting homesites of five-acre parcels with 2:1 rectangular shape. The length of a short side of such a parcel is 330 feet. To account for both the length of perimeter and density of conflict, count the number of conflicting parcels, multiply by the length of the short side of the 2:1 five-acre rectangle (330 feet) and divide by the length of the perimeter of the LESA site (3,734 feet). This number, expressed as a percent, is used in Table 5.4.

Example A-l 8% conflict



Example B-62% conflict

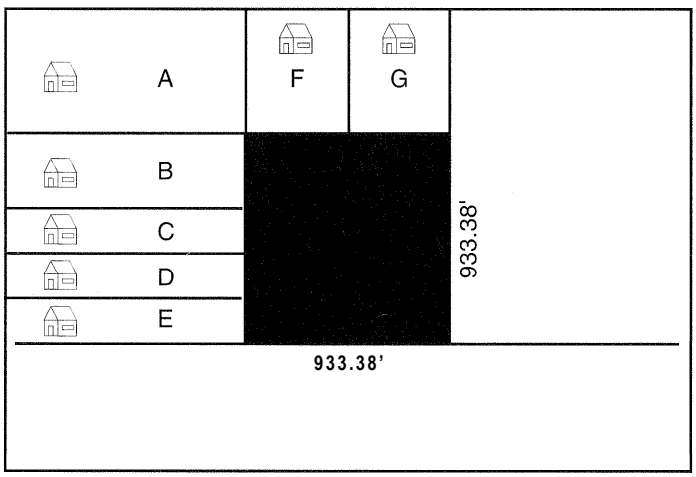


Figure 5.2. Examples of measuring perimeter conflict

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- uses—

Table 5.5. Conflict in relation to parcel size

Size of site (in acres)	Length of side (in feet)	Shielded area (in acres)	Percentage shielded
23	1,000	15	64%
52	1,500	39	75%
92	2,000	74	80%
207	3,000	180	87%
367	4,000	332	90%

Compatibility with surrounding ***(not*** *adjacent)*

Table 5.6. Example of a factor scale for surrounding (non-adjacent) land-use compatibility

Ratio of the number of conflicting parcels to parcel size	Factor scale	
0	100	
0.01-0.05	90	(e.g., 4 conflicts and 100-acre
0.06-o. 10	80	parcel or 15 conflicts and
0.1 l-0.15	70	350-acre parcel)
0.16-0.20	60	
0.21-0.25	50	
0.26-0.30	40	
0.31-0.35	30	
0.36-0.40	20	
0.41-0.50	10	(e.g., 50 conflicts and 100-acre
>0.50	0	parcel or 10 conflicts and
		20-acre parcel)

NOTE: Fractions are rounded up or down

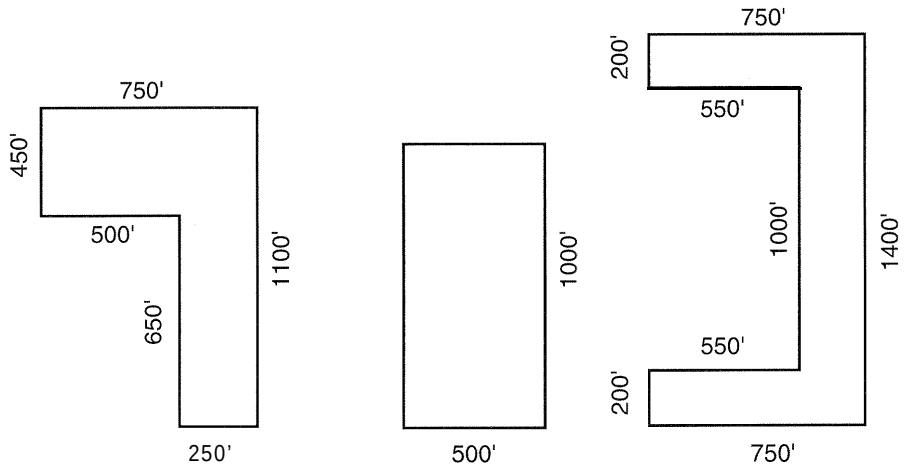
before the factor scale drops to zero, but a 100-acre parcel would have to have more than 50 conflicting parcels within the surrounding area in order to receive zero points.

The compatibility of both adjacent and non-adjacent surrounding uses are important factors affecting agricultural practices and cropping options. The focus of these factors within the SA-1 context is on potential limitations to agricultural productivity and flexibility. In most cases, these compatibility factors will be strongly correlated to SA-2 factors measuring development pressure. In some cases, the LESA committee may find that these more direct measurements of site limitations will encompass some or all of the concerns underlying SA-2 factors.

It is of course true that the type of agricultural use and the nature of surrounding uses may be more important that the number of potentially conflicting uses. However, these combinations vary with each site and to incorporate them would make the LESA system very complex.

Shape of site. Oddly shaped sites are inefficient to farm. Therefore, a number of jurisdictions have included a factor that rates the shape of the site. It is difficult to classify shapes in relation to ease of farming and, therefore, it is difficult to develop a scale for this factor. The effect of the shape of the site on efficiency of farming is less important for larger sites. Therefore, much of this effect is captured in the size-of-site factor.

However, for some jurisdictions or for some sub-areas within a jurisdiction, shape may be important to differentiate a high number of small sites. One approach is to establish a size cut-off below which shape will be rated. Rating may be done, for example, by using a ratio of the perimeter of the site to the perimeter of a 2:1 rectangle having the same area as the parcel. Examples of this approach are given in Figure 5.3.



	Example A	Example B	Example C
Area of the example	500,000 sq. ft.	500,000 sq. ft.	500,000 sq. ft.
Perimeter of subject parcel	3,700'	3,000'	5,400'
Ratio of perimeter of subject site to 2:1 rectangle with same area	1.23	1.00	1.80
Ratio of area to perimeter	135.14	166.66	92.59

Figure 5.3. Ratio of the perimeter of a parcel to perimeter of a 2:1 rectangle of the same area

Other approaches are possible. For example, a simple ratio of area to perimeter could be scaled and used to rate shape. This approach is also illustrated in Figure 5.3. Sites that are divided by a road or waterway will have a longer perimeter to area than sites not so divided and will be rated lower. If shape is not a significant factor for a particular jurisdiction, it should not be included.

Table 5.7. Example of a scale for shape of a site

Ratio	Factor scale
1.00-1.14	100
1.15-1.29	90
1.30-I .44	80
1.45-I .49	70
1.50-I .64	60
1.65-I .79	50
1.80-I .94	40
1.95-2.09	30
2.1 O-2.24	20
2.25-2.39	10
>2.40	0

NOTE: Fractions are rounded up or down.

Experimentation with this approach on a variety of shapes will help establish a basis for allocating points. As Figure 5.3 illustrates, the closer the shape is to a 2:1 rectangle, as in Example B, the closer the ratio will be to 1.0. Triangular or other very unusual shapes may require a different rating scale. An example of a scaling table for Figure 5.3 is given in Table 5.7.

Percent* of *site in agricultural use. For a site of any given acreage, the greater the percent of the site in agricultural use, the greater its agricultural productivity and economic importance to the farm economy. This might be determined to be a linear relationship. If so, a scale, such as shown in Table 5.8, would be appropriate.

per-

Table 5.8. Example of a scale for percent of site in agricultural use

Percent of site used (or suitable) for agriculture	Factor scale
90-1	100
80-89	90
70-79	80
60-69	70
50-59	60
40-49	50
30-39	40
20-29	30
10-19	20
0	0

NOTE: Fractions are rounded up or down.

Level* of *on-farm investment. indicat on-

ain

may

Availability **of *agricultural support services.***

gener-

Table 5.9. Example of a scale for on-site investment, adapted from Bonneville County, Idaho

Investment	Factor scale
Site is an agricultural service facility	100
High level compared to county farms	
More than $ _____(specify)	100
Average level	
Between $ and $ _____(specify)	50
Low level	
Less than $_____(specify)	0

Table 5.10. Example of a scale for support services

Support services	Factor scale
Adequate support service present (List specific areas of jurisdiction)	100
Some limitation on support services (List specific areas of jurisdiction)	50
Severe limitation on support services (List specific areas of jurisdiction)	0

al farm supply stores, veterinarian services, fertilizer, herbicide and pesticide suppliers, integrated pest management associations, spraying and seeding contractors, specialized insurance, banking and credit services, and marketing facilities and services. Because agricultural support services consist of such a variety of services at varying distances from any given farm, this factor is difficult to scale in a replicable fashion. A simple approach would be as shown in Table 5.10.

In this example, specific areas of the jurisdiction are listed with each criterion in order to assure replicable ratings. The areas could be assigned by the SA committee or other group.

This factor produces useful differences among sites when used in a statewide LESA system, but may provide little differentiation when used in a countywide or township-wide system. In many cases, support services are about the same in all areas; therefore, this factor may not be important in differentiating sites, and need not be included in the LESA system.

Stewardship of site. Some LESA systems have included stewardship as an SA factor. This measures the extent to which good soil and water conservation practices are used on the site. An example of a scale for stewardship is shown in Table 5.11. Such practices enhance the capability of the site to sustain agricultural production in the future. It should be kept in mind, however, that these practices are not inherent in the resource and may be changed, particularly if ownership of the site changes. This factor also serves as an example of a factor for which it is difficult to differentiate among more than a few steps on the scale and for which documentation may be difficult. However, since conservation plans are required

Table 5.11. Example of a scale for stewardship

Status of conservation plan	Factor scale
An approved conservation plan has been fully implemented	100
Implementation of an approved conservation plan is on schedule	90
Implementation of an approved conservation plan is behind schedule	40
Implementation of an approved conservation plan has not been started	10
No conservation plan	0

NR

Environmental limitations on agricultural practices.

- *Soil properties and groundwater.*
- *Topography, soils, and* run-off.
- *Important wildlife or fisheries habitat or plant species.*

Wo affected?"
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Table 5.12. Example of a scale for irrigation water availability

Availability and reliability **of** *irrigation water.* jurisdictions, the availability

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SA-2 factors: Development pressures impacting a site's continued agricultural use

Table 5.13. Example of a scale for irrigation water reliability

Type of water source	Factor scale
Public systems	
Water district with adequate water quantity	100
Water district with occasional (e.g. 2 of 5 years) limitations on water quantity due to drought or other local conditions	80
Water district with annual limitations on water quantity due to drought or other local conditions	60
Wells	
Well water with adequate quantity for diverse crops	100
Well water with quantity limitations for some crops	70
Well water with inadequate quantity for crops	50
Surface water	
Surface water withdrawal with adequate quantity for crops	100
Surface water withdrawal with some limitations on quantity	80
No reliable irrigation source (e.g., interrupted 1 of 2 years)	0

NOTE: If more than one source is used, assign by highest factor rating or by percentage of site served.

Agriculture Near Cities

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Land-use po esignation.

Table 5.14. Example of a scale for adjacent zoning, adapted from Boone County, Illinois

Adjacent zoninq	Factor scale
All sides zoned for agriculture	100
One side zoned for non-agricultural use	77
Two sides zoned for non-agricultural use	54
Three sides zoned for non-agricultural use	23
All sides zoned for non-agricultural use	20

NOTE: Points are adjusted to a 100-point scale.

Table 5.15. Example of a scale for adjacent zoning, adapted from Bucks County, Pennsylvania

Adjacent zoning	Factor scale
Low density residential/agricultural zoning withing 1/2-mile	100
Medium density residential allowed within 1/2-mile	50
High density residential allowed within 1/2-mile	0

NOTE: Points are adjusted to a 100-point scale.

Percent of surrounding land in urban or rural development use.

Table 5.16. Example of a scale for housing density within 1/4-mile

Average number of dwellings/AC	Factor scale
< 0.10	100
0.20-O. 10	90
1.00-0.19	80
2.00-0.99	70
4.00-I .99	50
6.00-3.99	30
8.00-5.99	20
10.00-7.99	10
> 10	0

NOTE: Fractions are rounded up or down.

be

sep-

arate

(SA-1)

Distance to public **water, urban feeder** *highway,* **and** *urban* **center or** *urban growth boundary.*

1978),

Table 5.17. Example of a scale for impervious surfaces within 1/4-mile

Percent impervious surface	Factor scale
< 0	100
IO-19	90
30-39	60
20-29	80
40-49	40
50-59	20
60-69	10
> 70	0

Table 5.18. Example of a scale for distance to a central sewage or water system, adapted from Champaign County, Illinois

Distance (miles)	Factor scale
> 1.5	100
0.75 to 1.49	80
0.50 to 0.74	60
0.25 to 0.49	40
200 feet to 0.24	20
200 feet or less or on-site	0

NOTE: Fractions are rounded up or down.

front-

Length of road (or type of road) frontage of subject site.

Table 5.19. Example of a scale for road access, adapted from Montgomery County, Maryland

Access	Factor scale
Site access to unimproved road	100
Site access to secondary road	50
Site access to primary road	0

Proximity **to protected farmland.**

conser-

Table 5.20. Example of a scale for distance to city, village, fire station, or emergency services; adapted from Henrv Countv. Illinois

Distance (miles)	Factor scale
> 1.5	100
1.1 to 1.5	93
0.76 to 1.O	80
0.51 to 0.75	60
0.26 to 0.50	40
Adjacent	0

NOTE: Fractions are rounded up or down.

Table 5.21. Example of a factor scale for proximity to protected sites

Protected sites	Adjacent	Less than 1 mile	1-5 miles
1 site:			
> 500 acres	100	80	70
100-500 acres	90	70	60
< 100 acres	60	50	30
2-3 sites:			
> 500 acres	-loo	80	70
100-500 acres	90	70	60
< 100 acres	60	50	30
More than 3 sites:			
> 500 acres	100	80	70
100-500 acres	90	70	60
<100 acres	60	50	30
No protected site within 5 miles	0		

NOTE: Fractions are rounded up or down. Assign maximum points once by proximity.

vation

SA-3 factors: Other public values of a site supporting retention in agriculture

procedure.

Open space strategic value of *a site.*

Educational value of *a site.*

Historic buildings or archaeological sites.

McHenry

Wetlands and riparian values of *a site.*
bined

Scenic values of *a site,*

Wildlife habitat values of *a site.*
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Table 5.22. Example of a scale for historic or cultural features, adapted from McHenry County, Illinois

Presence of a unique feature as determined by a local survey	Factor scale
Yes	100

Table 5.23. Example of a scale for wildlife habitat, wetlands, unique natural area, or floodplain; adapted from McHenry County, Illinois

Percent of site considered environmentally sensitive	Factor scale
75% or more	100
50% to 74%	75
25% to 49%	50
Less than 25%	0

NOTE: Round fractions up or down. Environmentally sensitive sites should be identified by map and text.

Environmentally sensitive areas (ESA).

ESAs

ESAs

Floodplain protection *a site.* locat-

protec-

reten-

Summary

Table 5.24. Example of a scale for rating floodplain protection

Type of floodplain	Factor scale
At least 200 acres in a 50-year floodplain	100
At least 100 acres in a 50-year floodplain	90
At least 50 acres in a 50-year floodplain	80
At least 200 acres in a 100-year floodplain	80
At least 100 acres in a 100-year floodplain	70
At least 50 acres in a 100-year floodplain	60
More than 10, but less than 50, acres in a 50- or 100-year floodplain	20
Less than 10 acres in a 50- or 100-year floodplain	0

NOTE: Apply the one criterion that has the highest rating.

will depend on state or local conditions, policies, and intended applications. The simpler the system, the easier it is to understand and the less costly to administer. While some factors may seem important, they may be redundant, and the underlying concern may be adequately addressed by weighting. On the other hand, too few factors may oversimplify and miss important effects. In most cases, three to seven SA factors will capture the important considerations for differentiating sites.

Since the SA process tends to raise the most questions, the LESA committee will usually make tentative decisions on selection and scaling. These decisions may be refined and adjusted as the process proceeds to the field testing stage. The next step is combining and weighting the factors, covered in Chapter 6.

Chapter 6
Combining and weighting factor ratings

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SA-3 factors in the LESA system 91
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Combining LE factors

Once LE and SE factors are selected and assigned a factor scale, as discussed in Chapters 4 and 5, the next task for the Land Evaluation and Site Assessment (LESA) committee is to decide how to combine the factors into the LESA system. The choices for LE are somewhat simpler than for SA. If soil potential ratings (SPRs) are available or can be developed with assistance from Natural Resources Conservation Service (NRCS) or other soil scientists, then SPRs provide the best measure of soil quality, as outlined in Chapter 4. If SPRs cannot be used, then the second best option will be the combination of land capability classification and soil productivity ratings.

More than two LE factors can be used if the LESA committee finds that state or local conditions and policies are best addressed by this choice. Land capability classes, soil productivity ratings, important farmlands classes, and soil potential ratings could be combined and weighted according to the relative importance of each. However, as noted in Chapter 4, more than two LE factors may be redundant. The fewer the factors, the easier the system is to apply and understand.

Sites with multiple

The procedure for rating sites with more than one soil is illustrated in Figure 6.1 and Tables 6.1 and 6.2. This procedure determines the average productivity of the entire site by proportionately weighting the productivity of each soil type on the site. To simplify this discussion, we will assume the site has two soils. Figure 6.1 shows a site with 150 acres of each soil. The soils are of differing quality, as indicated by the ratings given in Figure 6.1 for soil potential, land capability, soil productivity, and important farmland group. In Table 6.1, only one factor is used-SPR. Soil A has an SPR of 60 (on a 100-point scale), a factor weight of 0.50 (or 50 percent of the total LESA score), and comprises 50 percent of the site. Soil B has better soils, with an SPR of 80; the factor weight is the same (0.50), and it comprises 50 percent of the site. If there were more soils on the site, this table would be expanded to include the same calculations for all soils. Of course, the percentage of the site figures would change. All partial ratings are summed to obtain the LE subtotal.

In Table 6.2, land capability classes, soil productivity ratings, and

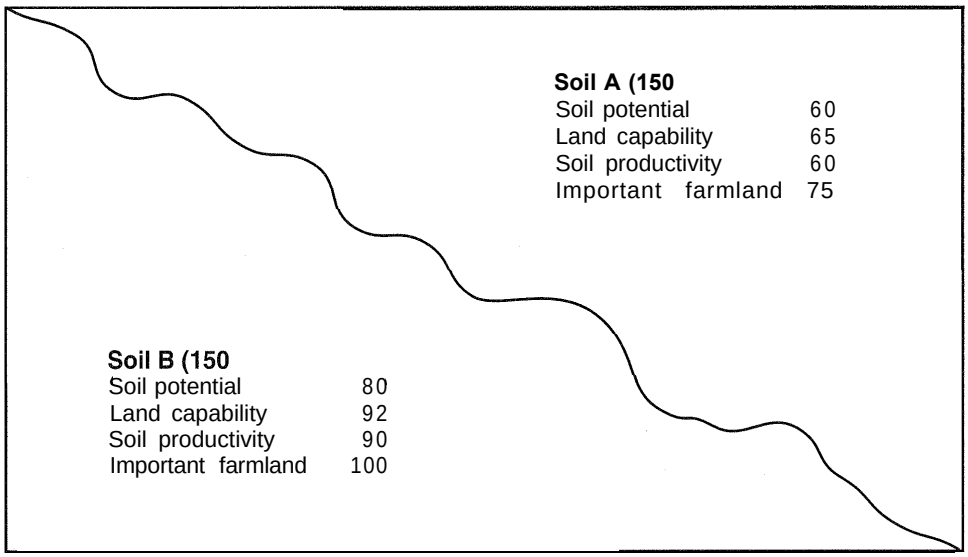

Figure 6.1. Example of a site with two soils

important farmlands classes are combined for each soil type by summing the three weighted factor ratings. The percentage of the site (in this case, 50/50) for each soil type is multiplied by the weighted factor rating to obtain site partial ratings. The site partial factor ratings for the two soil types are summed to obtain the LE subtotal. The procedure would be extended to include more soil types as necessary.

Table 6.1. Calculating LE ratings for sites with more than one soil

Soil name	Factor rating (O-100)	X	Factor weight	=	Weighted factor rating	X	% of site (fraction)	=	Site partial rating
Soil A									
Soil Potential	60	X	0.50	=	30	x	0.50	=	15
Soil B									
Soil Potential	80	X	0.50	=	40	X	0.50	=	20
LE Subtotal	//////////		//////////		//////////		//////////	=	***35***

Table 6.2. Calculating LE weighted factor ratings for sites with more than one soil using land capability, soil productivity, and important farmland groups

Soil name	Factor rating (O-l 00)	X	Factor weight	=	Weighted factor rating	X	% of site (fraction)	=	Site partial rating
Soil A									
land capability	6.5	X	0.20	=	13.00				
soil productivity	60	X	0.15	=	9.00				
important farmland	75	X	0.15	=	11.25				
Soil A subtotal					33.25	X	0.50	=	16.63
Soil B									
land capability	92	x	0.20	=	18.40				
soil productivity	90	x	0.15	=	13.50				
important farmland	100	x	0.15	=	15.00				
Soil B subtotal					46.90	X	0.50	=	23.45
LE subtotal (add partial site ratings)	//////////		//////////		//////////		//////////		40.081

Combining SA-1, SA-2, and SA-3 factors with LE

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Design with Nature (McHarg,

and Bucks County, Pennsylvania, (Kendig, 1980) compare suitabilities for development with environmental standards and resource values. In the Breckenridge system, all development proposals must meet basic standards. Above these standards, the development proposal is rated on several site factors in a scoring system. In Bucks County, the density and location of development on a given site is based on carrying capacity and an incentive density bonus system. The book *Flexible Zoning: How* It *Works* (Porter et al., 1988) includes excellent descriptions and critical reviews of seven performance zoning ordinances.

