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Natural
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National Ecological Site Handbook

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Reserved

Part 630 – Policy and Procedures

Subpart A – Introduction

630.0 Purpose

A. The National Ecological Site Handbook (NESH) and other technical and procedural references provide standards, guidelines, definitions, policies, responsibilities, and procedures for conducting the collaborative process of ecological site description (ESD) development. Responsibilities for ESD development are shared among disciplines, including soils, range, forest, agronomy, wildlife biology, and hydrology. The steps needed to collect information on site attributes, site correlation and classification, site dynamics, and site interpretations are all separate, but they must be coordinated so that the expertise of the available interdisciplinary staff is used to ensure acceleration of ESD development.

B. The process of developing an ESD includes managing information, synthesizing existing scientific literature, collecting field data, organizing informal and formal knowledge, interpreting successional projections of change due to disturbances such as management actions or climate events, and then communicating findings to support conclusions made by a range of decision makers. Thus, defining and describing ecological sites (ESs) in a credible, transparent, and efficient manner is reliant on a well-defined system of information collection, organization, and delivery. This handbook describes the roles and responsibilities, movement of information, tasks and products, and quality control and quality assurance necessary to provide quality information to decision makers.

C. The NESH is specific to NRCS, but it adheres to the guidelines established in the Interagency Ecological Site Handbook for Rangelands. The standards set in the NESH are as stringent or more so than those in the interagency handbook. The information in this version of the NESH pertains to rangeland and forestland. Standards and guidance for additional land types will be added to the handbook as the information becomes available.

630.1 Definition

An ecological site is a conceptual division of the landscape. It is defined as “a distinctive kind of land based on recurring soil, landform, geological, and climate characteristics that differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and in its ability to respond similarly to management actions and natural disturbances.”

630.2 Principal References and Their Maintenance

A. Other NRCS manuals and handbooks, including the National Soil Survey Handbook (NSSH), Soil Survey Manual, National Range and Pasture Handbook, National Forestry Handbook, National Forestry Manual, and National Biology Manual, will refer to this handbook for policy and guidance regarding operating procedures and technical information required for ESDs. Interagency manuals and handbooks, such as the Rangeland Interagency Ecological Site Manual and the Interagency Ecological Site Handbook for Rangelands, were used extensively in the development of the NESH.

B. Updates to ES policy, procedure, and science will be included as future versions of the NESH. Related stratification schemes, such as forage suitability groups, are discussed in part 642, subpart A, of this handbook. A citation for the handbook or manual containing the related procedure will be included. Every effort will be made to provide a specific kind of information in one document only so that maintenance of the information will not require update of multiple documents.

630.3 Roles and Responsibilities

A. Specialists from the Soil Science Division (SSD) and Ecological Sciences Division at the State level, major land resource area soil survey offices (SSOs), soil survey regional offices (SSROs), national centers, and National Headquarters work together to develop ESDs, commonly with specialists from other agencies and partner organizations. The Ecological Sciences Division, particularly the State resource conservationists (SRCs) and their staffs, provides specialized expertise on vegetation, conservation planning, and resource management for development and certification of ESDs. The SSD staff develops soil and vegetation groups, verifies soils, and facilitates or leads the ES planning, approval, and correlation processes. This is only a slight modification of the soil survey planning process. A list of general roles and responsibilities is provided in this section. Information on specific roles is given in the appropriate part of the handbook. For example, part 630, subpart B, lists the roles and responsibilities specific to the planning process and part 630, subpart E, lists the roles and responsibilities specific to quality control, quality assurance, correlation, and certification.

B. At the national level, development and implementation of ES policy, procedures, and data management require the collaborative effort of many different disciplines within NRCS (part 630, subpart G, section 630.60) and of partners (Interagency Ecological Site Handbook for Rangelands, section 1.0.D).

C. Partners such as Forest Service (FS) regional, supervisor, and district office staff; Bureau of Land Management (BLM) State, district, and field office staff; university staffs; staff from nongovernmental organizations; and others may participate or lead in any role or responsibility in ESD development. If an ESD is to be used by NRCS, however, it must undergo the correlation and quality assurance processes provided in this handbook to ensure that it adheres to NRCS policy.

D. National Headquarters (NHQ) Staff

- (1) Deputy Chief for Soil Science and Resource Assessment—
  - (i) Coordinates leadership for operations management and quality assurance of ES information in coordination with the Deputy Chief for Science and Technology.
  - (ii) Establishes and maintains an interagency workgroup to provide support and oversight of ESD development and use in coordination with the Deputy Chief for Science and Technology.
- (2) Deputy Chief for Science and Technology—
  - (i) Coordinates leadership for the development and use of ES information in coordination with the Deputy Chief for Soil Science and Resource Assessment.
  - (ii) Establishes and maintains an interagency workgroup to provide support and oversight of ESD development and use in coordination with the Deputy Chief for Soil Science and Resource Assessment.
- (3) Director of Soil Science Division—
  - (i) Provides overall direction, policy, guidance, and leadership for ES operations management and quality assurance, in coordination with the director of the Ecological Sciences Division.
  - (ii) Establishes goals for the program and monitors progress.
  - (iii) Ensures that the SSD is represented and ES information is incorporated into all applicable NRCS business at the national level.
- (4) Director of Ecological Sciences Division—
  - (i) Provides overall direction, policy, guidance, and leadership for ES development and use in coordination with the director of the SSD.
  - (ii) Ensures that the development and implementation of agency policy and procedures for ESs conform with interagency policy, in coordination with the director of the Soil Sciences Division.

(iii) Ensures that the Ecological Sciences Division is represented and ES information is incorporated into all applicable NRCS business and programs at the national level.