Separate rating systems could be developed for suitabilities for urban expansion, rural residential development, rural commercial/industrial development, or for the relative quality of wetlands, quarry sites, or whatever other use is important to the jurisdiction. While it may take longer to develop separate rating tools, they each will be stronger because of their focus. Soils, for example, would be specifically rated for each use. Several such rating systems have been developed. Some examples and references are given in Appendix C.

Option 2: Detractor/Bonus points. If the committee decides to use LE and SA-1 factors as the basic LESA system, the results could be adjusted by using a set of bonus or detractor points for selected SA-2 and SA-3 factors. In this way, the LESA score for farmland productivity is clear enough, but development pressure or other public value (such as scenic value) could be used to adjust the basic score. This option would work best when only a few SA-2 and SA-3 factors are important, since the bonus or detractor points should be relatively small. They would be most helpful in borderline cases for decision-making thresholds, as outlined in Chapter 8. Also, it is essential that bonus or detractor points are assigned uniformly and objectively as part of the LESA system to assure consistency among users.

Factors could be assigned either detractor points or bonus points. For example, a distance of 1/2-mile or less to a sewer system could be 5 detractor points to a total LESA score. An outstanding scenic quality or wildlife habitat site (specifically defined) could be assigned 5 bonus points. This approach was used in the forestry LESA system in Columbia County, Oregon. Under parcel size, a site was penalized up to 3 points if the slope averaged more than 30 percent. Under the surrounding land-use factor, the rating was

Table 6.3. Example of a scale for scenic values using detractor/bonus points

Examples of attributes	Factor scale
Agricultural production on a parcel of > 25 acres on a slope of 3%, visible from a state or federal highway	5
Agricultural production on a parcel of < 25 acres on a flat surface, visible from a county road	0
Feedlot of > 100 animals on < 25 acres, visible from state or federal hiahwav	-5

+5.

Metland

Option 3: Integrating SA-1, SA-2, and SA-3 factors in the LESA system.

Huddleston 80)

As Huddleston (1994, p. 80) noted about combining SA-1, SA-2, and SA-3, "One could never be sure whether a low SA score was the result of truly poor agricultural suitability, or represented mediocre agricultural land and mediocre development suitability, or implied that excellent development suitability rendered even the best agricultural land useless for continued agricultural production."

Weighting the factors

Another important task for the LESA committee is assigning factor weights. Simply adding up the factor ratings and dividing by the number of factors to get a LESA score would imply that each of the factors were of equal importance. That is not typically the case. LESA committees usually consider some factors to be more important than others. To reflect such considerations, the committee may give each factor a weight (a number between 0 and 1.0) that is to be multiplied by the factor rating. As discussed in this Guidebook, the weights assigned to all factors should add up to 1.0.

There is no easy formula for assigning weights. They must be based on a consideration of local and state laws, the relative importance of individual factors to the policy objectives for which the LESA system is to be applied, and the characteristics of the application area. For example, if water is a scarce resource, its availability may be weighted higher than in an area with more abundant water resources.

Committee members [redacted] differentiate sites for decision making.

In the 1983 LESA *Handbook* weighting was presented as a two-step procedure. Individual factors were weighted, then LE as a whole and SA as a whole were weighted. This procedure is unnecessarily complex and its results are not always predictable. This Guidebook recommends that weighting be applied to factors only, and that each factor be weighted in relation to all other factors. If the 1983 *Handbook* two-step procedure is followed, it should be borne in mind that the weights given LE and SA can have critical effects on the final LESA score. The 1983 *Handbook* suggestion that it is generally desirable to assign 100 points to LE factors and 200 points to SA factors on a 300-point scale (or on a weight scale of 0.0 to 1.00, 0.33 to LE and 0.67 to SA) should be carefully evaluated. Committee members should take local conditions and goals into account to assign factor weights that adequately differentiate sites for decision making.

If soils are generally uniform throughout the jurisdiction, soil factors should probably be given relatively small weights and non-soil factors should be given relatively larger weights. Otherwise, the system might not differentiate (that is, provide a clear difference in point spread) among sites. Alternatively, if soils are varied or if site-related factors such as conflict or parcel size are generally uniform for all sites, it may be advisable to give greater weight to soil factors in order to obtain LESA scores

2)

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bot-

another may be more appropriate for deciding which parcels should be chosen for purchase of development rights or easement. In a zoning program, it is important to identify large numbers of adjacent parcels that could be combined to constitute a zoning district. In an easement program, the goal is to identify a relatively small number of parcels on which the public should spend considerable funds in order to preserve them permanently for agriculture.

If a major policy objective is to protect sites with the best soils, then soil factors should be weighted heavily. If the objective is to preserve commercial-scale farms, parcel size would be weighted accordingly. However, if the objective is to protect sites that are under the most pressure for development, factors measuring development pressure should receive greater weight. If, in addition to agricultural protection, historic or scenic preservation is an important policy objective, then factors that measure historic or scenic value should be given relatively heavy weight. Thus, weights should depend on the policies to be implemented.

In assigning weights, it may be helpful to group factors according to the policy considerations they reflect and run subtotals for the groups. The committee could then see how a proposed change in individual factor weights would relate to more general policy considerations.

The use of subtotals in deciding on factor weights is illustrated in Table 6.4, which is based on data taken from the Clarke County, Virginia, LESA system. The factors have been grouped into logical categories. Soil quality is described by just one factor. Other factors refer to a variety of Site Assessment considerations. They fit reasonably well into four groups. The subtotals make it possible to ask whether the weights make sense at the category level as well as at the specific factor level. If the committee judges that the subtotals are not in accord with their objectives, then it can vary weights on individual factors until they do. This is easy to do if a table like Table 6.4 is set up as a spreadsheet with formulas in the subtotal cells. Evaluation at the category level is particularly useful here, because the Clarke County system has a very large number of factors.

This procedure lends itself to using a multi-attribute utility approach in assigning weights (Chen et al., 1992). This approach ranks the categories in order of importance as a first step. Then

each category is given a weight, with all weights totaling to 1.0. The process is repeated for all factors making up a category. This systematic procedure clarifies the relative importance of each category and each factor within each of the categories.

The possibility that a system with many factors could be simplified and clarified by removing some of the factors has been discussed in Chapters 4 and 5. In the Table 6.4 example, factors with weights of .01, .02, and .03 will make very little, if any, difference in relative site rankings. Deletion of these factors (and perhaps others) could help focus the system on factors that make a real difference.

Once a set of weights is tentatively agreed upon, the committee should test the system to be sure that the factor definitions, ratings, and weights are appropriate. The committee can fine-tune the system by varying the tentative weights until the resulting LESA scores are consistent with the policies the jurisdiction is attempting

Table 6.4. Using subtotals to evaluate factor weights

	Factor weiuhts	Subtotals
A. Soil quality	0.33	
Subtotal		0.33
B. Likelihood that farm will be economically viable		
1. Large size	0.06	
2. Reliable irrigation water available	0.06	
Subtotal		0.12
C. Likelihood of little conflict from nearby land uses		
3. Adjacent land use in agriculture	0.07	
4. Far from urban concentration (e.g. >5 miles)	0.03	
Subtotal		0.10
D. Public or private investment that would increase pressure for development		
5. Water/sewer	0.06	
6. Road on boundary	0.04	
7. Isolated remnant	0.03	
8. ROW easement on site	0.02	
9. Subdivision or residential density zoning	0.06	
10. Mineral leases	0.01	
Subtotal		0.22
E. Policy exists for conservation and continuation of agriculture		
11. Comprehensive, general, or master plan designation for agriculture	0.13	
12. In agricultural district or zone	0.07	
13. Scenic/historic values on site	0.03	
Subtotal		0.23
Total		**1.00**

*Adapted from data for Clarke County, Virginia LESA system for parcels larger than 40 acres.
Weights have been adjusted to sum to 1.OO.

Summary

SA-

Chapter 7

Testing the draft LESA system

CONTENTS

Steps in testing LESA. 99
Field testing the draft LESA system 101
Benchmarking option 102
The Delphi method 102
Focus groups. 105
Summary 107

Steps in testing LESA

Step 1.

In many jurisdictions, the sample can be drawn from agricultural tax lots, which are usually coded by the assessor's office for differential property tax assessment.

Step 3 (data

Step (redundancy).

stepwise

Step 5 (reproductibility).

Step 6 (replicability).

Field testing the draft LESA system

As with any model, LESA systems are generalizations on reality, subject to errors of both commission and omission. The overall goal should be to combine simplicity with maximum infor-

1988),

Benchmarking refers to comparing LESA results to another rating of the same site, which is assumed to be more accurate.

Benchmarking option

The Delphi method.

medi-

	OK? Yes/No	Adjust scale? Yes/No	Adjust weight? Up/Down
LE factors (list):			
Land capability	No	No	UP
Soil productivity	No	No	UP
SA Factors (list):			
Size	No	Yes	N/A
Perimeter compatibility	Yes	No	N/A
Distance to sewer	No	No	Down
Wildlife habitat	No	No	Down?

Examples of notes for adjustments:

1. Weight of LE factors may need to be increased for prime soils. Even small parcels are used intensively for commercial agriculture.
2. Size-Adjust scale to give smaller parcels more weight in areas of better soils.
3. Distance to sewer-Parcels near sewers are used intensively for commercial agriculture. Decrease weight?
4. Wildlife habitat-This is difficult to document, even with field inspection.

Figure 7.1. Example of a checklist for field trips

ans and interquartile ranges. The less informed responses tend to gravitate toward the more informed responses on each successive round. The method relies on the assumptions that summary statistics are indicative of true estimates and that persons less confident of their estimates will be more likely to change their estimates than those who are more confident.

Statistical summary of anonymous responses is a way of reducing group pressure for conformity assuring that the opinion of every member of the group is represented. For a detailed description of the Delphi method see Linstone and Turoff (1975) and Dalkey (1969).

Delphi has been shown to be an inexpensive and efficient method for gathering information on natural resource and land-use data (Nelson, 1985; Pease, 1984; Pease and Beck, 1984). Delphi research has found that expert opinion was highly correlated with mail-out

Table 7.1. Example of Delphi individual recording sheet for factor weighting

Factor	Round one	Round two	Round three	Group consensus
Land capability class	0.60	0.50	0.40	0.35
Parcel size	0.20	0.25	0.30	0.30
Compatibility with adjacent uses	0.20	0.25	0.30	0.35

NOTE: Each Delphi panelist keeps this worksheet to record his or her responses for each round. For each round, each panelist weights each factor. Weights for all factors must add up to 1 .O.

Table 7.2. Example of a Delphi response sheet for factor weighting

Factor	Round one
Land capability class	0.60
Parcel size	0.20
Compatibility with adjacent uses	0.20

NOTE: This worksheet is completed by each participant, collected, and tabulated to determine the median and inter-quartile range of respondents. The results are posted so that panelists can consider the group response in each round. After each round, each panelist records his or her response on the individual recording sheet. Separate response sheets are distributed for rounds two and three to avoid confusion.

(1994b).

Focus groups.

Delphi or focus group participants may be paid a small honorarium (e.g., $50) or treated with a dinner for their participation.

1989), commit-

Telephone Screening Questionnaire

Name _____ Date _____

Address _____ Phone ( ) _____

Hello, my name is _____ and I'm calling from _____
[jurisdiction]

We are conducting a short survey of farmers in _____

Am I speaking to (Mr., Mrs., Ms.) _____?

[IF YES, CONTINUE. IF NO, ASK WHEN WOULD BE A GOOD TIME TO CALL.]

We are conducting a survey of farmers that will take approximately 2 minutes. Is it o.k. to begin?

1. Would you say that most of your income (> 50%) is from farming or non-farming sources?
   ( ) Farming [CONTINUE]
   ( ) Non-Farming [TERMINATE]

2. How many acres do you farm?
   ( ) less than 160 acres
   ( ) 160-320 acres
   ( ) over 320 acres

3. Where do you farm?
   ( ) Subarea A [TRY TO RECRUIT AT LEAST 1 FOR EACH SIZE GROUP ABOVE]
   ( ) Subarea B [TRY TO RECRUIT AT LEAST 1 FOR EACH SIZE GROUP ABOVE]
   ( ) Subarea C [TRY TO RECRUIT AT LEAST 1 FOR EACH SIZE GROUP ABOVE]

We are asking selected people to join us for a discussion about rating farmlands. The discussion will be at the _____ on _____ at _____ and will last about one and one-half hours. Coffee and rolls will be served. Would you be able to join us at that time?

( ) IF YES, I will be sending you a letter confirming this information. Should I use the address of ? [CONFIRM ADDRESS] If you need any help with directions or if you need to cancel, please call our office at _____ _____ . Thank you very much for your cooperation.

( ) IF NO, Thank you for answering our questions.

Figure 7.2. Example of a telephone screening questionnaire to select farmers for a focus group or Delphi panel (adapted from Krueger, 1988)

Although benchmarking may not be necessary for all jurisdictions, it will broaden the basis for legal defensibility where this is important. If a decision is made to perform a benchmarking validation study, the LESA advisor or LESA committee should seek assistance from a consultant or university faculty member familiar with Delphi, focus group, or other group processes to assure that proper procedures and conditions are followed.

Summary

The various tests discussed in this chapter will help assure that LESA provides a valid decision-making tool. With the participation of LESA committee members, field visits to a sample of sites ranging from those with zero points to those with 100 points will help pinpoint factor, scaling, or weighting problems and provide a basis for setting thresholds for decision making. Benchmarking is an optional step that provides an extra measure of validation. The next phase is to apply the LESA scores in decision making, which is discussed on Chapter 8.

Chapter 8

Interpreting LESA scores for decision making

How LESA is usually used in making decisions 112
Dealing with the inherent ambiguity of
LESA scores: Setting factor thresholds 114
Considerations for large parcels 119
Dealing with the inherent imprecision
of LESA scores: Fuzzy thresholds. 119
The creeping effect. 121
Summary 122

The creeping effect refers to situations where case-by-case decisions may lower LESA scores on nearby parcels, thereby justifying more land conversion decisions, causing a creeping boundary to occur.

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Handbook

A better approach for many situations is to establish separate thresholds for each factor as well as for total LESA scores.

impre-

Table 8.1. Example of a template for arraying LESA score data for a sample

Parcel number (or label)			Factor C	Total LE	SA weighted factor ratings Factor A	Factor B	Factor C	Total SA	LESA score
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
etc.									

cise

How LESA is usually used in making decisions

Table 8.2. Example of a data table for LESA sample sites

Parcel number	Sample LESA score
21	20
2	25
8	30
4	34
27	38
6	45
7	47
3	48
9	51
24	53
11	55
22	56
19	58
30	62
15	63
20	64
29	64
18	65
13	66
16	68
12	71
1	73
23	76
10	78
25	85
26	86
5	89
28	95
17	97
14	100

Horn

Table 8.3. Data table and statistics for figure 8.1

LESA score	Frequency of sites	Cumulative % of LESA sites
100	1	100.00%
90-99	2	96.67%
80-89	3	90.00%
70-79	4	80.00%
60-69	7	66.67%
50-59	5	43.33%
40-49	3	26.67%
30-39	3	16.67%
20-29	2	6.67%
<20	0	0.00%

Sample statistics of LESA scores

Mean	62.067
Median	63.5
Mode	64
Minimum	20
Maximum	100
Standard deviation	21.047

The data and graphs may help in setting threshold levels, but the specific policy objectives for the local application will be the deciding factor in assigning thresholds. For purchase of development rights, the amount of funds will influence the threshold level. If funds are verv limited, then thresholds could be set very high or funds could be simply allocated by order from highest score to lowest. If the maximum zoning protection of very limited agricultural land is a local policy objective, thresholds could be set low to protect more sites. If residential or other development is an important objective, recognizing that conversion will need to occur, the thresholds will be higher to allow more sites to be converted.

Dealing with the inherent ambiguity of LESA scores: Setting factor thresholds

If a total LESA score is very high, it is clear that all factors rated high; however, it is more difficult to know what a middle level LESA score means, because the total LESA score is made up of the sum of weighted factor ratings as shown in Table 8.4. A high score could mean that the site has excellent soils and poor site characteristics, or mediocre soils and site characteristics, or poor soils and excellent site characteristics.

There is no way to tell from the total LESA scores in Table 8.4 which factors rate high and which low. If the policy is to protect

Table 8.4. Example of weighted factor ratings giving the same LESA score

	Maximum possible points	Site 1	Site 2	Site 3
Soil quality	34	33	21	10
Size	33	20	21	20
Compatibility with surrounding uses	33	IO	21	33
Total LESA score	100	63	63	63

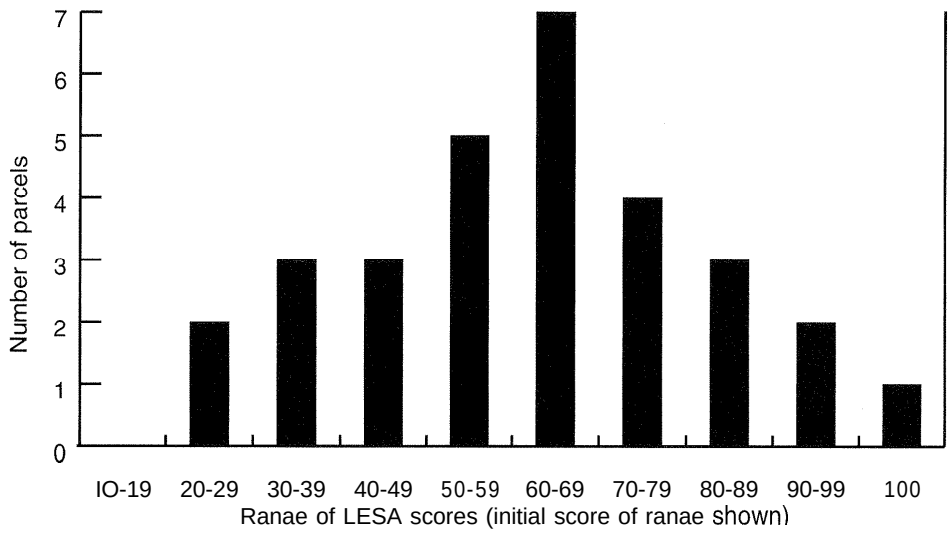

Figure 8.1. Frequency distribution of LESA scores in Table 8.2

sites with the better soils even in areas of conflicting uses, site 1 should be given priority. If the policy is to protect sites with little or no surrounding conflict, site 3 should be given priority. We can make these interpretations from examining the weighted scores for each factor but not from the total LESA score alone. By placing all of the interpretation on one number, i.e., the total score, much of the power of the LESA system to identify potential limiting factors is likely to be lost.

In order to be sure that decision rules reflect the policy they are intended to serve, it may be helpful to set minimum thresholds for individual factors, or groups of factors, in addition to the threshold for the total LESA score. In the above example, the LESA committee might require a minimum weighted factor rating of, say, 25 on soil quality in addition to a total LESA score threshold of, for example, 60 in order for a site to qualify for protection. With such a threshold, site 1 would qualify, while the other two sites would not.

A large site may support important agricultural uses even if it has mediocre soils. For some applications, it may be desirable to reduce factor compensation by setting thresholds for more than one factor. Some examples of threshold setting for both individual factors and the overall LESA score, from Oregon case studies, will help illustrate the procedures. They are taken from a chapter by J. Herbert Huddleston (1994) in *A Decade With LESA: The Evolution* of *Land Evaluation and Site Assessment.*

Factor compensation refers to one factor, size for example, compensatlng for another factor, such as soils.

Table 8.5. Example of a LESA system structure, Linn County, Oregon

Factor	Maximum points	Weighted factor ratings Site A	Site B
Land evaluation:			
SPR	50	50	45
Site assessment:			
Land use compatibility	25	24	10
Perimeter	(15)	(15)	(10)
Surrounding 1/4-mile (non-adjacent)	(10)	(9)	(0)
Parcel size	25	17	10
Total	100	91	65

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sul
(SPR

> = greater
< = smaller
≤ = smaller or equal

- *Best agricultural land.* SPR > 27 **and** > 17 **and** size > 15 **and** total > 67
- *Good agricultural land.* SPR >17 **and** > **and** size > 3 **and** total > 33
- *Marginal agricultural land.* SPR < 17 **or** < **or** size < 3 **or** total < 33

In developing threshold criteria, the LESA committee felt strongly that any single factor should be allowed to control the classification.

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objective,

labeled primary, and the poorer lands being secondary. In this case, the LESA committee wanted excellent soils to be able to compensate for limitations associated with compatibility or site size, and vice versa. The threshold criterion used to accomplish this objective was quite simple-primary land had to have an LE weighted factor rating of 26 or more and a total LESA score of 67 or more.

This criterion mandates that primary land must have some minimum level of soil resource quality, but allows the compatibility score to vary according to the quality of the soil. In this way, marginal soils can qualify as primary only if they are in large sites virtually free of conflict, while the very good soils can tolerate much higher levels of conflict on smaller sites.

A slight variation of this criterion was used to distinguish between primary and secondary land in a LESA system for forestry in Lane County, Oregon (Pepi, 1989). The structure of the system itself was similar to the agricultural LESA systems described above, except that LE weighted score was allocated only 35 percent of the total points, and compatibility (in SA) was weighted at 40 percent of the total, instead of 25 percent. Given a 100-point total, maximum scores were distributed as follows: soils, 35; parcel size, 25; adjacent land use compatibility, 25; and surrounding land use compatibility, 15.

In setting thresholds for this system, the LESA committee felt that size alone should not be allowed to control the rating. As long as the soils were adequate, and the conflict was low, parcels of any size were deemed suitable for commercial forestry. To accomplish this objective, the following three criteria were written:

1) If site size is less than 11, then total must be greater than 79;

2) If site size is greater than 11, and if soils are less than 18, then total must be greater than 60;

3) If site size is greater than 11, and if soils are equal to or greater than 18, then total must be greater than 53.

Criterion 1 says that in order for a very small site to qualify as primary land, it must have excellent soils and be free of land-use conflicts. Criteria 2 and 3 invoke a threshold for soils, but unlike the agricultural LESA system, there is no absolute minimum of soil quality required. Instead, the poorer soils are allowed to be in the

Considerations for large parcels

SA

Dealing with the inherent imprecision of LESA scores: Fuzzy thresholds

Table 8.6. Examples of secondary factors to be evaluated by a local LESA committee for classification of sites

- History of use
- Investment in equipment or improvements
- Market conditions
- Alternative uses
- Potential use by other producers

Table 8.7. Fuzzy thresholds on a 100-point scale

Class	Threashold scale
Best (equal to or greater than 90)	100
	95
	90
Fuzzy Range (equal to or greater than 75, but less than 90)	89
	80
	75
Good (equal to or greater than 65 and less than 75)	74
	65
Fuzzy Range (equal to or greater than 50 but less than 65)	64
	55
	50
Marginal (less than 50)	49
	40
	etc.

However,

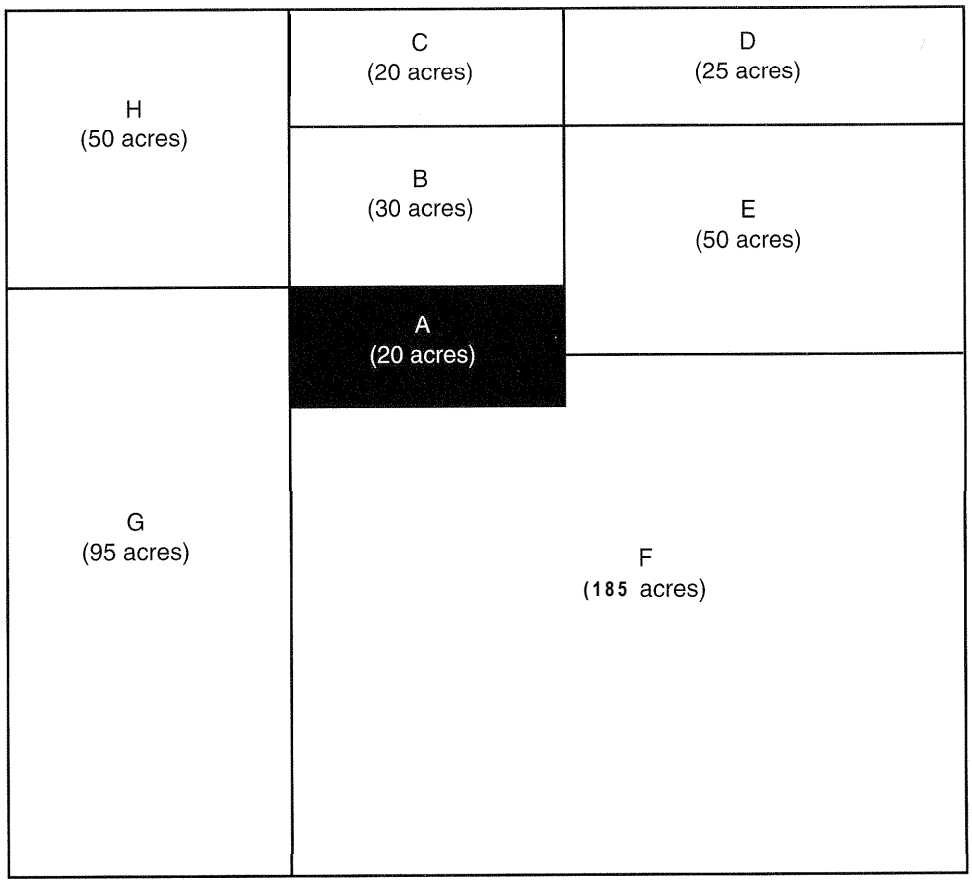

Figure 8.2. Surrounding area impact analysis

The creeping effect

1/4-mile

Summary

dataset

Chapter 9
Summary and Conclusions

Guidebook

of the 1984 federal Farmland Policy Protection Act Rule, is used for evaluating the impact of federal projects and programs on farmlands. A local LESA system can be used in place of the federal system for evaluating federal projects after certification by NRCS.

LESA is a relative rating system on a point scale. This Guidebook recommends a O-100 scale, but another scale could be used. The use of thresholds is a way to rank sites, such as ownership parcels, into two or more relative classes of agricultural importance. The ranking will depend on the scale of application. For example, the lowest ranked site in one county may be the best site in another county in the same state because of differences in soil, climate, and development patterns. Ranking of a particular site in a county could change when the LESA system is applied at the regional or state level. It is therefore important to determine the geographic scale for comparing sites. In most cases, land use decisions are made at the local level and the decisions as to which sites should be protected for agriculture and which should be designated for development are made by local officials.

The interpretation of LESA scores merits some caution. For most applications, it is helpful to set class thresholds on each factor as well as on the total LESA score. The reason for this is that factor thresholds provide more information in interpreting the scores. For example, to qualify for the highest ranking class, thresholds could be set on the soil factor, as well as on size, surrounding land use and other factors. These factor thresholds provide a means to make the LESA system more sensitive to local conditions and objectives.

Developing a LESA system requires a substantial commitment of local official and staff time and volunteer work. The experiences of LESA users over the last 15 years indicate that an agricultural LESA system takes about three to eight months to develop in a sequence of meetings. NRCS staff can usually provide the basic technical assistance for the Land Evaluation component, but the committee still needs to make decisions about factor selection, scaling and weighting. If soil potential ratings are developed, the committee provides valuable help in estimating costs of overcoming soil limitations.

The Site Assessment component often takes more time than the Land Evaluation component because of the wider choice of factors and scaling methods. Testing for factor redundancy and replicability as well as the field site evaluations add time to the development process.

The actual time commitment of staff and volunteers is of course far less than the development process time, since the scheduling of meetings and field trips is usually spread out over several months with a diverse committee. Actual costs to local governments may be low with technical assistance from public agencies and volunteers, except for the time of local government staff.

Most LESA case applications are currently done using tax assessment, soil survey, and other paper maps as well as tabular data and other reports. However, many local governments are initiating geographic information systems (GIS) for use by government agency staff and citizens. GIS is a computer information storage, retrieval, and analysis process to combine maps with attribute data. Where GIS is available, the application of a LESA system to a specific site is made much easier and faster than using non-computer data sources. Some GIS case studies are summarized and referenced in Appendix D and presented in the book, *A Decade with LESA: The Evolution* of *Land Evaluation and Site Assessment* (Steiner et al., 1994).

As population and development pressures increase, public policy decisions on which lands to develop and which to protect for continued resource use will continue to be made by state and local government officials. LESA provides an objective and consistent tool to aid decision makers in evaluating the relative importance of specific sites for continued agricultural use. Once developed, the system is usually quite efficient to apply. The LESA system is kept current by periodic review and revision. With LESA's help, citizens and officials can improve the basis for public policy decisions affecting the long-term stability of our agricultural land base.

Appendix A
Federal law and the Farmland Protection Policy Act LESA system

The protection of farmland as federal policy has been incorporated into federal legislation [Farmland Protection Policy Act of 1981, PL 97-98 and amendments, 7 U.S.C. 4201(b)] and into federal executive orders (USDA Land Use Policy Department Regulation 9500-3, March 22, 1983). A generic LESA system was included in the FPPA rule published in 1984 and in the final rule, published in the *Federal Register* June 17, 1994 (7CFR Part 658).

These policies and rules, as well as other federal legislation and executive rules, provide the framework for federal agency involvement in farmland protection, especially the role of USDA Natural Resources Conservation Service (formerly the Soil Conservation Service). Background discussion of the policy framework is given in Bridge (1994), Grossi (1994), and Wright (1994), and in the original LESA *Handbook* (USDA Soil Conservation Service, 1983).

This Appendix provides the federal LESA system in Table A-l and includes a copy of the 1994 *Federal Register* rule.

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request
Name Of Project	Federal Agency Involved
Proposed Land Use	County And State
[redacted]	Date Request Received By SCS
[redacted]	
(If no, the FPPA does not apply – do not complete additional parts of this form). ☐ ☐	
Major Crop(s) / Farmable Land In Govt. Jurisdiction	Amount Of Farmland As Defined In FPPA
[redacted]	
Name Of Land Evaluation System Used / Name Of Local Site Assessment System	Date Land Evaluation Returned By SCS

~~PART III (To be completed by Federal Agency)~~	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly				
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site				
PART IV *(To be completed by SCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by SCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*				

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use					
2. Perimeter In Nonurban Use					
3. Percent Of Si[redacted]					
4. Protection Provided By State And Local Government					
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average					
8. Creation Of Nonfarmable Farmland					
9. Availability Of Farm Support Services					
10. On-Farm Investments					
11. Effects Of Conversion On Farm Support Services					
12. Compatibility With Existing Agricultural Use					
TOTAL SITE ASSESSMENT POINTS	160				
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100				
Total Site Assessment *(From Part VI above or a local* [redacted]					
TOTAL POINTS *(Total of above 2 lines)*	260				

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See instructions on reverse side)

Form AD-1006 (10-83)

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 – Federal agencies involved in proposed projects that may convert farmland. as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form.

Step 2 – Originator will send copies A, B and C together with maps indicating locations of site(s), to the Soil Conservation Service (SCS) local field office and retain copy D for their files. (Note: SCS has a field office in most counties in the U.S. The field office is usually located in the county seat. A list of field office locations are available from the SCS State Conservationist in each state).

Step 3 – SCS will, within 45 calendar days after receipt of form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland.

Step 4 – In cases where farmland covered by the FPPA will be converted by the proposed project, SCS field offices will complete Parts II, IV and V of the form

Step 5 – SCS will return copy A and B of the form to the Federal agency involved in the project. (Copy C will be retained for SCS records).

Step 6 – The Federal agency involved in the proposed project will complete Parts VI and VII of the form.

Step 7 – The Federal agency involved in the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA and the agency's internal policies.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

Part I: In completing the "County And State" questions list all the local governments that are responsible for local land controls where site(s) are to be evaluated.

Part III: In completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them.

2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities) that will cause a direct conversion.

Part VI: Do not complete Part VI if a local site assessment is used.

Assign the maximum points for each site assessment criterion as shown in §658.5(b) of CFR. In cases of corridor-type projects such as transportation, powerline and flood control, criteria #5 and #6 will not apply and will be weighed zero, however, criterion #8 will be weighed a maximum of 25 points, and criterion #11 a maximum of 25 points.

Individual Federal agencies at the national level, may assign relative weights among the 12 site assessment criteria other than those shown in the FPPA rule. In all cases where other weights are assigned, relative adjustments must be made to maintain the maximum total weight points at 160.

In rating alternative sites, Federal agencies shall consider each of the criteria and assign points within the limits established in the FPPA rule. Sites most suitable for protection under these criteria will receive the highest total scores, and sites least suitable, the lowest scores.

Part VII: In computing the "Total Site Assessment Points", where a State or local site assessment is used and the total maximum number of points is other than 160, adjust the site assessment points to a base of 160. Example: if the Site Assessment maximum is 200 points; and alternative Site "A" is rated 180 points:

$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \times 160 = 144 \text{ points for Site "A."}$$

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17, 1994

Part III

Department of Agriculture

Soil Conservation Service

7 CFR Part 658
Farmland Protection Policy; Final Rule

DEPARTMENT OF AGRICULTURE

Soil Conservation Service

7 CFR Par[illegible]

Farmland [illegible]on Policy

S[illegible] Co[illegible]ervation Service, USDA.

Fin[illegible]rule.

This rule amends part 658 of title 7 of the Code of Federal Regulations which implements the Farmland Protection Policy Act (FPPA). The amendments contained in this rule are necessary to enable the Department of Agriculture to effectively implement the FPPA, as amended. They request reports by federal agencies, recognize the statutory authority of a governor of a state to bring legal actions to enforce the FPPA, provide policy direction regarding [illegible] and federal programs, [illegible] a subsection of the e[illegible] from pu[illegible] effective Ju[illegible]

Lloyd E. Wrig[illegible], Basi[illegible] Area Planning, [illegible] Service, PO [illegible] Wash[illegible] DC 20013, teleph[illegible]

regulations of the United States Department of Agriculture (the Department) implementing the Farmland Protection Policy Act (FPPA) are contained in 7 CFR part 658. A proposed rule, setting forth several amendments to these regulations, was published for public comment on January 14.1987, at 52 FR The comment period closed February 27, 1987, during which time nineteen sets of comments were received from five federal agencies: four state agencies: seven national organizations in the agricultural, resource conservation, and planning fields: one county board of supervisors: and two individuals.

The proposed rule, as discussed below, contained six amendments to the Department's existing regulations. Of these six amendments, three were being proposed as a result of the specific changes in the FPPA that Congress had enacted in section 1255 of the Food Security Act of 1985, Public Law 99-198, 99 Stat. 1518. Another amendment to the existing rule was to correct a clerical mistake. These four amendments, with minor changes, are made final by this rule.

The two remaining amendments, of the six included in the proposed rule, were not responses to any new direction enacted by Congress, but were the Department's proposals to change its policy in the interpretation of FPPA provisions. These two amendments were a departure from the policy that the Department had announced when the existing regulations were promulgated on July 5, 1984, 49 FR 2 77 16. The existing sections of part 658 that would be changed by these two amendments are §§ 658.2(a) and 658.3(c). The rationale underlying the provisions of the existing regulations is set forth in the preamble of the final rule publication, which is found at 49 FR 27716-27724. The rationale for the proposed changes is set forth in the preamble of the proposed rule at 52 FR 1465-1468. After reviewing the policy considerations that led to the adoption of the existing regulations in 1984, as well as considering the proposed changes and the public comments to the pmposed rule, the Department has concluded that the proposed amendments to § 658.2(a) should be adopted with some additional interpretive clarification, as discussed below.

In addition, the Department has concluded that § 658.3(c) should be amended as proposed to comport with the authority of a governor of a state to take action to enforce the provisions of the FPPA with regard to a policy or program of the affected state for the protection of farmland,

I. Background

The FPPA was enacted as Subtitle I, sections 1539–1549, of Title XV of the Agriculture and Food Act of 1981, Public Law 98-98, 7 U.S.C. 42014209. In enacting the FPPA, Congress found that the Nation's farmland was "a unique natural resource" and that each year, "a large among of the Nation's farmland" was being "irrevocably converted from actual or potential agricultural use to nonagricultural use," in many cases as a result of action taken or assisted by the federai government. The FPPA directs federal agencies to identify and take into account the adverse effects of federal programs on the preservation of farmland: consider alternative actions, as appropriate, that could lessen such adverse effects; and assure that such federal programs, to the extent practicable, are compatible with state government, local government, and private programs and policies to protect farmland.

In order to guide the federal agencies in implementing the FPPA, section 1541(a) of the Act, 7 U.S.C. 4202(a), directs the Department of Agriculture, in cooperation with other departments, agencies, independent commissions, and other units of the federal government, to "develop criteria for identifying the effects of Federal programs on the conversion of farmland to nonagricultural uses." The Department issued these criteria in its current rule implementing the FPPA at 7 CFR 658.4 and 658.5. The FPPA also authorizes the Department to provide technical assistance to federal, state, and local government agencies to develop programs or policies to limit the conversion of productive farmland to nonagricultural uses, and this is covered in the current rule at 7 CFR 658.7.

In addition, section 1542 of the FPPA, 7 U.S.C. 4203, requires "each department, agency, independent commission, or other unit of the Federal Government" to review its laws, administrative rules, policies and procedures "to determine whether any provision thereof will prevent" the federal entity "from taking appropriate action to comply fully" with the FPPA, and to "develop proposals for action to bring its programs, authorities, and administrative activities into conformity with the purpose and policy" of the F'PPA.

The Act does not expressly require a federal agency to modify any project solely to avoid or minimize the effects of conversion of farmland to nonagricultural uses. The Act merely requires that, before taking or approving any action that would result in conversion of farmland as defined by the FPPA, the federal agency examine the effects of that action using the criteria which the Department of Agriculture has supplied and, if there are adverse effects, to consider alternatives to lessen those effects. Once the agency has completed this examination, it may proceed with a project that would convert farmland to nonagricultural uses.

As originally enacted, the FPPA contained a prohibition against the use of the Act as a basis for litigation, Section 1548 states that the FPPA "shall not be deemed to provide a basis" for any litigation "challenging a Federal project, program or other activity that may affect farmland." 7 U.S.C. 4209. In the 1985 amendments to the F'PPA, Congress amended this section to allow the governor of a state to bring a suit to enforce compliance with section 1542 (7 U.S.C. 4202) and related regulations.

II. Discussion of the Existing Regulations to Implement the FPPA

The current regulations were promulgated principally to enable federal agencies, with the help of the Soil Conservation Service (SCS), to measure the adverse effects, if any, of

their programs and projects on farmland. The SCS has developed a Farmland Conversion Impact Rating Form, Form AD-1006, for this purpose. A federal agency considering a project on or affecting farmland completes and submits a Form AD-1006 to a local SCS office. The SCS determines if the proposed site or sites contain farmland subject to the FPPA, i.e., farmland that is "prime," "unique," or of "statewide or local importance," as defined by the FPPA. If SCS determines that the site or sites are not subject to the Act; SCS returns the form to the agency with that determination noted.

However, if SCS determines that the FPPA applies, SCS measures the "relative value" of the site or sites as farmland on a scale of 0 to 100, enters this score on the Form AD-1006 and returns the form to the federal agency. At this stage, the agency prepares a site assessment using twelve criteria set forth in the rule. After scoring each of the criteria and arriving at a total site assessment score, up to a maximum of 160 points, the agency adds this site assessment score to the "relative value" score that was supplied by the SCS on the Form AD-1006. The higher the combined score, the more suitable the site would be for protection as farmland, On the other hand, if a site receives a combined score of less than 160 points, the regulation recommends that it he given only "a minimal level of consideration for protection" and that additional sites do not need to be evaluated as alternatives.

Although the primary purpose of the Department's regulations implementing the FPPA was to impart these criteria and the guidelines for their use by agencies, the rule, in addition, established the Department's policy as to the farmlands that are subject to the FPPA, and as to the effect that the FPPA could have on private parties and nonFederal units of government applying for federal assistance to convert farmland to nonagricultural uses.

With regard to the first matter, the FPPA's definition of "prime farmland," excludes "land already in or committed to urban development or water storage." Section 1540(c)(1)(A), 7 U.S.C. 4201(c)(1)(A). The current regulation, § 658.2(a), provides that prime farmland is "committed to urban development or water storage" if a locai zoning code or ordinance or current local comprehensive land use plan designated this land for commercial or industrial use or for residential use that is not intended at the same time to protect farmland.

With regard to the second issue, the current regulation, § 658.3(c), sets forth the Department's determination that the FPPA does not authorize a federal agency to withhold assistance to a project solely because that project was going to convert farmland to nonagricultural uses.

III. Discussion of the Amendments to the Existing Regulations

A. The Two Amendments Necessary for the Annual FPPA Report to Congress

Section 1546 of the FPPA, as enacted in 1981 (99 Stat. 1343–1344), required the Secretary of Agriculture to report to Congress on the progress made in implementing the FPPA. Only one report was required: and it was due within one year after the date of enactment, December 22, 1981. Section 1546 provided that the report should include information on:

(1) The effects, if any, of federal programs, authorities, and administrative activities with respect to the protection of United States farmland; and

(2) The results of

to enable the Department to carry out its reporting obligations.

The first of these amendments would have added a new § 658.4(g) to request federal agencies to return a copy of their completed Form AD-1006 to SCS after a final decision on a project has been made; This amendment received support in comments from all nongovernmental organizations and individuals, from the State of Rhode Island Statewide Planning Program, and from the Clarke County (Virginia) Board of Supervisors. However, the response was different from federal and state agencies that work with Form AD-1006 and would be responsible for returning it to the SCS.