E. National Leaders

(1) National Ecological Site Team leader—
(i) Provides leadership for the development of technical concepts, tools, and support material for ESs, including planning, data collection and analysis, training, and implementation, for use by national, regional, State, and local staffs.
(ii) Develops and implements agency ES policy, procedures, and standards in coordination with the national leader for Soil Quality and Ecosystems and National Grazing Lands Team leader.
(iii) Provides guidance and recommendations to other national leaders, division directors, and deputy chiefs to ensure that interagency policy is appropriately integrated and implemented throughout NRCS.
(2) Ecological Sciences Division national leaders—
(i) Advise other national staff on ES policy, procedures, and technology and on use of ES information.
(ii) Lead NRCS in national coordination with Federal land management agencies and other partners.
(iii) Provide guidance and recommendations to other national leaders, division directors, and Deputy Chiefs to ensure interagency policy is appropriately integrated and implemented throughout NRCS.
(3) National leader for Soil Quality and Ecosystems (SQE)—
(i) Serves as permanent cochair (in partnership with non-NRCS cochair) of the National Cooperative Soil Survey Standing Committee for Soil and Ecosystems Dynamics.
(ii) Develops and implements agency ES policy, procedures, and standards in coordination with the National Ecological Site Team (NEST) and National Grazing Lands Team (NGLT) leaders.
(iii) Provides guidance and recommendations to other national leaders, division directors, and Deputy Chiefs to ensure that interagency policy is appropriately integrated and implemented throughout NRCS.
(4) NGLT leader—
(i) Develops and implements agency ES policy, procedures, and standards in coordination with NEST and SQE leaders.
(ii) Provides guidance and recommendations to other national leaders, division directors, and Deputy Chiefs to ensure that interagency policy is appropriately integrated and implemented throughout NRCS.

F. National Centers

(1) NEST, including NGLT, SQE, and others—
(i) Collaboratively leads national NRCS efforts in support of ESD development and advancement of supporting science.
(ii) Develops ES theory in coordination with appropriate partners.
(iii) Develops and revises technical tools and databases for the development of ESDs.
(iv) Develops and revises policy, procedures, and technical standards and guidance.
(v) Coordinates activities with Federal agencies and other partners at appropriate levels (commonly at national or regional level).
(vi) Provides training, guidance, and technical assistance on development of ES concepts, ESD development, and uses of ESDs to SSRO and national technology and support center (NTSC) staffs.

(vii) Leads development of training, guidance, and technical assistance material on the formulation of ES concepts and development and the uses and procedures for ESDs for NRCS and partners.
(viii) Presents ES concepts to professional societies and organizations.

(2) NTSC technical specialists—
(i) Support NEST in the development of theories, tools, policies, and procedures for ESD development as needed.
(ii) Provide training and technical assistance on ES concepts and the development and use of ESDs.
(iii) Integrate ESs into conservation planning processes and tools.
(iv) Work with universities and colleges to integrate ESs into curriculum.
(v) Present ES theory and ESD use to professional societies and organizations.

G. Soil Survey Regional Offices (SSROs)

(1) Soil survey regional directors (SSRDs)—
(i) Coordinate and participate in project planning within SSRO.
(ii) Provide leadership for development and quality assurance of ES information.
(iii) Coordinate activities among Federal agencies and other partners at appropriate levels (usually at regional level).
(iv) Report progress on ESD development, including field reviews and correlations.

(2) Regional ES specialists—
(i) Review all memorandums of understanding (MOUs), statements of work, agreements, and proposed amendments for compliance with NRCS technical standards for ESs.
(ii) Provide and coordinate training and assistance to SSO ES specialists and others as needed.
(iii) Present ES theories to professional societies and organizations.

H. State Offices

(1) State Conservationist (STC)—
(i) Serves as member of board of advisors (BOA).
(ii) Reviews proposed changes to office locations and MLRA boundaries and other delineations and provides recommendations to the management team and SSRD, who will forward recommendations to the SSD director as appropriate.
(iii) Certifies ESDs for inclusion in the State field office technical guide (FOTG).

(2) State soil scientist (SSS) and State resource conservationist (SRC), or appointed designees—
(i) Serve as members of the management team.
(ii) Advise and assist the STC in allocating resources as effectively as possible to carry out all ES activities in the State.
(iii) Assist the STC and SSRD in monitoring progress to ensure that work schedules and timelines coincide with the plan of operations.
(iv) Develop schedules to meet ES program objectives and to assist the STC in technical ES service activities for conservation operations.
(v) Provide ES technical services and assistance within the State as needed.
(vi) Work closely with SSRO and SSO staff to ensure that personnel meet the overall goals of the ESD program.
(vii) Ensure that existing ESDs in the State are evaluated effectively by the SSO staff and other knowledgeable personnel, such as the technical team, cooperators, and resource soil scientists and other technical specialists, to identify possible deficiencies in the long-range plan.

(viii) Provide technical input at any stage during development of ESDs to ensure that information meets State needs for conservation planning, implementation, monitoring, and assessment.
(ix) Develop local ES interpretations as needed.
(x) Update and maintain ESDs in the FOTG.
(xi) Develop cooperative relationships with regional soil survey cooperators, agencies, universities, SSROs, SSOs, and national centers for the development of ESDs.
(xii) Work with universities and colleges to integrate ESs into curriculum.
(xiii) Assist all users of ES information.

(3) State technical discipline specialists—
(i) Serve on management team or technical team as assigned.
(ii) Provide training and technical assistance to State, area, and field office personnel on ES concepts and development and use of ESDs.
(iii) Assist SSRO in providing training and technical assistance to SSOs on ES concepts and development of ESDs as assigned or requested.
(iv) Provide technical input at all stages during development of ESDs to ensure that information meets State needs for conservation planning, implementation, monitoring, and assessment.
(v) Assist in development of project plans.
(vi) Conduct field data collection and investigation needed to develop ESDs.
(vii) Present ES concepts to professional societies and organizations.