Two federal agencies, the Federal Highway Administration (FHWA) and the Department of Housing and Urban Development (HUD), and the Michigan Department of Transportation and that of Oklahoma expressed concern that this requirement would generate additional, burdensome paperwork. The FHWA suggested that only those forms in which the selected site had a score of more than 160 be returned to SCS. HUD proposed to advise SCS of any tracts of farmland for which financing of housing subdivisions was being approved, but said it would be hard-pressed to return a Form AD-1006 for each action taken by HUD, especially those involving individual mortgage insurance.

The Michigan Department of Transportation and that of Oklahoma made comments that were almost identical to one another. On federally supported highway projects requiring environmental assessments or impact statements, the Form AD-1006 is included in such documentation and SCS receives a copy of the final document. Lesser projects, on the other hand, do not require an envimnmental assessment or impact statement, because they are often categorically excluded from review by regulations implementing the National Environmental Policy Act. These projects "usually require only minor amounts of right-of-way and thus have a very minimal impact on prime farmland." the Oklahoma Department of Transportation stated. Both Michigan and Oklahoma objected to having to submit Form AD-1006 on these types of projects.

The Department recognizes that this change in its regulation may increase the paperwork requirement on federal public works and other federally, assisted programs that are already burdened with reporting requirements. Congress, however, directed that each year the Department is to report on the effects federal programs and actions are having on farmland, and the Department believes that collecting the Form AD-1006 data generated by the affected federal agencies is the best way to compile this information.

The Department has made changes in the final rule to reduce reporting burdens. Under the current rule, SCS determines whether the site or sites in question are of the type of farmland subject to the FPPA. Even in cases SCS determines the FPPA does not apply and SCS returns a Form AD-1006 to the referring agency, further tracking of agency decisionmaking is carried out with a report back to SCS on the final decision regarding the initial referral. New procedures set forth in § 658.4(g), give agencies the option of referring questions of FPPA applicability to SCS or of making these determinations

which it either plans to change its FPPA compliance process or undertakes a new program that may be subject to the FPPA.

The FHWA commented that a single report from an agency should be sufficient until any future revisions to the FPPA or the SCS regulations are made.

The Tennessee Valley Authority (TVA) asked for additional guidance concerning the type of information in the report, and recommended that the annual report be an assessment of the progress made in implementing the FPPA, without excessive and burdensome documentation of specific farmland conversion or protection activities.

The Department has incorporated the suggestion offered.

agency has completed the review of its policies and proce
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of "land already in or committed to water storage." Federal not required to consider the impact of their projects on prime farmland that is "already in or committed to urban development or water storage," even if this and otherwise fall within the definition of "prime farmland."

In developing the existing regulations, the Department adopted standards for determining if prime farmland is "already in urban development" and whether land, although not "in urban development," was nevertheless "committed to

Under § 658.2(a) of the current regulation, prime farmland which had been zoned for nonagricultural use by a state or local government with jurisdiction over the land, or which was in a current state or local land use plan for nonagricultural use, is regarded as "'committed to urban development." This would mean that projects on prime farmland in those areas would not have to be analyzed by agencies for their effect on prime farmland.

The Department noted in the preamble to the 1984 final rule, at 49 FR 27720, that land use planning and zoning "are prerogatives of state and local government, not the Federal

rule amendment would provide that once a project site had been analyzed rind given a combined score of 160 points or less. it would "committed to urban development" and thus no longer covered by the FPPA.

The preamble to the 1987 proposed rule, at 52 FR 1466–1467, cited three masons for introducing these change?. First, it stated that the existing definition "is inconsistent with the definitions of prime farmland used in almost all other State and Federal programs which use the definition." Second, it noted that the existing definition requires the SCS district conservationists to review local plans and use regulations and that many of them do not have the background in land use planning to make the proper determinations as to whether a given project site is truly "committed to urban development." Third, because land "committed to urban development" is excluded in the FPPA's definition of "prime farmland" but not from the FPPA's definitions of farmland that is "unique" or' "of statewide or local importance," it is an anomaly that this type of "prime farmland" can be so easily and categorically put outside the reach of the FPPA while farmland that is "unique" or "of statewide or local importance" is covered by the FPPA despite the existence of zoning designations or land use plans that would allow urban development of such lands.

The comments on the proposed rule were sharply divided on whether the Department should change the identification of farmland *'committed to urban development.'* The American Farmland Trust "strongly" supported the proposed change, callig the existing rule "confusing and inconsistent with the intent of the legislation." The Natural Resources Defense Council (NRDC) also supported the proposed change since it did not appmve of farmland being excluded from the FPPA's coverage just because local land-use plans or zoning ordinances would allow urban development on it. This, the NRDC would be an "arbitrary 'grandfather' exclusion • * * even where there is no current nonagricultural developnient and the prospect of future nonagricultural development is highly speculative." The American Land Resource Association agreed with the proposed change, claiming that the existing rule worked "inadequately" for protection of prime farmland and caused "unnecessary confusion among Federal agencies implementing the FPPA." The Farmers Home Administration and the Rhode Island Statewide Planning Program supported the change. Other commenting parties agreed with the change as part of their general support of all the amendments being proposed.

However, the Department of Housing and Urban Development (HUD). the Federal Highway Administration (FHWA). and the Michigan Department of Transportation making the change in the Department's interpretation of farmland "committed to urban development." In particular, HUD devoted the principal thrust of comments to this pmvision. objecting "strongly" to the change and outlining the importance of the Department's current interpretation that land under planning or zoning for nonagricultural use was "committed to urban development."

Thii procedure ignores and undermines local government's land use decisions made thmugh zoning, comprehensive planning, and subdivision regulations which are to direct urban development and growth * * * By changing the 'farmland committed to urban development' requiring Fannlaod Conversion Impact Rating (AD-1006) be prepared, which must result in an aggregated score 160 points or less before it is considered 'farmland committed to development,' certainly qualified as taking a "big brother" approach to local use plans and decisions.

HUD explained that whenever an application for project

principal method for issuing mortgage insurance on single, family homes in housing subdivisions has been to wait until the local government has approved the subdivision plan and construction of the necessary streets and water and sewer Under the existing rule, HUD would not have to analyze this land as "prime farmland" under FPPA. argued that under the proposed rule. it would be required to complete the AD-1006 form on this land, which it termed a "useless exercise" at that point.

Aside from the mechanics of the proposed amendment, HUD made these comments about the general problem of farmland protection measures that the agency might undertake:

In the single family housing program (which actions are most likely to be on the fringes of urban areas), preservation of farmland require would have to either be in the local planning and zoning process at the earliest conceptual stages or by prohibitive and restrictive regulations which assistance for projects which had converted to nonagricultural uses. Taking either action could easily be interpreted as an indirect way to regulate the land the property owners such lands. We do not

believe to be intent of Congress.

a penalty on either directly indirectly, could result in creating a greater housing shortage, especially for low and moderate income families who are the primary users of HUD mortgage housing programs.

The FHWA, likewise, objected to the proposal on the grounds that it would require preparation of a site assessment on every project that requires rights-of-way. This would require "an enormous amount of time and resources to be provided by Federal, State and/or local agencies" and in many cases there would be "no apparent justification." FHWA suggested that the same exclusion of farmland "committed to urban development" that the Department has applied to "prime farm should be applied to the other two categories in FPPA, "unique" farmland and farmland "of local or statewide importance."

The Michigan Department of Transportation had similar objections. It explained that the current rule "screens many projects and constitutes real time savings * * * If the local entities have designated the land for other uses, it doesn't warrant a high degree of protection as resource base at the federal level." On the other hand, if the rule assessments of "each project that required rights-of-way."

As noted in the preamble to the proposed rule at 52 FR 1467, the zoning and land use plans that are applicable to a particular site will be considered in conjunction with other criteria that are designed to assess the degree to which the site is committed to urban development. In this way, the prerogatives of state and local government, as exercised in zoning codes and land use plans, will play a role in determining whether a site should be given further FPPA review. Because the amended regulations will neither prohibit the providing of federal assistance to convert farmland nor preclude the conversion of farmland through non-federal means, the [redacted] Under the current regulation, sites that contain prime farmland that otherwise would have been exempted due to being "in or committed to urban development" would have still been covered by the FPPA if the site also contained lands of statewide or local importance. The exclusion of lands "in or committed to urban development" would have limited effect. After consideration of the comments, the Department is amending the rule to apply the exemption for farmland "in or committed to urban development" to all four types of farmland. It is clear from the comments provided by a number of federal agencies that they am already applying the exemption to all four types of farmland. Section 658.2(a) is being revised to remove the word "prime" before the word "farmland," thereby, making the exemption apply to all farmland.

An AD–1006 for a site that is located in urban areas need not be sent to SCS for evaluation. In addition, some agencies would like to use available mapped information to make their determinations without sending a Form AD–1006 to SCS. To facilitate the use of such information, § 658.2(a) will be revised to clarify that farmland "already in" urban development or water storage be identified by an area shown as "urbanized area" (UA) on the Census Bureau map, or shown as an urban tint outline or urban area map on U.S.G.S. topographical maps, or shown as urban-built-up on the USDA Important Farmland Maps. Areas shown as white on the USDA Important Farmland Maps are not farmland and, therefore, are not subject to the Act. In addition, § 658.4(a) is being amended to clarify that federal agencies may determine whether or not a site contains farmland as defined in § 658.2(a) without sending a Form AD-1006 to SCS. Where SCS is asked to complete the land evaluation portion of Form AD-1006 before the Federal agency completes the site assessment portion, and SCS determines that the site is subject to the FPPA, then when SCS returns the form to the agency for completion of the site assessment portion, SCS will at the same time provide the agency with the requested information data necessary for the Federal agency to complete score the site assessment factor questions, where the agency chooses to complete the site assessment portion of the form first, SCS will cooperate in providing timely information data to enable the Federal agency to score the site assessment factor questions.

E. Amendment to Allow an Agency to Either Provide or Deny Assistance to a Project to Convert Farmland

The existing regulations, at § 658.3(c), interpret the extent to which an agency can use the FPPA as a basis for denying assistance to a project that would convert farmland. The paragraph reads as follows:

The Act and these regulations do not authorize the Federal Government in any way to regulate the use of private or nonfederal land, or in any way affect the property rights of owners of such land. The Act and these regulations do not provide authority for the withholding of federal assistance to convert farmland to nonagricultural uses. In case where either a private party or a nonfederal unit of government applies for federal assistance to convert farmland to a nonagricultural use, the federal agency should use the criteria set forth in this part to identify and take into account any adverse effects on farmland of the assistance requested and develop alternative actions that could avoid or mitigate such adverse effects. If, after consideration of the adverse effects and [redacted] the applicant wants to proceed with the conversion, the federal agency may not, on the basis of the Act or these regulations, refuse to provide the requested assistance.

The proposed rule contained an amendment that would change the Department's interpretation of the effect of the FPPA by revising this paragraph significantly. This amendment would drop the second sentence. In the closing sentence, instead of retaining the language that the federal agency "may not, on the basis of the Act or these regulations, refuse to provide the requested assistance," the new language [redacted] the required analysis and following its internal policies or procedures, would be free to deny as well as provide the assistance. See 52 FR 1467.

The rationale for this proposed change, as stated in the preamble to the proposed rule at 52 FR 1466, is that the FPPA leaves to the discretion of each agency "the determination of whether [redacted] in a given situation, comply with the policy and purpose of the FPPA." It was further noted that the rule, as presently written, "may be misread as a limitation on the previously described discretion [redacted] the general process through which it is exercised."

Under the current regulation, when private landowners as well as state and local governments apply for assistance for a project involving the conversion of farmland subject to the FPPA, the federal agency is required to examine the effects of the project and alternatives but may not, based on the FPPA, refuse to provide the assistance. The amendment in the proposed rule would avoid making this analysis a pointless exercise by removing the rigid restriction on agency deliberations and [redacted]

scope of eact'evaluation is determined by the scope of the objectives and facts of the agency activity under consideration.

It should be noted that the guidance provided in § 658.3(c), as amended by this rule, regarding the providing of federal assistance to convert farmland clearly applies beyond situations where a federal agency has been requested to [redacted] rather than requests for federal assistance, necessarily involve the same farmland protection policy considerations. In a situation where a Federal agency is contemplating an action that would convert farmland to a nonagricultural use and which is not the result of a direct request for federal assistance, the federal agency may decide, after conducting the analysis required by the FPPA, not to proceed with the action in order to achieve the objectives of the FPPA.

Implementation of the policy objectives of the FPPA in the manner discussed above and as contained in this final rule not only respects the traditional deference to state and local land use decisionmaking reflected in the FPPA, but also comports with and [redacted] of October 26, 1987, 52 FR 41685, 41687) [redacted] convert farmland.

The wording of § 658.3(c) has been slightly modified from that of the proposed rule to clarify that any agency policies or procedures for implementing the Act may be considered by an agency in deciding how to proceed with an activity.

F. Additional Considerations

to decide, in light of the policies of the [redacted] result in the irreversible conversion of farmland, the focus will be on those [redacted] that could convert farmland. Therefore, [redacted] achieve their mission and comply with the FPPA.

In similar deference to the agency discretion provided by the FPPA, the Department has determined not to accept the recommendations for a complete withholding of federal assistance to convert farmland in [redacted] that can be reasonably identified and evaluated. In a review of a specific activity which does not contain proposals for, nor necessarily lead to, future activities that may convert farmland, the potential activities may be too general or speculative to adequately identify and usefully consider. The [redacted] cases where a Clean Water Act section 404 permittee is required by the Corps of Engineers to perform compensatory mitigation on farmed wetland, thereby converting the wetland actual or potential use of farmland to a nonagricultural use, that conversion is

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not subject to FPPA. In complying with § 658.7 (a) and (b), Federal agencies may identify those programs that they determine are not subject to the Act and provide details on how other programs will be implemented consistent with the Act.

As further clarification, it should be noted that only those actions that will or could convert farmland to nonagricultural uses are subject to the Act. Assistance provided to purchase, maintain, renovate, or replace structure that already exists is because conversion farmland took place at the time the structure was constructed. The addition of minor new ancillary structures, such as garages or sheds, to serve existing structures is also not included under the Act. Even in cases where loans are made for new houses, that action is not subject to the FPPA if the request for assistance and commitment by the federal agency was made after the house was constructed. Likewise, once one Federal agency has performed an analysis under the FPPA for the conversion of a site, that agency's a second Federal agency's determination with regard to additional assistance site do not FPPA

Section 658.4(h) is being added to the final rule to reflect this clarification,

Several federal agencies cited concern for the application of the FPPA to land acquisitions by these agencies, providing temporary, intermediate ownership by the Federal Government such as through foreclosure, the acquisition of assets of an insolvent thrift institution or through forfeiture in criminal law enforcement proceedings. They expressed concern for potential conflicts between their statutory responsibilities to obtain prompt, high value disposal of these assets and the analysis procedures required under the FPPA.

The definition of "Federal program" in the FPPA, 7 U.S.C. 4201(c)(4), extends the coverage of the FPPA to "acquiring, managing, or disposing of Federal lands and facilities." If an agency determines that its program does not result in a sufficient acquisition of legal or equitable title by the United States to characterize the property as "Federal land or facilities," then the agency may exclude such land through its own policies and procedures for implementing the FPPA.

However, the Department determined that an interpretive clarification of the term "Federal land and facilities" as used in the definition of "Federal programs" covered by the FPPA would be useful. In that regard, the Department believes that the use of the word "Federal" to modify the words "land and facilities" indicates an intent by Congress to focus the scope of federal programs covered by the FPPA to lands and facilities acquired or managed by federal agencies as necessary proprietary elements of federal programs, such as national parks, or military bases. The use of the modifier "Federal" is significant; if the intent was to include the acquisition, management, or disposal of any land facility by a federal agency, regardless of the purpose of the use of the facility, Congress omitted the modifier "acquiring, managing, or disposing of lands and facilities."

Accordingly, the Department has amended the definition of "Federal program" contained in § 656.2(c) that, for the purposes of the FPPA and these phrase "acquiring, managing, or disposing of federal lands and facilities" refers to lands and facilities that are squired, managed, or were used by a federal agency specifically in support of a federal activity or program. It does not [redacted] actions by that the agency has temporary custody of the land or facility, such as acquisition Pursuant to a lien for delinquent taxes, the exercise conservationship or receivership authority, or the exercise of civil or criminal law enforcement forfeiture or seizure authority.

The Department has also incorporated in the definition of "Federal program" interpretive clarification that loan guarantees or loan insurance of the construction of buildings or other structures is covered by the phrase "undertaking, financing, or assisting construction or improvement projects" contained in the definition of "Federal program." This interpretation was previously provided in the preamble of the final rule that promulgated the current regulations. See 49 FR 27720, July 5.1984. further in this reg the Department has clarified that the acquisition. management, and disposal land or facilities that a federal agency obtains as the result of foreclosure or other actions taken under a loan, loan or other financial assistance proved by the agency directly and specifically for that property or facility is likewise within the definition of "Federal program."

A federal agency may develop and use procedures to implement the FPPA for its loan. loan guarantee, or other financial assistance programs on either a specific project/loan basis or on the basis of an entire program. Further, if an agency has conducted a FPPA review of a loan other assistance for the conversion of farmland and the agency or any other federal agency subsequently acquires the property [redacted] develop and use specific policies and procedures for the management and disposal of property acquired through foreclosure, forfeiture, or other such means that take into consideration its primary statutory authorities regarding such properties. Clearly, these determinations can be best made by the particular agencies involved through their respective FPPA policies and procedures. in consideration of the statutory requirements under which they operate. The Department will consult with pursuant to section 1542 of the FPPA, 7 U.S.C. 4203, to address these concerns,

Some federal agencies would like to sites related to the expansion of existing linear projects that would convert only a few acres of farmland but would avoid the conversion of a large number of acres. Some LESA systems currently include exemptions of 10 acres per bridge and 3 acres per mile on existing highways. The construction of bridges and widening of existing highways is a farmland protection method. USDA will consult with Federal Highway Administration, on actions that are designed to improve existing linear projects so as to avoid the conversion land that would occur if a new linear project were to be constructed.

This rule has been reviewed under USDA procedures established in accordance with provisions of Departmental Regulations 1512-1 and has been designated "non-major."

Lisf of Subjects in 7 CFR Part 658

Agriculture. Soil conservation, Farmland.

Accordingly, Part 656 is added to Title 7 of the Code of Federal Regulations, Table of Contents and text to read as follows:

PART 658—FARMLAND PROTECTION POLICY ACT

Sec.
658.1 Purpose.
656.2 Definitions.
666.3 Applicability and exemptions.
656.4 Guidelines for use of criteria.
658.5 Criteria.
656.8 Technical assistance.
658.7 USDA Assistance with federal agencies' reviews of policies and procedures.

§ 658.1 Purpose.

This part sets out the criteria developed by the Secretary of Agriculture, in cooperation with other federal agencies, pursuant to section 1541(a) of the Farmland Protection Policy Act (FPPA or the Act) 7 U.S.C. 4202(a). As-required by section 1541(b) of the Act, 7 U.S.C. 4202(b), federal. agencies are (1) to use the criteria to identify and take into account the adverse effects of their programs on the preservation of farmland, (2) to consider alternative actions, as appropriate. that could lessen adverse effects, and (3) to ensure that their programs, to the extent practicable, are compatible with state and units of local government and private programs and policies to protect farmland. Guidelines to assist agencies in using the criteria are included in this part. The Department of Agriculture (hereinafter USDA) may make available to states, units of local government, individuals, organizations, and other units of the Federal Government, information useful in restoring, maintaining, and improving the quantity and quality of farmland.

§ 658.2 Definitions.

(a) Farmland means prime or unique farmlands as defined in section 1540(c)(1) of the Act or farmland that is determined by the appropriate state or unit of local government agency or agencies with concurrence of the Secretary to be farmland of statewide of local importance. "Farmland" does not include land already in or committed to urban development or water storage. Farmland "already in" urban development or water storage includes all such land with a density of 30 structures per 40-acre area. Farmland already in urban development also includes lands identified as "urbanized area" (UA) on the Census Bureau Map. or as urban area mapped with a "tint overprint" on the USGS topographical maps, or as "urban-built-up" on the USDA Important Farmland Maps. Areas shown asivhite on the USDA Important Farmland Maps are not "farmland" and, therefore, are not subject to the Act Farmland "committed to urban development or water storage" includes all such land that receives a combined score of 160 points or less from the land evaluation and site

program

val programs
non-Federal

d or easements for
d or all required

appropriate agency;
(ii) a final environmental impact

(iii) the engineering or architectural

includes the acquisition, management

"acquiring, managing, or disposing of

§ 658.3 Applicability and exemptions.

(a) Section 1540(b) of the Act, 7 U.S.C. 4201(b), states that the purpose of the Act is to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses. Conversion of farmland to nonagricultural uses does not include the construction of on-farm structures necessary for farm operations. Federal agencies can obtain assistance from USDA in determining whether a proposed location or site meets the Act's definition of farmland. The USDA Soil Conservation Service [SCS) field office serving the area will provide the assistance. Many state or local government planning offices can also provide this assistance.

(b) Acquisition or use of farmland by a federal agency for national defense purposes is exempted by section 1547(b) of the Act. 7 U.S.C. 4208(b).

(c) The Act and these regulations do not authorize the Federal Government in any way to regulate the use Of private or nonfederal land, or in any way affect the property rights of owners of such land. In cases where either a private party or a nonfederal unit of government applies for federal assistance to convert farmland to a nonagricultural use, the federal agency should use the criteria set forth in this part to identify and take into account any adverse effects on farmland of the assistance requested and develop alternative actions that would avoid or mitigate such adverse effects. If after consideration of the adverse [redacted] conversion, the federal agency, on the basis of the analysis set forth in § 658.4 [redacted] assistance and actions that would convert farmland to nonagricultural uses are subject to this Act. Assistance [redacted] maintenance, renovation, or replacement of existing structures and sites converted prior to the time of an application for assistance from a federal agency, including assistance and actions related to the construction of minor new [redacted]

(d) Section 1548 of the Act, as amended, 7 U.S.C. 4209, states that the Act shall not be deemed to provide a basis for any action, either legal or equitable, by any person or class of persons challenging a federal project, program, or other activity that may affect farmland. Neither the Act nor this rule, therefore, shall afford any basis for such an action. However, as further provided in section 1548, the governor of an affected state, where a state policy or program exists to protect farmland, may bring an action in the federal district court of the district where a federal program is proposed to enforce the requirements of section 1541 of the Act, 7 U.S.C. 4202, and regulations issued pursuant to that section.

§ 658.4 Guidelines for use of criteria.

As stated above and as provided in the Act, each federal agency shall use the criteria provided in § 658.5 to identify and take into account the adverse effects of federal programs on the protection of farmland. The agencies are to consider alternative actions, as appropriate, that could lessen such adverse effects. and assure that such federal programs, to the extent practicable. are compatible with state, unit of local government and private programs and policies to protect farmland. The following are guidelines to assist the agencies in these tasks:

(a) An agency may determine whether or not a site is farmtand es defined in § 658.2(a) or the agency may request that SCS make such a determination. If an agency elects not to make its own [redacted] Conversion Impact Rating Form, available at SCS offices, for determination of whether the site is farmland subject to the Act. If neither the entire site nor any part of it are subject to the Act, then the Act will not apply and SCS will so notify the agency [redacted] measure the relative value of the site as farmland on a scale of 0 to 100 [redacted] of their receipt except that in cases where a site visit or land evaluation system design is needed, SCS will [redacted] event that SCS fails to complete its response within the required period, if further delay would interfere with construction activities, the agency should proceed as though the site were not farmland.

(b) Federal agencies may elect to assign the site assessment criteria relative weightings other than those [redacted] agency by SCS will also include the following incidental information: The total amount of farmable land (the land in the unit of local government's jurisdiction that is capable of producing the *commonly grown crop]: the* percentage of the jurisdiction that is farmland covered by the Act; the percentage of farmland in the jurisdiction that the project would convert; and the percentage ot tarmland in the local government's jurisdiction with the same or higher relative value than the land that the project would convert. These statistics will not be part of the criteria scoring process, but are intended simply to furnish additional background information to federal agencies to aid them in considering the effects of their projects on farmland.

(c) After the agency receives from SCS the score of a site'5 relative value as described in § 658.4(a) and then applies the site assessment criteria which are set forth in § 658.5 (b) and (c), the agency will assign to the site a combined score of up to 260 points, composed of up to 100 points for relative value and up to 180 points for the site assessment. With this score the agency will be able to identify the effect of its programs on farmland, and make a determination a5 to the suitability of the site for protection as farmland. Once this score is computed, USDA recommends:

(1) Sites with the highest combined scores be regarded as most suitable for protection under these criteria and sites with the lowest scores, as least suitable. [redacted] consideration for protection and no additional sites need to be evaluated.

(3) Sites receiving scores totaling 160 or more be given increasingly higher levels of consideration for protection.

(4) When making decisions on proposed actions for sites receiving scores totaling 160 or more, agency personnel consider:

(i) Use of land that is not farmland or use of existing structures:

(ii) Alternative sites, locations and design5 that would serve the proposed purpose but convert either fewer acres of farmland or other farmland that has a lower relative value:

(iii) Special siting requirements of the [redacted] which an alternative site fails to satisfy the special siting requirements as well as the originally selected site.

(d) Federal agencies may elect to assign the site assessment criteria relative weightings other than those [redacted] the agency adopt its alternative weighting system (1) through rulemaking in consultation with USDA, and (2) as a system to be used uniformly throughout the agency. USDA recommends that the weightings stated in § 658.5 (b) and (c) be used until an agency issues a final rule to change the weightings.

(e) It is advisable that evaluations and analyses of prospective farmland conversion impacts be made early in the planning process before a site or design is selected, and that, where possible, federal agencies. They are in two parts, (1) the land evaluation criterion, relative value, for which SCS will provide the rating or score, and (2) the site assessment criteria, for which each

(4) Is the site subjec
local government policies or programs to protect farmland or covered by private programs to protect farmland?

Site is protected—20 points

Ail required services are available-5 points

Some required services are available-4 to 1 point(s)

No required services are available—0 points

(10) Does the site have substantial and well-maintained on-farm [redacted] converting farmland to nonagricultural [redacted] converted—10 points

Some reduction in demand for support services if the site is converted—0 to 1 point(s).

No significant reduction in demand for support services if the site is converted—0 points

(12) Is the kind and intensity of the proposed use of the site sufficiently incompatible with agriculture that it is likely to contribute to the eventual conversion of surrounding farmland to nonagricultural use?

Proposed project is incompatible with existing agricultural use of surrounding farmland—10 points

Proposed project is tolerable to existing agricultural use of surrounding farmland—9 to 1 point(s)

Proposed project is fully compatible with existing agricultural use of surrounding farmland—0 points

(c) *Corridor-type Site Assessment Criteria.* The following criteria are to be used for projects that have a linear or corridor-type site configuration connecting two distant points, and crossing several different tracts of land. These include utility lines, highways, railroads, stream improvements, and flood control systems. Federal agencies are to assess the suitability of each corridor-type site or design alternative for protection as farmland along with the land evaluation information described in § 658.4(a). All criteria for [redacted] except as noted below:

(1) Criteria 5 and 6 will not be considered.

(2) Criterion 8 will be scored on a scale of 0 to 25 points, and criterion 11 will be scored on a scale of 0 to 25 points.

§ 658.6 Technical assistance.

(a) Section 1543 of the Act, 7 U.S.C. 4204 states, "The Secretary is encouraged to provide technical assistance to any state or unit of local government, or any nonprofit organization, as determined by the Secretary, that desires to develop programs or policies to limit the conversion of productive farmland to nonagricultural uses." In § 2.62. of 7 CFR Part 2. Subtitle A, SCS is delegated leadership responsibility within USDA for the activities treated in this part,

(b) In providing assistance to states, local units of government, and nonprofit organizations, USDA will make available maps and other soils information from the national cooperative soil survey through SCS field offices.

(c) Additional assistance, within available resources, may be obtained from local offices of other USDA agencies. The Agricultural Stabilization and Conservation Service and the Forest Service can provide aerial photographs, crop history data, and related information. A reasonable fee may be charged. In many states, the Cooperative Extension Service can provide help in understanding and identifying farmland protection issues and problems, resolving conflicts, developing alternatives, deciding on appropriate actions, and implementing those decisions.

(d) Officials of state agencies, local units of government, nonprofit organizations, or regional, area, state-level, or field offices of federal agencies may obtain assistance by contacting the office of the SCS state conservationist. A list of Soil Conservation Service state office locations appears in Appendix A, Section 661.6 of this Title. If further assistance is needed, requests should be made to the Assistant Secretary for Natural Resources and Environment, Office of the Secretary, Department of Agriculture, Washington, D.C. 20250.

§ 658.7 USDA assistance with federal agencies' reviews of policies and procedures.

(a) Section 1542(a) of the Act, 7 U.S.C. 4203, states, "Each department, agency, independent commission or other unit of the Federal Government, with the assistance of the Department of Agriculture, shall review current provisions of law, administrative rules and regulations, and policies and procedures applicable to it to determine whether any provision thereof will prevent such unit of the Federal Government from taking appropriate action to comply fully with the provisions of this subtitle."

(b) Section 1542(b) of the Act, 7 U.S.C. 4203, requires, as appropriate, each department, agency, independent commission, or Other unit of the Federal Government, with the assistance of the Department of Agriculture, to develop proposals for action to bring its programs, authorities, and administrative activities into conformity with the purpose and policy of the Act,

(c) USDA will provide certain assistance to other federal agencies for the purposes specified in section 1542 of the Act, 7 U.S.C. 4203. If a federal agency identifies or suggests changes in laws, administrative rules and regulations, policies, or procedures that may affect the agency's compliance with the Act, USDA can advise the agency of the probable effects of the changes on the protection of farmland. To request this assistance, officials of federal agencies should correspond with the Chief, Soil Conservation Service, P.O. Box 2890, Washington, D.C. 20013.

(d) To meet the reporting requirements of section 1546 of the Act, 7 U.S.C. 4207, and for data collection purposes, each Federal agency is requested to report to the Chief of the Soil Conservation Service by November 15th of each year on progress made during the prior fiscal year to implement sections 1542 (a) and (b) of the Act, 7 U.S.C. 4203 (a) and (b). Until an agency fully implements those sections, the agency should continue to make the annual report, but may omit the report upon full implementation. However, an agency is requested to file [redacted] which the agency has substantially changed its process for compliance with the Act.

Dated: June 8.1944.

Mike Espy,

Secretary of Agriculture.

[FR Doc. 94-14548 Filed 6-16-94; 8:45 am]

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Appendix B

Guidelines for forest

LESA systems

Forest Land Evaluation and Site Assessment (FLESA) systems have been developed for at least 28 jurisdictions in 15 states, according to LESA profiles in *Agricultural Land Evaluation and Site Assessment: Status* of *State and Local Programs* (Steiner et al., 1991). This set of guidelines is based on forest LESA applications in Vermont and Oregon. In Vermont, the 1988 Growth Management Act (Act 200) encouraged forest lands planning by municipalities through goal statements and guidelines for local planning. Also, a Forest Land Evaluation and Site Assessment (FLESA) system was developed to aid in adding private lands to national forests under the federal Taconic Mountains Protection Act of 1991. In Oregon, several counties developed forest LESA systems to help county officials in zone designations and permit decisions, and as a classification tool for identifying primary and secondary resource lands.

Adaptation of the LESA system to forest lands includes similar procedures to those discussed throughout this *Guidebook,* especially Chapters 2, 3, 6, 7, and 8. A local committee is an important part of the process, as are needs assessment, factor weighting, field testing of a draft FLESA system, and setting thresholds for decision making. The differences lie in the LE measurements and factor selection for SA. This appendix will provide a brief overview of concepts, LE and SA factors, and a discussion of studies and sources of LESA documentation which would be helpful to those developing a LESA system for forest lands.

Basic concepts

As with an agricultural LESA system, a forest LESA committee needs to consider several concepts in developing the system, including the following:

Focus. Forest lands, even more than agricultural lands, provide several public benefits in addition to harvestable forest products, such as recreational opportunities (where access is permitted), visual enjoyment, wildlife habitat, old growth stands, and other unique or scientifically interesting plant or animal associations, as well as water supply protection. While all of these benefits are important to evaluate, if combined into a single FLESA system, the resulting scores may be difficult to interpret. Options are discussed under the SA factors.

Replicability. In order to assure that different scores would obtain the same results, procedures and point scoring need to be clear and objective.

Redundancy. Since simplicity of both use and public understanding is usually a key goal of FLESA committees, selecting and testing factors for redundancy are important considerations.

Data basis for factor scaling. The FLESA committee should attempt to use available data sources and, when necessary, expert judgment in assigning scales and weights to factors. These data sources should be noted in the FLESA documentation.

Field testing and benchmarking. After the FLESA committee prepares a draft system, field evaluation with committee members and benchmarking (comparison to an independent rating-See Chapter 7) will clarify problems and help in making adjustments.

Scale of 100 points. As outlined in Chapter 1 and other chapters of this *Guidebook*, it is recommended that a 100-point scale be used and that each factor be weighted separately.

Land Evaluation for timber products

Land Evaluation for commercial forestry is based on the commercial values of designated tree species. These species will, of course, vary by geographic area. In Vermont, species included sugar maple, white pine, spruce fir, and hemlock. In western Oregon, Douglas fir was used as the indicator species.

Soil potential ratings (SPRs) for forest soils were used in Vermont and Oregon. SPR procedures are discussed in Chapter 4 and Appendix E. SPRs for forestry soils indicate the difference between value of harvested timber and the site management costs over several rotations. Certain assumptions need to be made about management practices and costs, including origin of stand, minimum basal area and diameter to be removed in commercial thinning, the number and spacing of trees to be replanted, site preparation methods, slope limitations for thinning and harvesting operations, and the rotation period.

Where SPRs

hard-

outwash

Potential Study and Forest Land Value Groups for Vermont Soils 1991).

Table B.1. Productivity value

Site index	Slope	Factor scale
	< 8%	100
	8-25%	75
	> 25%	60
	< 8%	75
	8-25%	60
	> 25%	50
III	< 8%	50
	> 8%	40
IV	—	0

Planning for the Future Forest, A Supplement to the Planning Manual for Vermont Municipalities (Bouton 1991).

Guidebook

LESA

Land Evaluation of *Forest Soils* (1990),

(Pepi 1988).

Management practices included in the Lane County SPR are stand establishment, thinning, harvest, and road construction and maintenance. Costs for initial and continuing limitations depend on soil depth, coarse fragment content, bedrock type, slope, and erosion hazard. The dollar values assigned to these costs are knowledgeable estimates by a local committee. Costs are subtracted from the dollar value of yields. The soil having the highest net value is assigned an SPR of 100; all other soils are scaled from 0 to 100 by the percentage each soil is to the highest soil (Pepi and Huddleston, 1988; Pepi, 1989).

Site Assessment fo products

The Vermont guidebook, *Planning for* the *Future Forest* (Bouton et al., 1991), suggests a number of factors which can be adapted to local needs. The suggested factors are parcel size, contiguous ownership acreage, accessibility, public/private investment in forestry (e.g., USDA cost-sharing practices), adjacent land use (within a l/Z-mile radius from parcel center), forest type or stand value (parcels with species of high market value are rated higher), social factors such as ownership type and pattern and past forest management practices, average stand size and quality, and marketability of stand species. Some of these factors may be redundant, or

Table B.2. An example of customizing FLESA criteria

Town A (Urban with scarce timberland)

Factors	Suggested point range	Assigned weight	Maximum points
Land evaluation:			
Soil potential index	o-1 00	1	100
Site Assessment:			
Parcel size	o-7	20	140
Accessibility	O-10	2	20
Public/Private investment	O-2	5	10
Forest type	o-4	5	20
Adjacent land use	O-5	2	10
Maximum Score			300

Town B (Rural with large parcels)

Factors	Suggested point range	Assigned weight	Maximum points
Land evaluation:			
Soil potential index	o-1 00	1	100
Site Assessment:			
Parcel size	o-7	10	70
Accessibility	o-5	4	20
Public/Private investment	o-1 0	5	50
Forest type	o-2	5	10
Adjacent land use	o-5	10	50
Maximum Score			300

Note: Vermont's *Guidebook* follows a different method from the one suggested in this *Guidebook* The points could be scaled from O-100 and the weights from O-I .O.

intercorrelated. Table B.2 shows how towns with different local characteristics might select and weight the factors.

In the LESA system for Columbia County, Oregon, SA factors were size, adjacent land use, surrounding (within 1/2 mile of an urban growth boundary, wildlife refuge, public recreation site, or a downstream domestic water supply caused detractor points to be subtracted from the LESA score (Pease and Huddleston, 1991).

The key points used in Columbia County for scaling these factors are as follows:

Soils. SPRs are used to calculate LESA scores. Management costs are subtracted from dollar value of yields to give a number used to assign soil potential ratings. The soil having the highest difference between output value and input costs (based on 1 acre) is assigned an SPR of 100. All other soils are assigned SPRs on a scale between 0 and 100 according to the difference between inputs and outputs. Each soil in the county is rated in a table provided by a local technical committee. The table is used in the rating worksheet.

Size. Tracts less than 5 acres cannot be feasibly managed for commercial forestry. Tracts between 5 and 20 acres have minimal value for commercial forestry. Tracts greater than 20 acres have increasing value for commercial forestry management, with 40 acres a preferred minimum size, and an optimum minimum management size of 320 acres. Tracts larger than 320 acres will be rated the same.

Shape of parcel is a limiting factor for tracts less than 20 acres but is not used in the model because such tracts receive very few points for size. Slopes of greater than 30 percent invoke a 10 percent penalty in the parcel size matrix.

Adjacent land use. Two types of adjacent land use are rated for conflict potential. Incompatible uses place limitations on management or lead to problems such as trespass. Incompatible uses include tracts zoned for rural residential use or RA 19, which qualify for a dwelling unit (DU); tracts zoned for Exclusive Farm Use (EFU) or Forestry that are less than 20 acres and a DU is present; developed recreation sites such as golf courses or public parks; and right-of-way (ROW) for utilities. Somewhat incompatible uses place some limitation on management. Such uses include non-forestry related commercial uses; educational uses; and tracts in an

Surrounding land

M.

(UGB),

Stream and line ROW.

Table B.3. Soil potential rating worksheet, Columbia County, Oregon

Soil map unit	Soil potential rating (from table on a scale of 0-100) *	% of Tract	Raw factor rating % of Tract
Total tract SPR factor rating (add last column)			
LE factor rating = Total raw factor rating * 0.25 (weight) = (weighted factor rating)			

Table B.4. Adjacent land use, Columbia County, Oregon

Incompatible parcels:

- any parcel zoned rural residential or FA 19 that qualifies for a DU
- any parcel in EFU or forestry zones that both:
  is smaller than 20 acres and
  has a DU on it
- developed recreation sites such as golf courses or public parks which provide access to the public on a regular basis

Somewhat compatible parcels:

- any parcel in EFU or forestry zones that both:
  is between 20 and 40 acres in size and
  has a DU on it
- non-forestry related commercial uses
- educational uses

Density adjustment factor:

Adjacent density is adjusted in reference to a "standard level of conflict" defined as that arising from a 5-acre parcel rectangular in shape, with a 2:1 width ratio, and oriented with a short side adjacent to the parcel in question. Any density less than this standard would reduce the penalty; any density greater would increase the penalty.

$$\text{density adjustment} = \frac{\text{number of incompatible parcels}}{\text{potential number of incompatible parcels}}$$

$$\text{potential number} = \frac{\text{total length of incompatible perimeter}}{\text{short side length of 5-acre, 2:1 rectangle (330')}}$$

NOTE: Do not include "somewhat incompatible" parcels in density adjustment.
The general formula for calculating the rating is:

Total perimeter = {(Length incompatible perim. * density adj.) + (Length swc per/2)}/total perim. * 100

NOTE: For measurements in inches on a 1" = 400' map, the following formula can

" r e t e p

Table B.5. Surrounding land use

Radius of Influence = 0.5 mile

NOTE: If UGB present in radius of influence, score = 0.

Exclude adjacent parcels, but count all other contiguously owned tracts in RR zones or FA 19 zones that qualify for a DU and tracts in EFU or Forest zones < 20 acres with a DU within or partially within the area of influence.

RR tracts + EFU or Forestry zone tracts < 20 acres with DU divided by Tract Size = Ratio of Conflicts to Parcel Size.

Ratio of No. of Conflicts to Parcel Size	Raw Factor Rating
> o-c 0.05	100
0.05-e 0.10	98
0.10-c 0.15	95
0.15-c 0.20	90
0.20-c 0.25	80
0.25-c 0.30	65
0.30-< 0.35	50
0.35-c 0.40	40
0.40-c 0.45	30
0.45-c 0.50	20
> 0.50	0

Ratio Factor Rating = _____

Adjustment Factors (subtract):

Presence of: UGB (100 raw factor rating points)
Wildlife Refuge (50 raw factor rating points)
Public Access Recreation Site (25 raw factor rating points)
Downslope Domestic Water Supply:

% of Tract Affected	Subtract
c 25%	25
25-50%	50
51-75%	75
> 75%	100

Surrounding Land Use Factor Rating = _____

Weighted surrounding SA Factor Rating = Raw Factor Rating * 0.10 (weight) = _____ (weighted factor rating)

Table B.6. Conversion from raw factor rating to LESA score

	Raw factor rating (scaled to 100 points)	*	Weight (% of 100 points)	LESA weighted factor rating
Soils		*	0.25	
Size		*	0.30	
Adjacent land use		*	0.35	
Surrounding land use		*	0.10	
Total score (add LESA weighted factor ratings)				

Another reference source for forest LESA systems is the first Land Evaluation and Site Assessment *Handbook* (USDA Soil Conservation Service, 1983). Part 601 of this publication gives a local example of using LE factors of mean annual growth potential, species market value, slope steepness, and soil limitations. Table B.7 illustrates the scales for rating each factor. The LE rating is derived as shown in Table B.8.

Detailed instructions are given in the *Handbook.* As can be seen from these factors, selection, scaling, and weighting of factors are important decisions of a local LESA committee.