I. Area and Field Offices

Resource soil scientists, rangeland management specialists, foresters, agronomists, and other technical specialists—

(i) Serve on SSO technical teams as assigned.
(ii) Develop or assist in developing project plans.
(iii) Respond to user needs for new ES interpretations and collect performance data.
(iv) Provide technical input at any stage during development of ESDs to ensure that information meets State needs for conservation planning, implementation, monitoring, and assessment.
(v) Conduct field data collection and investigation needed to develop ESDs.
(vi) Evaluate adequacy of ES information.
(vii) Provide coordinated ES information to all users.
(viii) Train field personnel in use of ES information.
(ix) Assist field offices with delivery of ES information.

J. Soil Survey Offices (SSO)

(1) SSO leader (SSL)—
(i) Provides management and support of ES activities within SSO.
(ii) Schedules routine work activities in plans of operation and monthly and weekly plans, as appropriate, in consultation with responsible SSS, SRC, or SSRD.
(iii) Supports development of new and update ES projects within MLRA.
(iv) Serves as chair of ES technical team.
(v) Creates local project workgroups for ESD development.
(vi) Keeps maps and data related to ESs current to meet the changing needs of users.
(vii) Performs investigations, maintains ES datasets, and prepares and revises ESDs.
(viii) Improves quality of digital line work to conform to landscape and ES concepts.
(ix) Provides training to SSO ES specialists on soil morphology, geology, geomorphology, and hydrology as needed.

(2) ES specialist and other SSO staff—

(i) An ES specialist in the SSO may be delegated any of the duties listed for the SSL.

(ii) Lead or coordinate development of new or update ESDs within the SSO.

(iii) Serve as member of SSO technical teams or coordinate activities of teams as designated by SSL.

(iv) Develop ES project plans for submission to SSL.

(v) Assist in developing appropriate ecological units and soil component groups that facilitate identification of ESs.

(vi) Conduct field data collection and investigation needed to develop ESDs.

(vii) Evaluate existing ESDs to identify deficiencies, overlapping concepts, and lack of soil-ES correlation for possible inclusion in long-range plan.

(viii) Enter data into ES database and ensure data quality as needed.

(ix) Provide training to SSO soil scientists on plant identification, ecological site concepts, and plant community dynamics.

(x) Provide technical input at any stage during development of ESDs.

630.4 Interim Progress Reporting

A. Project Progress

Ecological site projects may take longer than typical soil projects; therefore, project milestones will be used to track progress toward goals. Ecological site project plans will be documented in NASIS.

B. Milestones

Each project will include milestones and a timeline for completion of the milestones. Each milestone includes a task that has a scheduled start and completion date and a person responsible for the task. Milestones can be used to measure progress of projects that last more than 1 year, to assess whether responsible technical experts have the appropriate expertise for a task, and to determine whether project participants are meeting the approved schedule. Milestones are useful for project planners, supervisors, and quality control and assurance reviewers. These individuals work together to determine when progress can be reported.

(i) National Milestones

- A set of unique national milestones and their definitions are presented in part 630, subpart G, section 630.61. Each of the milestones is included in the NASIS Project Milestone table. The scheduled and actual start and completion dates for each one can be tracked in this table. In NASIS, the names of the ES milestones all begin with "ES." The national milestones will be used for ES projects as appropriate. These milestones comprise a minimum set of goals for a new ES project, but not all are needed for revision or update ES projects. National milestones will be used to track the progress of ESD development.
- In NASIS, each project milestone has a "Project Milestone Progress" child table, which is used to track the progress of the milestone.

(ii) Additional Milestones

The set of national milestones may not include all tasks necessary to complete a project. Some tasks routinely needed for all projects, such as "English edit," are not included, but they can be added to ES project plans and tracked in NASIS as appropriate. These milestones will be used to assess the progress of individual projects.

C. Milestones for Levels of Completion

(1) Provisional ES

A provisional ES is established after ES concepts are developed and an initial state and transition model is drafted. Following quality control and quality assurance reviews of the ES concepts, an identification number and name for the provisional ES are entered into the ES database.

(2) Approved ESDs

An approved ESD must contain a defined set of information (part 630, subpart G, section 630.62). Before being made available to the public, an ESD must undergo a quality control review and at least one quality assurance review and then the SSRD must verify that the ESD meets quality standards with a signature. An approved ESD is available for interim agency and public use through the ES database and the State FOTG once it is signed by the STC and partners (part 630, subpart G, section 6301.70).

(3) Correlated ESDs

Correlated ESDs must meet all standards as determined by the quality control review, final quality assurance review, and final correlation (see part 630, subpart G, section 630.63, for list of required information). Once correlated by the SSRD and certified by the STC and partners, the ESD is available for agency and public use through the ES database and the State FOTG.

630.5 Correlated ESD Performance Measure

Reserved.

Part 630 – Policy and Procedures

Subpart B – Project Management

630.10 Purpose

An effective project planning process is needed to develop and maintain ESDs. This involves the development, prioritization, and approval of project plans for work within a given MLRA. The formal process of project planning assists in organizing and prioritizing work on an annual, project, and long-range (about 5 years) basis and in analyzing workload and resources. Project management is necessary for developing and maintaining quality ESDs. This standard follows the same basic steps outlined in Title 430, National Soil Survey Handbook (NSSH), Part 608, but it allows for additional participants, including partners, to acknowledge the interdisciplinary nature of ecological site projects.

630.11 Roles and Responsibilities

A. Board of Advisors (BOA)

(1) The BOA consists of the State Conservationist (STC) from each State served by a soil survey regional office (SSRO). Representatives of Federal and State entities and others with affected land can serve as members. The soil survey regional director (SSRD) provides the necessary staff to plan work, conduct meetings, and present information. BOA members develop specific operating procedures and add other board members as needed.

(2) The BOA—

(i) Serves as a review board. It provides advice, counsel, and broad management direction to the SSRD to ensure ES activities are relevant to agency goals and priorities and conservation needs.