Table B.7. Forest land scaling elements, Hanover County, Virginia

Mean annual increment cu ft/acre	Factor scale
>180	1.0
160-I 79	0.9
140-159	0.8
120-I 39	0.7
100-I 19	0.6
80-99	0.5
60-79	0.4
40-59	0.3
20-39	0.2
< 20	0.0

Use site index from SCS-Soils 5 Form and convert to C.M.A. I. for indicator species.

Indicator tree species	Factor scale
Loblolly pine	1.0 Most desirable
Yellow poplar	0.9
Shortleaf pine	0.8
No. red oak	0.7
White oak	0.6 Medium desirable
Sweetgum	0.4
Virginia pine	0.3 Least desirable

Examples:
The West: Douglas fir might be most desirable, hemlock might be medium desirable, etc.
The South: Loblolly pine might be most desirable, and upland hardwoods might be least desirable.

Slope%	Factor scale
0-15 (0-7)	1.0
15-25 (7-I 5)	0.8
25-35 (15-25)	0.6
35-50 (> 25)	0.4
50+ (NA)	0.1 (NA)

Slope ranges in ( ) modified for coastal plain and piedmont areas of Hanover County.

Soil Characteristic	Factor scale
No limitations	1.0
Fragmental or skeletal	NA
Sandy (aeric subgroups)	0.5
Clayey (sandy)	0.4
Stony or rocky (aquults/toxic)	0.2
Excessive wetness (ponding)	0.1
Other—shallow (droughty)	0.1-1.0

Table B.8. Forest land relative value rating, tianover County, Virginia

1	2	3	4	5	6	7	8	9	10
Soil mapping svmbol	Soil series	Productivity rating	Indicator species rating	Slope %	Steepness of slope rating	Soil limitation	Soil limitation rating	Composite value (3+4+6+8)	Relative factor rating (before weighting)
1B	Abell	0.7	1.0	2-7	1.0	None	1.0	3.7	100
3B	Appling	0.6	1.0	2-7	1.0	None	1.0	3.6	97
8	Augusta	0.7	1.0	o-2	1.0	Aeric	0.5	3.2	86
10C	Bourne	0.5	1.0	7-15	0.8	Droughty	0.1	2.4	65
18	Coxville	0.7	1.0	o-2	1.0	Aquults	0.2	2.9	78
29	Forestdale	0.4	0.4 (Sweetgum)	o-2	1.0	Aqualfs (ponding)	0.1	1.9	48
45B	Mayodan-Creedmoor	0.6	1.0	2-7	1.0	Clayey	0.4	3.0	81
51B2	Pacolet	0.6	1.0	2-7	1.0	None	1.0	3.6	97
75C3	Wedowee	0.5	1.0	7-I 5	0.8	Clayey	0.4	2.7	73
69D	Udults	0.7	1.0	15-25	0.6	None	1.0	2.3	56

Relative factor rating = $\frac{\text{composite value}}{3.7} \times 100$ (where the highest composite value was 3.7)

Combining LE and SA factors and setting thresholds

The general LESA model presented in Chapter 1 of this Guidebook will make combining LE and SA factors easier by scaling all factors to 100 and then multiplying by a weight between 0 and 1.0. The weighted factor ratings are then added to obtain the LESA score.

An Oregon case study will illustrate how thresholds were used for the LE and SA factors to distinguish between primary and secondary forest lands (Pepi and Huddleston, 1988). On a 100-point scale, the factors and maximum factor ratings are given in Table B.9. The thresholds for each factor are given in Table 13.10. The classification matrix is given in Table B.ll.

The soils threshold was set at about 50 percent of the maximum possible. The size threshold was set to correspond with a size of 10 acres when there are no other limitations due to slope, shape, or class I streams. The adjacent land-use threshold is set at a value in which 50 percent of the perimeter lies adjacent to 5-acre parcels. The surrounding land-use threshold is set at 1/3 of maximum points, which was deliberately low because the LESA com-

Table B.9. Forest lands LESA model, Lane County, Oregon

Factor	Max. raw rating		Weight	Maximum weighted factor rating
Soils	100	*	0.35	35
Size	100	*	0.25	25
Adjacent land use	100	*	0.25	25
Surrounding land use	100	*	0.15	15
Total				100

mittee felt this factor was of least importance. The total score threshold is set higher than the sum of factor thresholds to assure that at least one of the factors will have a value substantially above its threshold. The interaction matrix was worked out with the help of several field trips with the local LESA committee (Pepi and Huddleston, 1988).

Table B.10. LE and SA factor thresholds, Lane County, Oregon

Factor	Primary/Secondary threshold
Soils	18
Size	11
Adjacent use	12
Surrounding use	5
Total score	53

Table B.11. Primary (P)/Secondary (S) classification matrix, Lane County, Oregon

	Adjacent < 12		Adjacent > 12	
	Surrounding <5	Surrounding >5	Surrounding <5	Surrounding >5
Size < 11 and Soil < 18	S	S	S	P if Total > 53 S if Total c 53
Size < 11 and Soil >18	S	S	S	P if Total > 53 S if Total < 53
Size > 11 and Soil < 18	S	S	S	P if Total > 53 S if Total < 53
Size > 11 and Soil > 18	S	S	P if Total > 53 S if Total < 53	P

Summary

This forest LESA appendix is intended to provide some ideas and references to jurisdictions that are developing forest LESA systems. Procedures are similar to developing an agricultural LESA system. Factor selection, scaling, weighting, and combining are all decisions for a local LESA committee, with assistance of NRCS staff or other trained LESA leaders.

Appendix C

LESA adaptations for other uses: Riparian zones, rural residential sites, gravel sites and wetlands

ripari-

LESA-

Riparian areas

0-

Table 6.1. Site assessment criteria in the RESA system, Arizona

SA category	1-3 points	4-6 points	7-10 points
Vegetative cover	Little or no bank vegetation, no riparian vegetation, uplands devoid of vegetation because of overgrazing or development	Some bank vegetation, remnant riparian vegetation, partial regeneration, medium to good cover on uplands	Banks are well vegetated, riparian vegetation well established and regenerating
Channel morphology	Extensive manipulation by human activity. Poorly developed flood plains, little or no natural vegetation	Channel is mostly or all natural, mostly natural banks, some human impact, some natural and introduced vegetation	Channels in a natural state, well-developed flood plains, well-vegetated banks
Erosion control	Erosion is sever. Bank downcut is 3 feet or more, banks are perpendicular to channel. No structural mitigation	Erosive conditions exist; however, erosion control structures such as gabions or holding ponds are in place	Erosion is being stemmed by vegetation. Upland land does not accelerate erosion
Wildlife diversity	Wildlife is limited to species found in most urban environments such as common birds, insects, few mammals	Wildlife includes several species of birds, reptiles, and mammals. Non-urban species present, but not threatened	Threatened, endangered, or rare species present. Native fish present
Local land use	Graded void of vegetation overgrazed, use of toxic products; sand, gravel, and other mining operations	Developed but re-vegetated, grazed but not overgrazed, impacted but most cases mitigated	Organic farming, low-level human impact, open space, undistributed
Surface water quality	Advanced erosion, high turbitity, toxic products, mining tailings, little or no vegetation to trap sediment or cycle nutrients	Less human impact, healthy upland vegetated, some bank stabilization via natural or human processes, few erosion factors	Banks are well vegetated, trapping sediment and slowing erosion. Aquatic, riparian, and upland plants cycle nutrients
Groundwater recharge	Straightened channel, impermeable channel bottom, banks, or flood plains. Water does not percolate down	Partial straight and partial meander, natural or slightly manipulated channel bed, some vegetation	Natural channel, meander patter, sufficient vegetation to slow water and facilitate recharge
Recreation potential	Channel void of water, vegetation, wildlife, natural values, privately owned, inaccessible	Channel supports birds, mammals, non-game fish, private/public ownership, accessible and close to population center	Outstanding wildlife viewing and recreation opportunity, high durability public ownership
Upland condition	Developed and/or graded void of vegetation, accelerated erosion, overgrazed	Mostly healthy upland vegetation, grazed but no overgrazed, development impacts mitigated	Healthy vegetation that traps sediment, slows run-off, and provides valuable habitat

Table C.2. Results of RESA

Site Number	1	2	3	4	5	6	7	8	9	10
RE: Category/Score	10	10	25	50	25	50	25	25	50	50
SA: Riparian vegetation	0	0	5	7	3	9	6	8	8	9
Channel morphology	5	2	1	5	5	9	6	7	8	8
Erosion control	8	2	5	5	5	9	5	7	8	8
Wildlife diversity	8	2	5	5	5	9	5	7	8	8
Local land use	7	7	3	2	7	9	5	5	7	3
Surface water quality	5	2	2	5	4	8	4	5	5	3
Groundwater recharge potential	8	0	2	5	7	7	7	7	5	5
Recreation potential	5	0	2	2	5	5	5	2	5	7
Upland potential	6	2	2	2	5	7	5	5	3	2
Total score	62	27	52	88	71	122	76	78	107	103

Site no.:			
1	Headwaters	6	Arcosanti
2	Fain Road	7	Higgins Ranch
3	Dewey	8	Horshoe Ranch
4	Humboldt	9	Badger Springs
5	Chauncey Ranch	10	Black Canyon City

Rural development suitability

Often, LESA is used in zoning decisions to determine whether land parcels should be protected from conversion or whether other land uses are appropriate. A separate rural residential rating could help local officials make these decisions.

Several LESA studies in Vermont have used a separate development suitability rating system to compare to the resource rating. For instance, in a study for Bennington County (Bennington County Regional Commission, 1994), rating systems for forest potential, development potential, recreation, important wildlife habitats, and public water supplies were developed, mapped, and compared to determine which land tracts should be added to the national forest. The two factors used in this study for development suitability were the capacity of the soil to support on-site wastewater disposal systems, and accessibility from maintained state or town highways. A third factor, proximity of existing development, was dropped because it was correlated to the accessibility factor and was not as important as the other two factors. The project used a geographic information system (GIS) to generate suitability maps for low, medium, and high suitabilities for all five categories.

Table C.3. Rural development suitability, Bennington County, Vermont

Soil evaluation		Highway accessibility	
Soil suitability class for septic systems	Rating	Distance	Factor scale
1-3	high	≤ 250 meters from a state highway or Class 1, 2, 3 town road	high
4-5	medium		
6-7	low	> 250 meters	medium

Note: Any area encompassed within a sewer district received a "high" rating.

Another Vermont study that used a development potential factor was done by the Town of Granby (Hamilton, 1994). In this study, four categories were rated and compared: timber, recreation, wildlife, and development potential. Table C.4 lists the factors and points used for evaluating development potential. The specific criteria and scoring system is given in the report by Hegman and Carbonetti (1991).

Table C.4. Development suitability, Granby, Vermont

Factor	Possible points	On-site limitations	
Access	108	Wetlands	-50
Slope	60	Slope < 20%	-50
Water present	84	Fragile area	-50
Dist. to population	24	Gravel pit	-50
View	6	No access	-50
Electric lines	8	Not on-site but within 500 feet	
Open land	10	Wetland	-25
		Gravel pit	-25
		Power line	-25
Total Possible	300		-325

A Hawaii land development suitability study used the following four main constraint factors: slope, erosion hazard, commuting times, and soil shrink/swell. Secondary factors included flood hazard, airport noise, or dedicated agricultural use. This rating system is outlined in Bowen and Ferguson (1994) and Ferguson and Khan (1992). More details are given in DMH, Inc. (1987).

As shown in Table C.5, eight evaluation factors for constraints to urban development were used. Urban suitability would be the inverse of the constraint ratings; thus, the highest suitability ratings go to sites with the lowest constraint values. The results of the urban suitability analysis are then compared to the results of the agricultural LESA system to select lands suitable for urban development.

Table C.5. Urban development constraint factors, Hawaii

Evaluation factors/constraints	Very high	High	Medium	Low
Slope	Over 20% in 50" rainfall Over 40% if not in 50" rainfall	20-40% if not in 50" rainfall 26-20%	4-15%	less than 4%
Shrink-Swell soils	High	Moderate	Slight	Slight
Erosion	Severe/Very severe	Moderately severe to moderate	Moderate	None to slight
Hydrology	Naturally formed wetlands Floodway district	100-year floodplain Floodway fringe Coastal high hazard General floodplain	No floodplain	No floodplain
Habitat/Use	Endangered/ Threatened species			
Committed ag use		Dedicated ag land		
Travel time to major employment center		Over 60 minutes	45-60 minutes	O-45 minutes
Airport noise zone		65 Ldn and above		

Two other examples of rural residential rating systems were developed by Pease (1989) as part of education programs on land rating. One is intended to be used in conjunction with forestry LESA systems to rate housing suitability in forest zones. The factors and scoring system are given in Table C.6. The results were compared to forest LESA scores to aid in decision making.

The second rating system was developed as an example of comparing rural residential suitability to agricultural LESA scores for decisions affecting agricultural lands. The rating system applied seven factors, as shown in Table C.7. Three case studies were used to compare results.

The case study parameters and scores are given in Table C.8. The final step was to compare scores to agricultural LESA scores, as given in Table C.9. In this table, Case Study III is more suited than the other two case studies for a housing permit. However, Case Studies I and II required further analysis, since both agricultural and housing suitability fell in the number 2 category. Three categories of suitability were used for both agriculture and housing. The factors and associated scoring systems were developed as an example and would need refinement for actual applications.

Table C.6. Rating housing suitability in forest zones

Factor		Maximum points
A.	Percentage of the perimeter in industrial or public ownership 50-100% = 0 points 25-50% = 10 points IO-25% = 30 points 0-10% = 60 points	60
B.	Distance of dwelling from conflicting use 1000' = 40 points 750' = 30 points 500' = 20 points <500' = 0 points	40
c.	Access to the property From state or county highway, or private residential drive = 30 points From seldom used haul road = 15 points From active haul road = 0 points	30
D.	Buffer strips (a stand of trees approximately 50' in depth from the property line) on property lines which adjoin public land or land that could be used as industrial forest land In all conflict areas = 20 points On 75% of conflict areas = 10 points < 75% of conflict areas = 0 points	20
E.	Lot size > 80 acres = 30 points 40-80 acres = 15 points 20-40 acres = 5 points c 20 acres = 0 points	30
F.	Percent of upslope in conflicting use 0% = 20 points Partial ownership (no likely problems) = 10 points > 50% = 0 points	20
	Total	200

Table C.7. Ratina rural residential suitabilitv in agricultural zones

Factor	Factor scale	Factor rating
Residential density (number of dwelling units per square mile)	>61	45
	46-60	35
	31-45	25
	16-30	15
	0-15	5
Lot size in acres (optimum buffer size)	>15	10
	6-15	35
	2-5	20
	0-1	5
Roads	Paved	30
	Gravel	15
	Dirt	0
Natural hazards	No	25
	Yes	0
Support services	Yes	25
	No	0
Percent of perimiter in agriculture	O-50	20
	51-75	15
	76- 100	0
Present use	Other	20
	Agriculture	10
Maximum points = 200		

Suitability thresholds:

160-200=1	Highly suitable
115-155=2	Moderately suitable
30-l 10=3	Poorly suitable

Table C.8. Case study evaluations

	Data		
	I	II	III
Residential density	74	29	31
Lot size	30	41	13
Roads	Paved	Paved	Paved
Natural hazards	Yes*	No	No
Support services	Yes	Yes	Yes
% Surrounding land	a4	70	100
Present use	Agriculture	Other	Agriculture

*Partially located on 100-year floodplain.

	Factor ratinqs		
	I	II	III
Residential density	45	15	25
Lot size	10	10	35
Roads	30	30	30
Natural hazards	0	25	25
Support services	25	25	25
% Surrounding land	10	15	10
Present use	10	20	10
Total	130	140	160

Table C.9. Case study (threshold classifications)

Case study	Agricultural LESA score (done separately)	Agricultural category	Residential score	Residential category
Hilicker	192	2 (marginal)	130	2
Main street investments	170	2 (marginal)	140	2
Idler	167	2 (marginal)	160	1

Sand and gravel sites

Aggregate sites often present controversial land-use issues because of potential conflicts with surrounding residential uses, scenic values, agricultural uses, and wildlife habitat. In jurisdictions with LESA systems, it may be helpful to develop a similar rating system for aggregate sites to aid in making land-use designations and decisions.

The study presented here was undertaken over several terms as part of graduate class research projects (Pease, 1992). Students applied and tested the rating system on more than 100 sites in Marion and Benton Counties in Oregon. The aggregate rating system was designed to be an objective and replicable method of rating sites, using the following five factors: quantity of aggregate, quality of aggregate, accessibility, land-use detractors, and the status of the site. Tables C.10 through C.16 give the criteria and associated factor scales for the five factors. The scores are grouped into three value classes to aid in decision making. Other factors, such as overburden depth, proximity to market, and local demand for the product, could also be incorporated. As is the case with agricultural LESA systems, tests of redundancy and consistency should be done to avoid unnecessary complexity. The results of this type of analysis can be compared to other rating systems as part of the total information base to make land-use decisions.

This rating system was scaled to a maximum of 245 points. It would be clearer to rate all factors to 100, then multiply by the appropriate weight, as recommended in Chapter 1 of this *Guidebook*.

C.10. Aggregate production — Benton County, Oregon

Category	Future potential (1,000 cubic yards)	Potential	Factor scale
1	above 300	Excellent	100
2	100-300	Good	70
3	II-99	Fair	40
4	1-10	Poor	10
5	0	None	—

Table C.11. Aggregate site quality, Benton County, Oregon

Geologic unit	Useful materials	Location	Quality of unit
Recent river alluvium (Qral)	Gravel, sand	Within active Willamette River channels	Excellent
Quaternary lower terrace (Qtl)	Gravel, sand, clay	Terraces adjacent to Willamette River	Excellent
Quaternary middle terrace (Qtm)	Gravel, sand, clay	Major terraces adjacent to Willamette River	Good
Quaternary higher terrace (Qth)	Gravel, sand, clay	Terraces near foothills	Poor
Oligocene sandstone (Tts)	Sandstone	One outcrop on Highway 99W South	Poor
Spencer formation (Ts)	Sandstone	Foothills	Fair
Fluornory formation (Tf)	Sandstone	Foothills	Fair
King's Valley siltstone (Tsrk)	Siltstone	Foothills	Poor
Siletz River volcanics (Tsr)	Basalt	Hills in north county area	Good
Intrusive volcanics (Ti)	Basalt, gabbro	Hills in south county area	Good

Note: Abbreviations are geology map symbols.

Table C.12. Geologic quality group ratings

Geologic unit	Quality group	Factor scale
Qral, Qtl	1	100
Tsr, Ti, Qtm	2	75
Ts, Tf	3	50
Qth. Tts. Tsrk	4	0

Table C.13. Site accessibility

Cateaorv	Distance to road in miles	Factor scale
1	0	20
2	>o-1	10
3	>1-2	5
4	2+	0

Table C.14. Land-use detractor groups/ratings

Land-use type symbol	Land-use detractor group	Detractor scale
TU, AF, AO, F, SG, OM	1	0
T, P, 0, N, PF, AD	2	-25
PL, DV, W, UR, UC, WS, UI, UT, UO. OR. D, FB	3	-50

NOTE: Abbreviations are land use map symbols.

Table C.15. Aggregate site status

Category	Status of site	Factor scale
1	Active	25 --
2	Inactive/Reclaimed	0

Table C.16. Resource value classes

Resource value total score	Value class	Number of sites
150+	I	24
101-149	II	26
o-1 00	III	56
Total		106

Class I: Resource sites that should be preserved and conflicting land uses constrained.
Class II: Resource sites that have moderate future potential. An attempt should be made to limit future land-use conflicts.
Class III: Resource sites with little or no future potential. Conflicting uses should be allowed.

An adaptation of LESA to wetlands should follow the general guidelines in the main text of this *Guidebook*, be supported by local wetlands experts, and include participation of local citizens.

Wetlands

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Table C.17. **A wetlands ratings system**

Factor	Factor scale	*	Weight	Weighted factor
Site size	< 20 acres	10		
	20-75 acres	30		
	> 75 acres	50	0.15	
Diversity-number of NWI types on site	One	0		
	Two	30		
	Three	50	0.20	
Endangered plant or animal species on site	Yes	100		
	No	0	0.30	
Wildlife presence	None	0		
	Birds (except waterfowl)	30		
	Waterfowl	50		
	Non-domestic mammals	30		
	Domestic mammals	-100		
	Fish, salmonids	50		
	Fish, other	10	0.15	
Human activity	Agriculture	-50		
	Mining or aggregate extraction	-100		
	Commercial, residential industrial, or transportation	-100		
			0.10	
Level of past disturbance	No evidence of past human use	100		
	Evidence of past use but no significant alterations	50		
	Encroachment from adjacent activity	-50		
	Significant past alteration	-100	0.10	

Value class	Points		
1	>40	Class I	Sites that should be protected
2	20-40	Class II	Sites that could have some development on perimeter
3	<20	Class III	Sites that could be converted

ing scales for each factor and applied the rating system to the 13 major coastal wetlands.

A development suitability rating system was also developed in a similar manner. Results of both systems were used as part of the decision-making process to classify the 13 wetland systems into categories of protection, conservation, multiple use, or development. This project was funded by the North American Wetlands Conservation Council (U.S. Fish and Wildlife Service funds), Arizona Game and Fish Department, Packard Foundation, and

other sources. Sonoran coastal wetlands are important wintering grounds for U.S. and Canadian waterfowl and shorebirds.

At the time of this writing, the rating systems were subject to revision at a second workshop to be held in July 1996. Readers may obtain more information and a copy of the rating system from Carlos Valdes, Geotecnia International, C/O ITESM-Campus Guaymas, Guaymas, Sonora, Mexico.

While the example given in Table C.17 is inadequate as it stands for a general model, it does provide a starting point to consider wetland values in a LESA context. An adaptation of LESA to wetlands should follow the general guidelines in the main text of this Guidebook, be supported by local wetlands experts, and include participation of local citizens. Where wetlands are a land-use issue, this type of analysis and rating could be helpful in making land-use decisions.

Summary

The examples of LESA-like adaptations given in this appendix are intended to stimulate ideas for local LESA committees. The choice of factors, scaling, and weighting is a local decision. While some of the examples do not necessarily reflect the LESA structure recommended in this Guidebook, it would not be difficult to adapt them to the recommended scaling and weighting procedures. Results can then be compared to agricultural or forest LESA systems to aid in decision making.

Appendix D
Computer programs for LESA applications

LESA

(GIS),

Example of a LESA spreadsheet program

2.

D.1.

3.

4.

5.

6.

Guidebook 1.1, 4.4,

Table D.1. Example of a spreadsheet program for calculating LESA scores

	A	B	C	D	E	F
1	Factor name	Factor rating (FR)	Factor weight	Weighted	% of site	Weighted FR %
2		(0-100%)	(Total must = 1.00)			
3	**Land evaluation**					
4	Soil A					
5	Factor 1	XXX	XXX	5B * 5C		
6	Factor 2	x x x	x x x	6B * 6C		
7	Factor 3	x x x	x x x	7B * 7C	2	
8	A subtotal			5D + 6D + 7D	xx	8D * 8E
9	Soil B					
10	Factor 1	x x x	x x x	10B *10 C		
11	Factor 2	x x x	x x x	11B* 11C		
12	Factor 3	x x x	x x x	12B * 12C	xx	
13	B subtotal					13D * 13E
14	LE subtotal		5C + 6C+ 7C			8F + 13F
15	**Site assessment**					
1[redacted]						
1[redacted]		x x x	x x x	17B * 17C		
16	Ag productivity	x x x	x x x	18B * 18C		
17	Factor 4	x x x	x x x	19B * 19C		
20	AP subtotal		17C + 18C + 19C	17D + 18D+ 19D		
21	Development pressure					
22	Factor 7	x x x	x x x	22B * 23C		
13	Factor 8	x x x	x x x	23B * 23C		
24	DP subtotal		22C+ 23C	22D + 23D		
25	Other public values					
26	Factor 9	x x x	x x x	26B * 26C		
27	Factor 10	x x x	x x x	27B * 27C		
28	OPV subtotal		26C + 27C	26D + 27D		
29	Total factor weights		14C+20C+4C+8C			
30	- -		-(Must = 1.00)			
31	**Total LESA score**			14F+20D+24D+28D		

Site number _____ Tax map number _____ Parcel number _____

[redacted]

Several articles have been published describing how GIS was used in LESA applications; undoubtedly there are many more GIS applications that have not been published. In the book, *A Decade with LESA: The Evolution of Land Evaluation and Site Assessment* (Steiner et al., 1994), three chapters outline GIS projects ranging from a forestry LESA application undertaken for a small rural township in Vermont (Hamilton, 1994) to more complex modeling efforts (Yangow and Shanholtz, 1994; DeMers, 1994).

DeMers

GIS-

DeMers

pleted

Land Use Policy 5(4):408-418.

Applied Geography 9:287-303.

Applications in Natural Resource Management 3(4):12-22.

Bowen,

Journal of *Soil and Water Conservation* 46(4):263-267.

(eds.) *A Decade with LESA: The Evolution* of *Land Evaluation and Site Assessment.*

Photogrammetvic Engineering and Remote Sensing

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Appendix E

supplements

This appendix contains an overview of soil classification systems in common use in the United States and of Natural Resources Conservation Service (NRCS) computer programs to help generate comparisons among the classification systems. It also contains a list of soil reference manuals, articles, and handbooks used by NRCS and other soil scientists.

Capability classes and subclasses show, in a general way, the suitability of soils for most kin s of field crops. The soils are classed according their limitations when they are used f
the risk of age when they are used, and the way
to treatment. The grouping does not take into account major and generally expensive land-forming that would change slope, depth, or other characteristics of the soils; and it does not apply to rice, cranberries, horticultural crops, or other crops that require special m
d

IIe.

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because

Soil productivity rating system

Soil potential rating system

(SPI)

$$SPI = P - (CM + CL)$$

P =

=

=

SPRs.

(1983a) for a somewhat different method used in the town of Vernon, Vermont, and other Vermont towns.

Part 2. Important farmlands[1] classification

The following definitions are contained in Secretary of Agriculture Memorandum No. 9500-2 dated March 10, 1982. This classification has been mapped for may parts of the United States.

Prime farmlands

General criteria. Prime f armland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land but not urban built-up land or water). It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding. Examples of soils that qualify as prime farmland are Palouse silt loam, Q-7 percent slopes; Brookstone silty clay loam, drained; and Tama silty clay loam, O-5 percent slopes.

Specific criteria. Prime farmlands must meet all the following criteria. Terms used in this section are defined in the following USDA publications: *Soil Taxonomy, Agriculture Handbook 436, Soil Survey Manual, Agriculture Handbook 18, Rainfall-Erosion Losses from Cropland, Agriculture Handbook 282, Wind Erosion Forces in the United States and Their Use in Predicting Soil Loss, Agriculture Handbook 346, and Saline* and *Alkali Soils, Agriculture Handbook 60.*

[1

(a)

(b)

(c)

(d)

(f) The soils are not flooded frequently during the growing season (less often than once in two years); and

(g) The product of K (erodibility factor) times the percent slope is less than 2.0, and the product of I (soils erodibility) times C (climatic factor) does not exceed 60; and

(h)

Unique Farmlands

of statewide *importance*. This is land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oilseed crops. Criteria for defining and delineating this land are to be determined by appropriate state agency or agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable. In some states, additional

farmlands of statewide importance may include tracts of land that have been designated for agriculture by state law.

Additional farmland of local importance. In some local areas, there is concern for certain additional farmlands for the production of food, feed, fiber, forage, and oilseed crops, even though these lands are not identified as having national or statewide importance. Where appropriate, these lands are to be identified by the local agency or agencies concerned.

Prime forest lands[2]

Because of the multiple use of forested lands, several categories of forest land use, i.e., timber, wildlife, and recreation, may be developed. These uses are not considered in the definition of prime forest land. Only that use associated with wood production is evaluated. For purposes of this memorandum only, the following timberland definitions will apply.

Prime timberland. Prime timberland is land that has soil capable of growing wood at the rate of 85 cubic feet or more/acre/year, under proper management (at culmination of mean annual increment), in natural stands and is not in urban or built-up land uses or water. Generally speaking, this is land currently in forest but does not exclude qualifying lands that could realistically be returned to forest. Delineation of these lands will be in accordance with national criteria.

Unique timberland. Unique timberland is land which does not qualify as prime timberland on the basis of producing less than 85 cubic feet/acre/year, but is growing sustained yields of specific high-value species or species capable of producing specialized wood products under a silvicultural system that maintains soil productivity and protects water quality. Delineation of these lands will be in accordance with national criteria.

Timberland of statewide importance. This is land, in addition to prime and unique timberlands, that is of statewide importance for the growing of wood. Criteria for defining and delineating these lands are to be determined by state forestry planning committees or appropriate state organizations.

[2] Prime Forest Land Definition and Criteria, U.S. Forest Service, May 26, 1977

Timberland **of** *local importance.* In some local areas, there is concern for additional forest lands for the growing of wood, even though these lands are not identified as having national or statewide importance. Where appropriate, these lands are to be identified by a local agency or agencies concerned.

Part 3. Computer-assisted checks for coordination of important farmland, land capability, and soil productivity ratings

Farmland criteria have been programmed to produce tables that should help states and NRCS national technical centers coordinate soil map units that qualify as prime farmlands, evaluate placement of soil map units into the Land Capability Classification System, and develop soil productivity ratings. Many of the same soil and environmental characteristics **that** are used as prime farmlands criteria also are used to place soils into the Land Capability Classification system and also influence soil productivity ratings. The prime farmlands criteria are used as the basis for the farmland criteria table.

For coordination purposes, it is useful to look at all the soils within a Major Land Resource Area (MLRA). MLRAs should have generally uniform geomorphology, climate, water resources, natural vegetation, and land uses. Thus, many environmental differences are suppressed and differences among soils become more apparent.

Computer programs maintained by NRCS state offices can produce soil interpretation tables of all the soils within an MLRA. Tables can also be prepared for counties, but a list of series names used in the county must accompany the request. Contact the state NRCS office for more information (see Appendix F).

Part 4. Reference s for soil survey and land-use interpretations

Burns, Russell M. 1983. *Silvicultural Systems for Major Forest Types* of *the United States.* USDA Forest Service, Washington, D.C.

Eyre, F.H. (ed.) 1980. *Forest Cover Types* of *the United States and Canada.* Society of American Foresters, Washington, DC.

Federal Regis ter. 1994. 59(116): June 17. LESA implementation rule.

HEW. 1969. *Manual* of *Septic Tanks.* Publication No. 526, Public Health Service, Washington, DC.

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Handbook.

D.C.

National

of

Virgin

Appendix F

LESA user contacts

USDA NRCS regional conservationists

- Gene Andreucetti
  USDA NRCS West Regional Office
  650 Capitol Mall, Room 6072
  Sacramento, CA 95814
  916/498-5284

- Diane Gelburd
  USDA NRCS East Regional Office
  Calverton Office Building Number 2, Suite 100
  11710 Beltsville Drive
  Beltsville, MD 20705
  301/586-1325

- Dwight I? Holman
  USDA NRCS Southeast Regional Office
  Suite 716-N
  1720 Peachtree Road, NW
  Atlanta, GA 30309-2439
  404/347-6105

- Judy Johnson
  USDA NRCS South Central Regional Office
  501 West Felix Street, Building 23
  Fort Worth, TX 76115
  817/334-5224

- Jeff Vonk
  USDA NRCS Northern Plains Regional Office
  100 Centennial Mall North
  Room 152
  Lincoln, NE 68508-3866
  402/437-5315

- Charles Whitmore
  USDA NRCS Midwest Regional Office
  Suite 123
  2820 Walton Commons West
  Madison, WI 53704-6785
  608/224-3000

State and local contacts

The following list of contacts is arranged by state. The contacts of LESA users at the state and local government levels were taken from the publication *Agricultural Land Evaluation and Site Assessment: Status of State and Local Programs* (Steiner et al., 1991). The reader is encouraged to first read the profile of LESA application in the jurisdiction given in the above publication; if more information or LESA documentation is needed, then the office listed below may be contacted. Please note that some of the individuals listed may have changed jobs.

The list also includes the USDA Natural Resources Conservation Service (NRCS) state office. For help in locating a trained LESA leader, contact the NRCS state office or Frederick R. Steiner (listed under Arizona).

Alabama

USDA NRCS
665 Opelika Road
PO Box 311
Auburn, AL 36830
20518874535

Alaska

Richard Troeger
Planning Director
Kenai Borough Resource Planning Department
144 N Binkley
Soldotna, AK 99669
907/262-4411

USDA NRCS
949 E 36th Avenue, Suite 400
Anchorage, AK 99508-4362
907/271-2424

Arizona

Jeff Schmid
Urban Conservationist
3003 North Central Avenue
Suite 800
Phoenix, AZ 85012-2945
602/280-8818
602/280-8805 (fax)

Frederick R. Steiner
Director
School of Planning and Landscape Architecture
College of Architecture and Environmental Design
Arizona State University
Tempe, AZ 85287-2005
602/965-9656

Arkansas

USDA NRCS
Federal Bldg, Room 5404
700 W Capitol Avenue
Little Rock, AR 72201-3228
501/324-5445

California

Charles Tyson
California Department of Conservation
Office of Land Conservation
801 "K" Street
MailStop 13-71
Sacramento, CA 95814
916/324-0862

USDA NRCS
2121 -C 2nd Street, Suite 102
Davis, CA 95616-5475
916/757-8200

Colorado

USDA NRCS
655 Parfet Street, Room E200C
Lakewood, CO 802 15-55 17
303/236-2886

Connecticut

George T. Malia
Farmland Preservation
Department of Agriculture
State Office Bldg
Hartford, CT 06106
203/566-4845

Kipen Kolesinskas
State Soil Scientist
USDA NRCS
16 Professional Park Rd
Storrs, CT 06268-l 299
203/487-4047

Delaware

Mike McGrath
Senior Resource Planner
Ag Lands Preservation
Department of Agriculture
2320 S DuPont Hwy
Dover, DE 19901
302/739-4811

USDA NRCS
1203 College Park Dr, Suite 1
Dover, DE 19904-8713
302/678-4160

Florida

Jeffrey K. Ludwig
County Planner
Highlands County Planning
Highlands County Courthouse
PO Box 1926
Sebring, FL 33871-l 926

Lew Carter
Resource Soil Scientist
USDA NRCS
1251 US Hwy 27 S
Sebring, FL 33872
813/382-2581

Michael D. Sims
Soil Conservation Technician
Marion Soil Conservation District
Ocala, FL 32671
904/867-5 130

G. Wade Hurt
State Soil Scientist
State Office, Room 248
401 SE 1st Avenue
Gainesville, FL 32601
904/377- 1092

USDA NRCS
PO Box 14150
Gainesville, FL 32614-l 510
904/377-0946

Georgia

Philip A. Page
District Conservationist
USDA NRCS
Federal Bldg, Room 15
120 N Broad Street
Winder, GA 30680
404/867-2788

M. Wiley Vickers
District Conservationist
USDA NRCS
Federal Bldg, Room 103
223 E Ashley Street
Douglas, GA 31533
912/384-3666

Frank Jackson
Chairman, County Commissioners
Coffee County Courthouse
Douglas, GA 31533
912/384-4799

Benjamin J. Wood
District Conservationist
USDA NRCS
Crisp County Courthouse
224 - 7th Street, Room 305
Cordele, GA 31015
912/276-2643

Carneth Goff
Area Conservationist
USDA NRCS
Federal Bldg, Suite G13
PO Box 15
Griffin, GA 30223
4041227-l 026

Johnny H. Mattox
District Conservationist
USDA NRCS, Fed Bldg, Rm G13
126 Washington Street NE
Gainesville, GA 30501
404/536-6981

James H. Norris
District Conservationist
USDA NRCS

Mary B Leidner
District Conservationist
USDA NRCS
PO Box 748
Tifton, GA 31793
912/382-4776

USDA NRCS
Federal Bldg, Box 13
355 E Hancock Avenue
Athens, GA 30601-2769
404/546-2272

Guam

USDA NRCS
GCIC Bldg, Suite 602
414 W Soledad Avenue
Agana, GU 96910
671/477-5940

Hawaii

Richard Bowen
Chairman
University of Hawaii
Department of Agriculture & Resource Economics
College of Tropical Agriculture & Human Resources
Gilmore Hall
3050 Maile Way
Honolulu, HI 96822

Carol Ferguson
University of Hawaii
Department of Agriculture & Resource Economics
College of Tropical Agriculture & Human Resources
Gilmore Hall
3050 Maile Way
Honolulu, HI 96822

Mary Lou Kobayashi
Planning Program Manager
Office of State Planning
State Capitol, Room 406
Honolulu, HI 96813
808/548-1710

USDA NRCS
300 Ala Moana Blvd, Room 4316
PO Box 50004
Honolulu, HI 96850-0002
808/541-2601

Idaho

Lee Nellis
Consulting Planner
615 S. Sixth Avenue
Pocatello, ID 83201
208/524-2569

Pamela Peterson
County Planner
Latah County Planning Department
County Courthouse
Moscow, ID 83843

USDA NRCS
3244 Elder Street, Room 124
Boise, ID 83705-4711
208/334- 1601

Illinois

Steven D. Chard
Bureau of Farmland Protection
Department of Agriculture
PO Box 19281
Springfield, IL 62794-9281
217/782-6297

Corby Schmidt
Boone County Planning Department
601 N Main Street, Suite 103
Belvidere, IL 61008

Frank DiNovo
Director
Champaign County Department of Planning and Zoning
1303 N Cunningham Avenue
Urbana, IL 61801
217/328-3313

Gary J. Lawrence
District Conservationist
USDA NRCS
Rural Route #4
Mt Sterling, IL 62353
217/773-2316

Christopher C. Aiston
Director
DeKalb County Planning Department
110 E Sycamore Street
Sycamore, IL 60178
815/895-7188

Charles F. Werner
Supervisor of Assessments
Ford County Courthouse
Paxton, IL 60957
217/379-4132

Brett Roberts
District Conservationist
USDA NRCS
PO Box 89
Lewistown, IL 61542
309/542-2215

Larry Pachol
Building and Zoning
Grundy County Courthouse
111 E Washington Street
Morris, IL 60450
8151942-9024 Ext. 228

Susan Yarger
Resource Conservationist
Henry County S&WCD
301 E North
Cambridge, IL 61238
309/937-3376

Gregory V. Schaefer
Jackson County Planning Commission
County Courthouse
Murphysboro, IL 62966
618/549-6383

Edward T. Sieben
Senior Planner
Kane County Development Department
719 Batavia Avenue
Geneva, IL 60134

Thomas E. Palzer
Executive Director
Kankakee County Regional Planning Commission
189 E Court Street
Kankakee, IL 60901

Suzanne Ehardt
Director
McHenry County Department of Planning
2200 N Seminary Avenue
Woodstock, IL 60098
815/338-2040

Kenneth J. Emmons
Principal Planner
McLean Co Regional Plan Commission
Illinois House Suite 201
207 W Jefferson Street
Bloomington, IL 61701

Charles E. Bentley
Zoning Officer
Mercer County
1109 SW 3rd Avenue
Aledo, IL 61231
309/582-7004

Philip W. Bremser
Zoning Administrator
Monroe County
224 E 3rd Street
Waterloo, IL 62298

Jay Hockstra
Director of Long Range Planning
Planning and Zoning Department
Peoria Co Courthouse, Rm 31
Peoria, IL 61602
309/672-6915

Pat Woods
Resource Conservationist
USDA NRCS
1319 W Washington
Pittsfield, IL 62363
217/285-4630

Geno Christini
Putnam County Zoning Administrator
County Courthouse
Hennepin, IL 61327
815/925-7238

Norm Neely
Zoning Code Enforcement Administrator
County Office Bldg
1504 - 3rd Avenue
Rock Island, IL 61201
3091786-445 1

John Harryman
USDA NRCS
2031 Mascoutah Road
Belleville, IL 62220
815/338-0049

Chrystal Younger
USDA NRCS
2031 Mascoutah Road
Belleville, IL 62220
815/338-0049

Randolph J. Armstrong
Springfield-Sangamon County
Regional Planning Commission
703 Meyers Bldg
W Old State Capital Plaza
Springfield, IL 62701
2 17/525-2 132

Leland Hardy
District Conservationist
USDA NRCS
Rural Route #3
Rushville, IL 62681
217/322-3359

Al Washburn
Zoning Administrator
Stephenson County Courthouse
15 N Galena Avenue
Freeport, IL 61032
815/235-8275

David Weber
Whiteside County Hwy Department
18819 Lincoln Road
Morrison, IL 61270

Martin Ince
Senior Planner
Will County Land Use Department
501 Ella Avenue
Joliet, IL 60433

USDA NRCS
1902 Fox Drive
Champaign, IL 61820
217/398-5267

Indiana

USDA NRCS
6013 Lakeside Blvd
Indianapolis, IN 46278-2933
317/290-3200

Iowa

Kenneth E. Lind
Black Hawk County Zoning
Administrator/Bldg Inspector
Iowa Northland Regional COG
531 Commercial, Suite 800
Waterloo, IA 50701-5442
319/235-0311

Johnson County Planning and Zoning
913 S Dubuque Street
PO Box 126
Iowa City, IA 52244
319/356-6083

K

David R. Guntert
Lawrence/Douglas County Planning Office
6 E 6th Street
PO Box 708
Lawrence, KS 66044

USDA NRCS
760 S Broadway
Slaina, KS 67401
913/823-4865

Kentucky

Robert G. Blanton
Planning Director
Winchester/Clark County Planning-Zoning Commission
PO Box 40
Winchester, KY 40392
606/744-7019

Tim Asher
Hardin County Planning and Development Commission
City Bldg/Public Square
Elizabethtown, KY 42701
502/769-5479

USDA NRCS
771 Corporate Drive, Suite 110
Lexington, KY 40503-5479
606/224-7390

Louisiana

USDA NRCS
3737 Government Street
Alexandria, LA 71302-3727
318/473-7751

Maine

Donald A. Collins, Jr
District Conservationist
Southern Aroostock S&WCD
USDA NRCS
Rural Route #3, Box 45
Houlton, ME 04730
207/532-2087