(ii) Reviews progress of ES activities in the region relative to agency goals and priorities and provides feedback to the associate director for soil operations for consideration during periodic performance reviews and annual evaluations of SSRDs.

(iii) Reviews management team recommendations for priorities of ES activities and provides concurrence or provides alternate recommendations to ensure local needs are in balance with State and national issues.

(iv) Reviews management team recommendations regarding approval of project plans, SSO annual plans of operation, and memoranda of understanding (MOUs) within the soil survey region (SSR), including any proposed amendments, and provides concurrence or alternate recommendations.

B. Management Team

(1) The management team consists of the SSRD, State soil scientists (SSSs), State resource conservationists (SRCs), and appropriate State technical leaders, as needed, for each State serviced by the SSRO. Representatives from Federal agencies, nongovernmental organizations, State organizations, universities, and other NCSS partners can serve as members. The NTSC and regional ES specialists may join or assist the team as needed. The SSRD serves as chairperson. Development of specific operating procedures and addition of other team members are the responsibility of the management team.

(2) The management team—

(i) Reviews and approves, by consensus, technical team ES project plans. If the team is unable to reach consensus within an agreed-to timeframe, the chairperson will make the final decision regarding ES project plan approval.
(ii) Reviews technical team recommendations regarding approval of ES MOUs within the SSR, including any proposed amendments, and provides concurrence or alternate recommendations.
(iii) Reviews and approves technical team recommendations on priorities for ES activities or provides, by consensus, an alternate priority list to ensure local priorities are in balance with State and national issues.
(iv) Reviews and approves new and updated long range and annual plans (including both soil and ES projects) proposed and developed by the technical team. If consensus cannot be reached, the chairperson will make the final decision.
(v) Chairperson forwards all decisions and recommendations to the BOA.

C. Technical Team

(1) The SSO technical team consists of technical specialists who work cooperatively to develop ESDs. The team includes SSO staff (SSL, ES specialist, and others); field, area, State, and regional specialists (soil, range, forestry, agronomy, and wildlife specialists, etc.); and applicable partners. Technical teams identify personnel (see part 641, subpart B, for information on local workgroups). If local assistance is limited or lacking, specialists from the SSRO and NTSC may assist or join the team as needed. In most cases, the specialists will provide assistance and training. The SSL serves as chairperson. Specific operating procedures are developed by the technical team as needed.
(2) The technical team—
(i) Gathers and consolidates the State ES priorities and ESD development needs for inclusion in the SSO long-range plan of operation.
(ii) Develops proposed project priorities.
(iii) Develops draft ES project plans and SSO annual plans of operation to address priorities and needs identified in long-range plan and any other goals identified by the management team and BOA.
(iv) Identifies personnel to complete tasks outlined in project plans.
(v) Designates a quality control reviewer for each project, subject to SSO management team approval.
(vi) Submits project plans to management team for review and approval.
(vii) Accomplishes the tasks and milestones outlined in project plans within the agreed-to timeframe.
(viii) Participates in ES quality control activities as appropriate.

D. Soil Survey Regional Office (SSRO)

(1) SSRD—
(i) Provides the necessary staff to plan work, conduct meetings, and present information to the BOA.
(ii) Submits approved plans and other recommendations to the BOA for review.
(iii) Serves as chairperson for the management team in the SSR and coordinates all activities of the team.
(iv) Ensures appropriate State technical leaders are on the management team.
(v) Approves project, annual, and long-range plans if the management team is unable to reach a consensus for approval.
(2) Soil survey region ecological site specialist (SSR ESS)—
(i) Assists the management and technical teams with technical and policy aspects of project planning and execution.

(ii) Becomes a member of the management team, technical team, or both upon request or as assigned.

E. National Center Technical Specialists

(1) Assist management and technical teams with technical and policy aspects of project planning and execution.
(2) Become members of management team, technical team, or both upon request or as assigned.

F. State Offices

(1) SSSs and SRCs or appointed designees on management teams—
(i) Ensure that individuals identified in the project plan have the appropriate knowledge, skills, abilities, and supervisory support to complete the project tasks. Persons assigned development responsibilities must have an understanding of ecological theory and process function.
(ii) Monitor progress of the management team to ensure that work schedules and timelines are being met according to the plan of operation.
(2) State technical discipline specialists on technical or management team assist in development or review of ES project plans.

G. Area and Field Offices

Resource soil scientists, rangeland management specialists, foresters, agronomists, and other technical specialists—

(i) Participate as members of the appropriate technical team as assigned.
(ii) Assist in development of ES project plans.

H. Soil Survey Office (SSO)

(1) SSO leader (SSL)—
(i) Provides leadership for the technical team.
(ii) Develops long-range plan to include ES projects, based on findings from an MLRA-wide assessment and in consultation with SSO ES specialist and other technical specialists.
(iii) Assesses training needs of individuals identified in ES-related project plans and requests training through the SSR, State, or center offices.
(iv) Ensures that individuals identified in the project plan have supervisory support to complete the project tasks.
(v) Ensures that the tasks are accomplished as described in the project plan.
(2) SSO ES specialist and other SSO staff—
(i) Develops or assists with ES project plans and annual plans to address the goals and activities identified as priority work by the management team and BOA.
(ii) Performs investigations throughout assigned area, maintaining ES datasets and developing and revising ESDs.

I. Partners

Partners, such as the Bureau of Land Management, Forest Service, National Park Service, and nongovernmental organizations (NGOs), may participate in any step in the project planning process or be included as members of the technical or management team as appropriate. Partners managing land affected by the project can also be members of the BOA. Outside contractors with appropriate knowledge, skills, and abilities may complete some tasks, as identified in the project plan. If an entity contributes funding, it may be appropriate to have a representative from the entity on the technical team, management team, or BOA.