Albert Dow
District Conservationist
USDA NRCS
Dover-Foxcroft, ME
207/564-2161

Patricia Jennings
Eastern Mid-Coast Planning Commission
9 Water Street
Rockland, ME 04841
207/594-2299

USDA NRCS
5 Godfrey Drive
Orono, ME 04473
207/866-7241

Maryland

Wally Lippincott
Baltimore County Agricultural Land Preservation Program
Department of Environmental Protection
401 Bosley Avenue, Suite 416
Towson, MD 21204
41 O/887-2904

Don Halligan
Principal Planner
Cecil County Office of Planning and Zoning
Cecil County Courthouse
Elkton, MD 21921
41 O/398-0200

Dan Rooney
Agricultural Planner
Harford County Planning and Zoning Commission
220 S Main Street
Belair, MD 21014
41 O/638-31 03

Donna Mennitto
Howard County Farmland Preservation Program
3430 Court House Drive
Ellicott City, MD 21043
41 0/313-5407

USDA NRCS
John Hanson Business Ctr
339 Busch's Frontage Road, Suite 301
Annapolis, MD 21401-5534
41 0/757-0861

Massachusetts

Richard K. Hubbard
Massachusetts Department of Food and Agriculture
142 Old Common Road
Lancaster, MA 01523
617/727-3000 ext. 150

Richard Scanu
Soil Scientist
USDA NRCS
451 West Street
Amherst, MA 01002
413/256-0441

Donald Liptak
District Conservationist
USDA NRCS
Flint Rock Road
PO Box 709
Barnstable, MA 02630
508/362-9332

Dan Lenthall
District Conservationist
USDA NRCS
40 Nagog Park
Acton, MA 01720
508/264-45 16

Richard DeVergilio
District Conservationist
USDA NRCS
243 King Street, Room 39
Northampton, MA 01060
413/586-5440
Ronald E. Thompson
District Conservationist

USDA NRCS
672B Main Street, Room 10
Holden, MA 01520
508/829-6628

Michigan

Geralyn Ayers
Resource Specialist
Bureau of Transportation Planning
PO Box 30050
Lansing, MI 48909
517/335-2635

USDA NRCS
1405 S Harrison Road, Room 101
East Lansing, MI 48823-5243
517/337-6701

Minnesota

David Drealan
County Planner
Carver County Zoning Department
600 E 4th Street
Chaska, MN 55318
612/488-3435

Art Harlander
Zoning Chairman
Holding Township
Holdingford, MN 56340
Township Zoning Administrator
103 Hillview Blvd
La Crescent, MN 55947

Kenneth D. Matzdorf
Area Soil Scientist
USDA NRCS
209 W Mulberry
St Peter, MN 56082
507/931-2530

Stearns County Soil & Water Conservation District
1 10 - 2nd Street S, Suite 128
Waite Park, MN 56387
612/25 I-7800

USDA NRCS
600 FCB Bldg
375 Jackson Street
St Paul, MN 55101-I 854
612/290-3675

Mississippi

USDA NRCS
Federal Bldg, Suite 1321
100 W Capitol Street
Jackson, MS 39269-i 399
601/695-5205

Missouri

USDA NRCS
Parkade Center, Suite 250
601 Business Loop 70 West
Columbia, MO 65203-2546
314/876-0901

Montana

Rich Pettersen
District Conservationist
USDA NRCS
35 W Reserve Drive
Kalispell, MT 59901-2331
406/752-4242

USDA NRCS
Federal Bldg, Room 443
10 E Babcock Street
Bozeman, MT 59715-4704
406/587-6813

Nebraska

USDA NRCS
Federal Bldg, Room 152
100 Centennial Mall North
Lincoln, NE 68508-3866
402/437-5300

Nevada

John Capurro
District Conservationist
USDA NRCS
1281 Terminal Way, Suite 204
Reno, NV 89502
702/784-5408

USDA NRCS
5301 Longley Lane
Bldg F, Suite 201
Reno, NV 89511
702/784-5863

New Hampshire

Vicki Smith
Upper Valley/Lake Sunapee Council
RR 1, Box 123
Lebanon, NH
603/448-I 680

USDA NRCS
Federal Bldg
Durham, NH 03824-1499
603/868-7581

James B. Hersey
District Conservationist
USDA NRCS
Federal Bldg, Room 203
719 Main Street
Laconia, NH 03246-2741
603/528-8713

William R. Yamartino
District Conservationist
USDA NRCS
196 Main Street
Keene, NH 03431-3765
603/352-3602

Michael Dannehy
District Conservationist
USDA NRCS
PO Box 229
Woodsville, NH 037850229

New Jersey

David L. Smart
State Resource Conservationist
New Jersey
201/246-4110

Susan Craft or Al Buchan
Land Planner
Burlington County Land Use Office
49 Rancocas Road
Mount Holly, NJ 08060
609/265-5787

Robert Dobbs
District Manager
Camden Soil Conservation District
59 S Whitehorse Pike
Berlin, NJ 08009
609/767-6299

Mona Peterson
District Conservationist
USDA NRCS
PO Box 144
Deerfield, NJ 08313
609/451-2422

Tim Dunne
District Conservationist
USDA NRCS
8 Gauntt Place
Flemington, NJ 08822

Bill English
District Manager
Hunterdon Soil Conservation District
Flemington, NJ 08822
201/782-3915

Linda Black
Hunterdon County Planning Board
County Administration Bldg
Flemington, NJ 08822
201/788-l 490

Janice Reid
USDA NRCS
Somerset County 4-H Center
308 Milltown Road
Bridgewater, NJ 08807
201/725-3438

Karen C. Fedosh
Monmouth County Planning Department
PO Box 1255
Freehold, NJ 07728
908/431-7460

Roberta Lang
Director
Morris County Agricultural Development Board
CN 900
Morristown, NJ 07960
201/285-1667

Ruben C. Keesee
District Conservationist
USDA NRCS
540 Lacey Road
Forked River, NJ
609/971-3316

Anthony V. McCracken
Somerset County Planning Board
County Administration Bldg, Box 3000
Somerville, NJ 08876
201/231-7021

Joanne C. Carr
Environmental Specialist
Sussex County Planning Department
55-57 High Street
Newton, NJ 07860

George Jones
District Conservationist
USDA NRCS
330 Route 206 S
Newton, NJ 07860
201/383-0529

USDA NRCS
1370 Hamilton Street
Somerset, NJ 08873
908/246-l 662

New York

Jeff Ten Eyck
District Manager
USDA NRCS
100 Grange Place, Room 205
Cortland, NY 13045
607/756-5991

John Whitney
District Conservationist
USDA NRCS
21 S Grove Street
East Aurora, NY 14052
716/652-8480

Frank Winkler
District Conservationist
USDA NRCS
249 Highland Avenue
Rochester, NY 14620
716/473-2120

Linda Y. Yancey
Assessor
Town of Pennfield
3100 Atlantic Avenue
Penfield, NY 14526
716/377-8600

Tom Nally
Agricultural Program Leader
Cornell Cooperative Extension
249 Highland Avenue
Rochester, NY 14620
716/461-l 000

Sheldon Chase
Soil and Water Conservation
5874 E Henrietta Road
Rush, NY 14543
716/533-l 312

USDA NRCS
441 S Saline Street
5th Floor, Suite 354
Syracuse, NY 13202
[illegible]

North Carolina

Newt Road
Albemarle, NC 28001
704/982-6811

Linda Lowder
Planning Director
Planning Department
201 S 2nd Street
Albemarle, NC 28001
704/983-7259

USDA NRCS
4405 Bland Road, Suite 205
Raleigh, NC 27609-6293
919/790-2888

North Dakota

USDA NRCS
Federal Bldg, Room 278
220 E Rosser Avenue
PO Box 1458
Bismarck, ND 58502-l 458
701/250-4421

Ohio

USDA NRCS
200 N High Street, Room 522
Columbus, OH 43215-2478
614/469-6962

Bruce Freeman
Director
Medina County Planning Commission
144 N Broadway
Medina, OH 44256
216/723-3641

Oklahoma

M.E. Williams
Director
Metropolitan Area Planning Commission
219 S Missouri, Suite l-102
Claremore, OK 74017

USDA NRCS
100 USDA, Suite 203
Stillwater, OK 74074-2655
405/624-4360

Oregon

J. Herbert Huddleston
Extension Soil Scientist
Ag & Life Science 3041
Oregon State University
Corvallis, OR 97331
541/737-5713

James R. Pease
Extension Land Resource Management Specialist
Wilkinson 252
Oregon State University
Corvallis, OR 97331
541/737-1213

Curt Schneider
Planning Director
Clatsop County Department of Planning and Development
PO Box 179
Astoria, OR 97103
503/325-8611

Peter Watson
Chief Planner
Columbia County Land Development Services
County Courthouse
St Helens, OR 97051
503/397-1 501

Bill Eagle
USDA NRCS
339 S Columbia River
St Helens, OR 97051
503/397-4555

Josephine County Planning Department
510 NW 4th Street
Grants Pass, OR 97526
541/474-5421

Kent Howe
Associate Planner
Lane County Land Management Department
125 E 8th Avenue
Eugene, OR 97401
541/687-3807

Steve Michaels
Linn County Planning and Building Dept.
County Courthouse
PO Box 100
Albany, OR 97321
503/967-3816

Robert Hallyburton
Marion County Planning Department
220 High Street NE
Salem, OR 97301
541/588-5038

Vic Affolter
Planning Director, Tillamook County
201 Laurel
Tillamook, OR 97141
503/842-3408

Gregg Leion
Associate Planner
Washington County Planning Division
150 N 1st Street
Hillsboro, OR 97124
503/640-35 19

USDA NRCS
101 SW Main Street, Suite 1300
Portland, OR 97204-3221
503/414-3200

USDA NRCS
Area Office
2225 Pacific Blvd SE
Albany, OR 97321
54-l/967-5931

USDA NRCS
Field Office
33935 Hwy 99E
Tangent, OR 97389
541/967-5927

Pennsylvania

[Note: for current contacts, call Farmland Protection Bureau 717/783-3167]

John J. Corris
Adams County Agricultural Preservation Program
County Commissioners Office
Gettysburg, PA 17325
717/334-6781

Bernard J. Riley
Berks County Agricultural Preservation Board
PO Box 520
Leesport, PA 19533
216/378-1327

John Keene
Department of City and Regional Planning
University of Pennsylvania
Philadelphia, PA 19104
215/898-7880

Anthony J. Ventello
Bardford County Planning Commission
County Courthouse
Towanda, PA 18848
7171256-i 715

Richard Harvey
Director
Bucks County Agricultural Land Preservation Program
Almshouse, Neshaminy Manor
Doylestown, PA 18901
215/345-3400

Maria Midas
Carbon County Agricultural Land Preservation Board
PO Box 210
Jim Thorpe, PA 18229
717/325-3671

Daniel Pennick
Centre County Agricultural Land Preservation Board
Willowbank Bldg
Bellefonte, PA 16823
814/355-6791

Ray Pickering
Chester County Agricultural Land Preservation Board
235 W Market Street
West Chester, PA 19382
215/344-6285

Bob Christoff
Dauphin County Conservation Board
1451 Peters Mountain Road
Dauphin, PA 17018
717/921-8100

Thomas Daniels
Agricultural Land Preservation Board of Lancaster County
50 N Duke Street, Box 3480
Lancaster, PA 17603
717/299-8355

Jeffrey W. Zehr
Lehigh County Agricultural Land Preservation Board
4184 Dorney Park
Allentown, PA 18104
215/820-3398

Thomas Corbett
Lycoming Agricultural Land Preservation Board
240 W 3rd Street, Box 68
Williamsport, PA 17703
717/326-5858

Kenneth R. Maxwell
Mercer County Agricultural Land Preservation Board
PO Box 530
Mercer, PA 19137
412/662-3366

Craig Todd
Monroe County Conservation District
RD #2, Box 2336-A
Stroudsburg, PA 18360
717/992-7565

Mary Ann L. Carpenter
Montgomery County Planning Commission
County Courthouse
Norristown, PA 19404
215/278-3722

Roslyn Kahler
Northampton County Conservation District
RD 4, Greystone Bldg
Nazareth, PA 18064
215/746-l 971

Craig Mitterling
Snyder County Agricultural Land Preservation Board
County Courthouse, Box 217
Middleburg, PA 17842
7 17/837- 1744

Wesley Gordon
District Conservationist
USDA NRCS
932 St Clair Way, Route 30 E
Greensburg, PA 15601

Patricia Comish
York County Agricultural Preservation Program
118 Pleasant Acres Road
York, PA 17402
717/771-9430

USDA NRCS
1 Credit Union Place
Suite 340
Harrisburg, PA 1711 O-2993
717/782-2202

Puerto Rico

USDA NRCS
Federal Bldg, Room 639
150 Carlos Chardon Street
Hato Rey, PR 00918-7013
809/766-5206

Rhode Island

USDA NRCS
60 Quaker Lane, Suite 46
Warwisk, RI 02886-0111
401/828-I 300

South Carolina

David W. Howe, Jr
District Conservationist
USDA NRCS
1555 Richland Ave E, Suite 400
Aiken, SC 29801
803/649-4221

Eddie Kephart
District Conservationist
USDA NRCS
960 Morrison Drive, Suite 300
Charlston, SC 29403
803/724-4671

USDA NRCS
Strom Thurmond Federal Bldg
1835 Assembly Street, Room 950
Columbia, SC 29201-2489
803/253-3935

South Dakota

USDA NRCS
Federal Bldg
200 - 4th Street SW
Huron, SD 57350-2475
605/353-1783

Tennessee

USDA NRCS
675 US Courthouse
801 Broadway
Nashville, TN 37203-3878
615/736-5471

Texas

USDA NRCS
WR Poage Bldg
101 S Main Street
Temple, TX 76501-7682
817/774-1214

Utah

USDA NRCS
WF Bennett Federal Bldg
125 S State Street, Room 4402
Salt Lake City, UT 84138
801/524-5050

Vermont

Stuart Hurd
Town of Bennington
205 South Street
Bennington, VT 05201
8021442-I 037

Lew Sorenson
Windham Regional Commission
139 Main Street
PO Box 818
Brattleboro, VT 05301
802/257-4547

Gaylord Hoisington
District Conservationist
USDA NRCS
12 Market Place, Unit 9
Essex Junction, VT 05452
802/951-6423

Bruce Chapell
District Conservationist
USDA NRCS
81 River Street, Heritage I
Montpelier, VT 05602
802/828-4493

Sharon Murray
Franklin-Grand Isle Regional Planning
and Development Commission
140 S Main Street
St Albans, VT 05478-I 850
802/524-5958

Dean Pierce
Addison County Regional Planning
Commission
RD #1, Box 275
Middlebury, VT 05752
802/388-3141

David White
Lamoille County Planning Commission
RR 1, Box 2265
Morrisville, VT 05661
802/888-4548

Peter G. Gregory
Two Rivers/Ottauquechee Regional Commission
King Farm
Woodstock, VT 05091
802/457-3188

William R. Forbes
District Conservationist
USDA NRCS
257 S Main Street
Rutland, VT 05701
802/775-7192

Timothy McKay
Soil Conservationist
USDA NRCS
Federal Bldg
St Johnsbury, VT 05819
802/748-3885

Daniel Koloski
District Conservationist
USDA NRCS
38 S Main Street
Randolph, VT 05060
802/728-3371

Gregory Federspiel
Stowe Planning Department
PO Box 216
Stowe, VT 05672
802/253-4091

Jeff Hatling
Southern Windsor County Regional Commission
PO Box 88
Windsor, VT 05089-0088
802/674-9201

USDA NRCS
69 Union Street
Winooski, VT 05404-l 999
802/95 1-6795

Virginia

Charles Johnson
Clarke County Planning Department
PO Box 169
Berryville, VA 22611
703/955-3275

Robert Lee
Fauquier County
40 Culpeper Street
Warrenton, VA 22186
703/347-8680

Kevin P. Hannigan
District Conservationist
USDA NRCS
604 S Main Street
Culpeper, VA 22701
703/825-4200

John H. Hodges
Planning Director
Hanover County
PO Box 470
Hanover, VA 23069
804/537-6171

George R. Ways
District Conservationist
USDA NRCS
305-B S Washington Hwy
Ashland, VA 23005
804/798-8 107

USDA NRCS
Federal Bldg
400 N 8th Street, Room 9201
Richmond, VA 23240-1001
804/771-2455

Washington

William Johnston
Clark County Department of Public Services
PO Box 5000
Vancouver, WA 98668
206/699-2375

Jerry Litt
Douglas County Planning Department
213 S Rainier
Waterville, WA 98858

Merlyn Paine
Island County Planning
PO Box 5000
Coupeville, WA 98239
206/678-5111

Hal H. Hart
Planning Director
Stevens County Planning Department
Colville, WA 99114
509/684-2401

Walla Walla County Planning Department
310 W Poplar, Suite 117
Walla Walla, WA 99362
509/527-3285

Mark Bordsen
Whitman County Department of Public Works
PO Box 430
Colfax, WA 9911 I-0430
509/397-6206

USDA NRCS
W 316 Boone Avenue, Suite 450
Spokane, WA 99201-2348
509/353-2337

West Virginia

Kelley N. Sponaugle
Area Conservationist
USDA NRCS
483 Tragland Road
Beckley, WV 25801
304/255-9225

Ron Estepp
Area Soil Scientist
USDA NRCS
500 E Main Street
Romney, WV 26757
304/822-3316

Carlos Cole
Area Soil Scientist
USDA NRCS
PO Box 1394
Parkersburg, WV 26102
304/420-6701

Roy Pyle
Area Soil Scientist
USDA NRCS
91 W Main Street
Buckhannon, WV 26201
304/420-6701

USDA NRCS
75 High Street, Room 301
Morgantown, WV 26505
304/291-4153

Wisconsin

USDA NRCS
6515 Watts Road
Madison, WI 53719-2726
608/264-5577

Wyoming

USDA NRCS
Federal Office Bldg
100 E "B" Street, Room 3124
Casper, WY 82601-I 911
307/26 I-520 1

Glossary

ASCS: U.S. Department of Agriculture-Agricultural Stabilization and Conservation Service [now part of the Farm Service Agency (FSA)].

Comprehensive, Master, or General Plan: These are all terms for a document that contains policies for the general development of a jurisdiction.

Delphi: A technique to obtain group consensus. Details are given in Chapter 7.

Differentiation: The application of the LESA score to rank sites relative to one another. The choice of factors, as well as their weighting, generally has to be adapted to local conditions in order to provide clear distinction among sites.

Factor: The term is used to label a group of attributes, such as soil potential, size, compatibility, or scenic quality.

Factor Rating: The number of points assigned to a factor, before weighting, on a O-100 point scale.

Factor Scale: The way points are assigned to a factor on O-100 point scale.

Focus Group: A technique to enable group discussion and resolution of a given problem. Details are given in Chapter 7.

Important Farmland Class: A classification system developed by the USDA NRCS. A description is given in Appendix E, Part 2.

Land Capability Classification: Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. See Appendix E, Part 1.

Land Resource Unit: An area of several thousand acres characterized by particular patterns of soil, climate, vegetation, water resources, land use, and type of farming. Land Resource Units are the basic map units on state land resource maps, which are usually mapped at a scale of 1:1,000,000. The USDA compiles data on land resource units for the publication Land Resource Regions and Major Land Resource Areas of the United States.

LE: Land Evaluation.

LESA: Land Evaluation and site Assessment.

MLRA: Major Land Resource Area.

NRI: National Resource Inventory.

NTC: National Technical Center.

Parcel: *Guidebook,*

PDR: Purchase of Development Rights.

Ranking:

Riparian Area:

SA: Site Assessment.

development pressure; and SA-3, factors measuring other public values, such as historic or scenic values.

Scaling: See factor scale.

Score: This term is used for the total of all factor ratings, i.e., a LESA score.

SCS: U.S. Department of Agriculture-Soil Conservation Service (now the Natural Resources Conservation Service).

Site: In this Guidebook, site designates a unit of observation for rating. The site may be a field, an ownership parcel, or a set of fields or parcels.

Soil Productivity Rating: Soil productivity is the capacity of a soil to produce a specified plant or sequence of plants under a physically defined set of management practices, measured in terms of inputs of production factors in relation to outputs or yields (See Appendix E, Part 1).

SPR: Soil Potential Rating. Soil potential ratings indicate the relative quality of a soil, compared with other soils in the area, for a particular crop and considering predicted yields, the relative cost of applying modern technology to minimize the effect of any soil limitation, and the costs of continuing limitations.

Suitability Analysis: An examination of physical, economic, and social characteristics of a site to determine limitations or desirable features for a particular use.

System: This term refers to all the factors, weights, and scales used in the evaluation of soils and other site conditions.

TDR: Transfer of Development Rights. This term refers to a program where a land-owner is permitted under local or state regulations to transfer development rights from one site to another.

USDA: United States Department of Agriculture.

Weighting: This term refers to assigning a weight (for example, 0-1.0) to each factor in order to recognize the relative importance of each factor in the LESA system.

Weighted Factor Rating: This term is used to denote the factor rating after weighting.

Zoning Ordinance: Specific regulations for the development of a jurisdiction.

Zoning Permit: A land-use permit obtained through a regulatory process at the local or state level.

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