630.12 Workload Planning

A. The formal process of project planning assists the SSO in planning and prioritizing work on an annual, project, and long-range (about 5 years) basis, and it also assists in analyzing workload and resources. The workload analysis planning process considers the work to be done, estimates the amount of time and resources required to complete each task, and provides a timetable for completing the work. The SSO long-range plan, project plans, and annual plan will be used to support proposed ES activities. Long-range, project, and annual plans that include ES activities help to direct the human and financial resources available to accomplish identified activities.

B. Types of Documents for Planning and Managing ES Projects

(1) The long-range plan for an SSO describes the activities needed to complete an initial ES project or to update all previous work to meet a common standard in the next 5 years or more (430-NSSH, Part 608, Subpart B, Exhibit 608-1). The format and level of detail for the long-range plan may vary. The purpose is not to develop detailed plans but rather to provide enough information for the needs to be prioritized effectively. Existing long-range plans may need to be updated to incorporate ES activities.

(2) A project plan for an SSO describes the activities needed to accomplish one or more of the priority tasks identified in the long-range plan. Projects for ES activities can be individual or combined with other soil survey activities. Project plans outline the work to be done, including personnel needed, geographic extent, milestones, and timeline (see part 630, subpart B, section 630.13, for details). They include reportable milestones to identify annual progress (see part 630, subpart G, 630.61, for details). ES projects may take more time to complete than other soil survey projects (see part 630, subpart B, section 630.13 for details).

(3) An annual plan of operation is developed to guide the staff and provide specific focus as the project plans are being implemented. An SSO annual plan of operation (or business plan) is used to identify objectives, goals, responsibilities, and timelines during a fiscal year. (430-NSSH, Part 608, Subpart B, Exhibit 608-2.)

630.13 Project Plan Development

A. The project plan is the main tool for analyzing workload (planning, scheduling, and coordinating activities) and tracking progress of ES activities. The scope of project plans will vary. A project plan may simply involve the collection of additional data for updating an existing ESD to the current standard, or it may involve going through the entire development process for an MLRA, LRU, or other geographic region. Some projects might be completed in weeks or months, and other projects may take several years. The actual length of time needed to complete a project plan will depend on the scope and complexity of the project. While there is no mandated maximum time allowed for completion of a project, shorter term projects are preferred because they can be managed and completed more effectively. Project plans containing ES activities may take 5 years or more to complete, particularly for new ESs on complex landscapes. See part 630, subpart G, section 630.64, for an example of a project plan.

B. Project plans are managed in the National Soil Information System (NASIS) database. The activities to be accomplished by the project are identified in NASIS. All ES projects are named as in the following the example:

ES^-^MLRA^xx1x^-^zzzz

“xx1x” is the specific MLRA code in which the project is conducted, and “zzzz” is a free text, descriptive name that identifies the project.

C. Key milestones also are entered into NASIS and are used to track progress (see part630, subpart G, section 630.61 for a list of nationally approved milestones). Milestones are especially important for projects that are expected to take more than 1 or 2 years to complete.

D. A project plan that conforms to the standards in this handbook is not required for any ES activities in progress as of the date of release of the handbook; however, the final ESD must go through and pass quality control and quality assurance reviews prior to correlation. All ES activities begun after release of this standard must have a project plan in compliance with this standard.

E. Project plans will include the following information, as a minimum:

(1) Contact information.
(2) Project Objectives.—Plan should include the objectives for the project, including what is to be accomplished, the scope of the work, and the justification for doing the work.
(3) Project Area.—Plan should define the specific geographic area, commonly a MLRA, LRU, or other subdivision.
(4) Justification.—Plan should include an explanation of the importance of the planned work, including rationale for making the project a priority.
(5) Priority Recommendation.—Plan priority and justification should be clearly defined as recommended by the technical team.
(6) Project Personnel.—Plan should identify the technical team members consisting of appropriate technical specialists (i.e., agronomy, biology, forestry, range, soil, and hydrology specialists) needed to complete project tasks. Identified staff has appropriate knowledge, skills, abilities, and supervisory support to complete the tasks. Plan may include staff from the SSO, State office, area office, field office, or other agencies or partners. Contractors with appropriate knowledge, skills, and abilities may complete some of the tasks.
(7) Milestones.—Plan should identify milestones representing the major tasks. For national progress reporting, plans should contain all applicable milestones as described in part 630, subpart G, section 630.61. Additional milestones may be included in the plan if needed. Each project task or milestone should identify the responsible individual and a projected start and completion date. For progress reporting, milestone completion dates can be used to estimate the percentage of the plan completed.
(8) Optional Attachments.—Additional information may be attached, such as project area map, soil map, draft ecological site concepts, vegetation maps, climate maps, legacy plant sampling strategies, inventory data, and training, support, and equipment needs.

630.14 Prioritizing Project Plans

A. Proposed project plans, including ES-related projects, must be prioritized in order of importance. Acres should not be used as the most important criteria for prioritization. Prioritization is needed to organize workloads, ensure efficiency, and distribute the workload over time. The technical team develops the draft priority list for all projects within the MLRA. The management team reviews and approves the project priorities. The BOA reviews and provides alternate recommendations, as needed.

B. Considerations for establishing priorities for ES projects:

(1) Need for information to assist in land use planning and decisions
(2) Need for information to assist with initiatives developed by the Chief of NRCS (or other regional or State initiatives)
(3) Need for information for partners administering Federal land
(4) Need for information regarding ecologically significant areas
(5) Contributions of funding or staff

(6) Other factors of local significance

C. Additional guidance for setting project priorities is in the 430-NSSH, Part 610, Subpart A, Section 610.04.

630.15 Project Plan Approvals

A. Project plans for an SSO are developed by the technical team. The technical team recommends an order of priority for completion of projects. The SSL forwards project plans to the SSRO.

B. The SSRO ensures that project plans are reviewed by the management team. The management team reviews and approves, by consensus, project plans and the order of priority. If consensus cannot be reached during the agreed-to decision period, the SSRD gives final approval and sets priorities for implementation.

C. The BOA reviews and provides alternate recommendations as needed to the management team regarding project plan approval and order of priority. The BOA communicates concerns regarding any project plan or priority to the management team.

630.16 ESD Revisions and Updates

A. New information is acquired over time that may result in a need to revise or update an ESD. This is a legitimate business need and is handled in much the same way as an initial project to identify and describe an original ES. Any end user or participant in ES business, both internal and external to NRCS, can identify new information or errors that result in a need for revision or update. New information can identify differences in community phase composition or production or can identify changes in the soil, climate, or physiographic data. Since the ESD is in the FOTG and in the ES database, the new information should be brought to the attention of the appropriate State technical discipline specialist, which depends on the land type and changes needed. For example, the State rangeland management specialist should be contacted if a rangeland ES needs a vegetation update, and the State soil scientist should be contacted if a forested ES needs a soil revision.

B. Continuous feedback on the accuracy and efficiency of individual ESDs is needed to meet the needs of internal and external customers. Seamless revision efforts and manageable update projects provide consistent delivery of information to land managers regarding ESs and the impact of management and disturbance on native and naturalized vegetation.

(1) If the new information is of minor extent, requiring only an update to the database (e.g., inclusion of an additional climate station), a revised ESD will be produced. The State technical discipline specialist obtains approval from the management team by working with the SRC to coordinate the edits and move the revised ESD through the correlation process.

(2) If the new information is of significant extent and fieldwork is required (e.g., identification of an additional community phase in the STM), an updated ESD will be produced. The State technical discipline specialist presents the information to the technical team. The technical team then organizes a project in accordance with the guidance contained in this handbook. All other entities involved in workload planning perform their respective roles in the process as outlined. This includes recertification that the ESD is accurate and meets business needs. Annual, project, and long-range plans are all impacted by update projects. Existing long-range plans should include periodic review of existing ESDs to make sure the most current scientific knowledge regarding ecological processes and disturbances is included.

(3) The State technical discipline specialist provides feedback to the original end user or participant. The feedback provides a brief summary of the results of the new information,

expresses appreciation to the provider of the information, and encourages continued participation in the development of ESDs.

(4) All revisions and updates of ESDs should be tracked. An accurate tracking history allows users to more readily find and use the most current ES data. The tracking history should include a record of all decisions regarding a particular ES. Part 630, subpart G, of this handbook provides further guidance on storing ancillary data supporting an ESD.

Part 630 – Policy and Procedures

Subpart C – Committees, Work Agreements, and Meetings

630.20 Reserved

Part 630 – Policy and Procedures

Subpart D – Working with Partners

630.30 Reserved

Part 630 – Policy and Procedures

Subpart E – ESD Quality Control, Quality Assurance, Correlation, and Certification

630.40 Purpose

A. Quality control (QC) and quality assurance (QA) ensure that ecological site (ES) concepts and their related descriptions are accurate and consistent, meet the objectives outlined in the memorandum of understanding (MOU) or project plan, and satisfy the needs of the majority of ecological site description (ESD) users. QC ensures the development of quality products that meet national standards. QA ensures that quality products are developed through proactive processes such as providing technical standards and procedures, training, and guidance and collaborating with stakeholders during development.

B. QC is performed on the end product. QA addresses the people and processes involved in the development of the product.

C. Correlation of ESs involves relationship and process. In its strictest sense, correlation of soils and ESs establishes the relationship between soil components and ESs. Ecological sites are correlated on the basis of soils and the resulting differences in species composition, proportion of species, total production of the reference community phase, and response to disturbance. The relationship of soil components and ESs may be one-to-one or many-to-one. Correlation is an iterative process that continues as more data and information are obtained. It addresses the natural geographic distribution and extent of specific soils and ESs to ensure consistent and accurate mapping, sampling intensity, naming, differentiation, joining, database population, and interpretation. In its broadest sense, correlation requires that data entered into NASIS and the ES database meet national standards. This ensures that each ES is distinguished from all others and that proper interpretations are assigned to each ESD. Correlation facilitates the effective transfer of technology.

D. QC, QA, and correlation are essential tools for certification of ESDs. These processes are used throughout the implementation of an ES project.

E. Certification assures that the information in the correlated ESD is appropriate for use in conservation planning, implementation, monitoring, and assessment. Certification also ensures that new ESDs or significant changes to updated ESDs are documented and that MOU deliverables and all project objectives are complete. Once certified, the ESD is published to the Field Office Technical Guide (FOTG) and ES database for public use.

630.41 Definitions

A. Quality Control (QC)

- (1) QC is the collective set of standards and procedures used to achieve a high level of precision and accuracy (aspects of quality). Controlling quality involves—
  - (i) Coordination of ES concept and ESD development activities to ensure that products meet the defined standards for content and accuracy.
  - (ii) Direct review and inspection.
  - (iii) Direction, consultation, and feedback.
- (2) The quality of ES concepts and ESDs is controlled during each step of development, from fieldwork through publication. QC procedures are performed by qualified individuals.

B. Quality Assurance (QA)

QA is the process of providing and ensuring adherence to technical standards and guidelines. QA also involves training, oversight, and review. This ensures that all products meet the specified standards and are produced using efficient and effective procedures to meet ESD production goals (measured in acres and number of ESDs produced).

C. Correlation

The correlation process requires that ES data are collected and ESD information is developed using the technical standards in this handbook. The process includes progressive correlation and final correlation.

(i) Progressive Correlation.—Progressive correlation identifies and records all the issues and decisions surrounding ES information throughout the course of a project. It is used throughout the course of an ES project, keeping pace with progress. Through field reviews and field assistance visits, the soil survey office (SSO), State, and soil survey regional office (SSRO) promote progressive correlation, maintain QC and QA, and ensure that technical standards are met. During each review or field assistance visit, any changes, deletions, or additions to ESs since the last review or assistance visit are evaluated and certified, if appropriate. For ESs that extend beyond the boundary defined for the project area, data and descriptions for the ES on similar soils and landforms are considered in defining ranges for ES properties. The data are documented for the project in progress. All ES activities, including interpretation, state-and-transition model (STM) development, field data collection, and interpretations development, are concurrent with the milestones and timetable in the project plan.

(ii) Final Correlation.—Final correlation is done when an ES project is near completion. If effective progressive correlation has taken place during the course of an initial project, the final correlation is primarily a review of the progressive correlation. The final correlation serves as a data check and also identifies any work that needs to be completed prior to ESD certification.

D. Certification

Once final correlation is complete, the ESD is certified by the State and partners. ESD certification ensures that MOU deliverables and project plan objectives are met and that information in the ESD is appropriate for use in conservation planning, implementation, monitoring, and assessment. Once an ESD is certified, it is published for public use in the FOTG (by each State using the ESD) and in the ES database.

630.42 Quality Control

A. Roles and Responsibilities

(1) Quality control (QC) is primarily concerned with data and interpretation accuracy. Individuals who are responsible for conducting QC reviews should have knowledge of and experience in the identification of plant communities and their relationship to edaphic features (i.e., soils, geomorphology, and landscapes) and climatic features in the project area and in the process of developing ES concepts and ESDs.

(2) Technical specialists who may be designated as QC reviewers include, but are not limited to—
   - (i) SSO ecological site specialists.
   - (ii) State, area, and field office technical specialists.
   - (iii) National technology support center (NTSC) technical specialists.
   - (iv) Resource soil scientists.
   - (v) Soil scientists.

(vi) Technical specialists from cooperating agencies.

(3) Coordination of QC at the field level is the responsibility of the SSO project leader, who may or may not be the direct supervisor of the QC reviewer. Members of the SSO technical team will either be assigned QC review duties or will identify other individuals with the necessary knowledge and experience to conduct QC reviews. Individuals responsible for conducting QC reviews will be identified in the project plan. Periodic QC reviews will not be performed by an individual responsible for completing other tasks in the project plan, thus ensuring an independent peer review. The following individuals have QC roles:

(i) State Offices.—State technical discipline specialists may participate in or lead QC activities, as assigned.

(ii) Area and Field Offices (or Partners).—Resource soil scientists, rangeland management specialists, foresters, agronomists, and other technical specialists participate in or lead ES quality control activities, as assigned.

(iii) Soil Survey Offices

- The SSL coordinates quality control activities for ES concepts and ESD development.
- The ES specialist or other SSO staff members participate in or lead ES quality control activities, as assigned.

B. Quality Control Reviews

(1) Each individual involved in ES activities is responsible for the quality of the work performed. The work should be done in a manner that results in ESDs that meet standards. Therefore, much of the QC work is done on a day-to-day basis through direct interaction among the SSL, QC reviewer, and technical team members. These individuals schedule activities and assign work, review completed work, provide on-the-job training, and conduct other related activities.

(2) In addition to these routine QC activities, systematic reviews are periodically conducted by the QC reviewer to document the success of the QC procedures used. The specific details of the items to be reviewed will vary with the kind of activities being performed, as described in the project plan. As a project step is reviewed, the corresponding QC document should be signed by the QC reviewer and sent to the soil survey regional ecological site specialist (SSR ESS) for a QA check.

C. Signature and Approval of Quality Control Review Reports

(1) The QC reviewer, identified in the project plan, conducts the review and is responsible for preparing and signing QC review reports and transmitting copies of the report to the SSL, SSR ESS, individual with QA responsibility, and others, as appropriate.

(2) Part 630, subpart G, section 630.65, is an ES QC review worksheet template, which should be adapted to reflect the review needs for a particular ES project. Examples of items that may be reviewed are as follows:

(i) Adequate resources are identified in project plan to complete tasks.

(ii) Proper ecological site-soil map unit component correlation is performed.

(iii) Data methods and documentation levels and quality meet standards.

(iv) Data analyses and interpretations are accurate.

(v) Consistency between developed ESD narratives and tabular information.

(vi) Completeness and accuracy of plant information.

(vii) Management interpretations are supported by data in ESD.

(viii) Progression (milestones) and completion are reported in (NASIS).

(ix) All sampling data and ESDs are properly entered into NASIS and the ES database.

D. Noted Deficiencies

If any issues or deficiencies in the ESDs are noted, either by the SSL or QC reviewer, the QC review report is not signed. The QC reviewer will inform the technical team and the SSL, who provides management oversight to address the issues. Once all issues are resolved, the review process is resumed and the QC review report is signed.

630.43 Quality Assurance

A. Roles and Responsibilities

(1) Quality assurance (QA) is primarily concerned with adherence to technical standards and guidelines. This includes reviews to ensure adherence to policy and use of efficient, effective procedures to meet production goals. The SSRO is responsibility for ensuring the quality of ES concepts and ESDs. The SSR ESSs perform this task under the overall leadership of the SSRDs. The SSR ESSs have knowledge of and experience in the entire ESD development process and related policies, from identification of ES concepts to final editing, publication, and correlation of ESDs. Technical specialists from NTSCs, the National Grazing Lands Team, and the National Soil Quality and Ecosystems Branch are regularly consulted to ensure that national ES standards and training and technical assistance needs are met and to request assistance as needed. QA is not performed by the same individuals who completed QC activities.

(2) The SSR ESS, as QA reviewer, is also responsible for preparing and signing all QA review reports. The SSRD signs the reports and transmittal letters, which are then sent to the State Conservationist (STC), SSL, QC reviewer, and others, as appropriate, for review and concurrence.

(i) National Centers

Technical specialists provide assistance to the SSRO to ensure national ES standards and training and technical assistance needs are met, upon request or as assigned.

(ii) Soil Survey Regional Offices

- The SSRDs sign the QA review reports and transmittal letters.
- The SSR ESS—
  - Conducts initial, progress, and final QA reviews.
  - Prepares and signs all QA reports.
  - Sends reports and transmittal letters to the STC, SSL, QC reviewer, and others, as appropriate.

(iii) State Offices

- The STC (or designee) reviews and signs QA reports to document the transfer of significant issues and agreed-to items pertaining to the review.
- SSSs and SRCs or appointed designees on management teams participate in ES QA activities as requested.
- State technical discipline specialists on technical or management teams participate in ES QA activities, as assigned.

(iv) Soil Survey Offices

The SSL reviews and signs QA reports to document the transfer of significant issues and agreed-to items pertaining to the review.

(v) Partners may also sign QA review reports to signify agreement with findings.

B. Quality Assurance Reviews

(1) Quality assurance reviews are scheduled with regular frequency to ensure that technical standards are met, policy and procedures are being followed, and progress is consistent with

timelines and milestones identified in the project plan. Each initial ES project (no ES information currently exists) requires one initial QA review, at least one progress QA review, and one final QA review. Progress reviews will be conducted at least annually on multiyear projects. For update ES projects, the number and type of QA reviews will be stated in the project plan. However, a final QA review is required for all ES projects.

(2) Initial Reviews

(i) The purpose of the initial review is to guide the ES project at the start of the work, to review the collection and recording of ES data, and to complete preparation of draft ES concepts based on work completed and data collected to date. Part 630, subpart G, section 630.66, is an "Initial QA Review Worksheet" template. This template should be adapted or a new one developed to reflect the activities to be reviewed for a specific project.

(ii) Preparation, completion, and reporting of an initial QA review includes—

- Preparation for an initial field review. An approved ES project plan and any related MOU must be available for the initial review. The long-range plan of operation for the SSO must also be available. The project office assembles, reviews, and summarizes existing information about the MLRA and the subset project area. The technical team is in place and has worked in the area long enough to become familiar with the project area and any surrounding ESs. The project office staff prepares items such as the following for the QA review:
  - Approved project, annual, and long-range plans
  - List of technical team members on the project and their primary responsibilities
  - List of available reference material
  - Available existing data or low-intensity ES characteristics data to help formulate site concepts
  - Preliminary ES concepts within the context of the MLRA
  - A first draft of the provisional ES list, such as the ES legend
  - Initial low-intensity data from sample areas for the provisional ES list
  - Field notes supporting tentative modal concepts for the ES
  - Information on geomorphology, surface features, kinds of vegetation, and hydrology
  - Equipment and supply needs
- Completion of initial QA review. The SSR ESS assesses the following, as appropriate:
  - All initial preparations to ensure that they are adequate (takes necessary action if they are not)
  - Adequacy of project milestones, timeline, and deliverables
  - Training needs for staff
  - Filing system is appropriate, considering both the digital and hard copies
  - Resources identified in project plan to ensure they are sufficient to complete tasks
  - Draft ES legend and inclusion of similar ESs
  - Join of soil map units and selected characteristics within the project area to adjacent map units (makes recommendations to SSL for those that are in question)
  - Provisional ES naming, identification and differentiation of ESs, and modal concepts
  - Long- and short-range activities needed for completion of the project
  - Schedule for subsequent progress field reviews and special studies, as needed
- Preparation of the report. The SSR ESS prepares a report of the initial QA review, which includes an "Initial Quality Assurance Review Worksheet" (part 630, subpart G, section 630.66). The SSL approves the report. In addition to the worksheet, the report includes the following:

- Provisional ES legend (or list)
- Draft descriptions of proposed ES concepts
- Statement on accuracy of initial data and its interpretation
- Notes recording important observations made during the field study
- Instructions and agreed-to items for the technical team that relate to completion of the project plan, assignment of responsibilities, priorities, and dates of accomplishment
- Transmittal letter distributing the report according to part 630, subpart E, section 630.43E. SSRD highlights significant issues and agreed-to items in letter

(3) Progress Reviews

(i) These QA reviews assess progress and ensure that ES standards are met. Progress reviews emphasize progressive correlation consistent with the MLRA. Assistance may also be provided to the technical team on any issues with ES differentiation; ES concept development; state-and-transition model (STM) development; data collection, storage, and retrieval; and soil interpretation. These issues, however, generally are best addressed during a separate field assistance visit.

(ii) The frequency of progress reviews depends on the complexity of the work, rate of progress, experience of individuals working on project plan tasks, and type of ES project (initial, revision, or update) (part 630, subpart B, section 630.16).

(iii) The review is tailored to the specific type of work. The QA reviewer checks the adequacy of documentation and rate of progress for scheduled activities. If at any time assistance is needed to properly assess the project, the QA reviewer may request assistance from technical specialists through supervisors. The QA reviewer determines if actions have been taken to correct deficiencies and complete agreed-to items from previous reviews.

(iv) Part 630, subpart G, section 630.67 is a template of the Quality Assurance Progress Review Worksheet. This template can be adapted to reflect the activities to be reviewed for a specific project, or a new one can be developed. QA progress review activities may include, but are not limited to, the following:

- Completion of the Review.—The SSR ESS, as the QA reviewer, examines provisional ES concepts for correct ES identification and differentiation. The SSR ESS spends at least some time in the field observing examples of ES concepts and associated data to ensure that the local quality control procedures are effective. If problems are noted, the reviewer concentrates on solutions to avoid similar problems in the future. Additional checks by the QA reviewer during the course of the progress review include, but are not limited to, the following:
  - QC reports are current.
  - Proper ecological site-soil map unit component correlation is performed.
  - ES key adequately supports identification of ES concepts.
  - Completeness of records for progressive correlation of ES work.
  - Proper methods, procedures, and protocols are used and reported for data collection.
  - Data documentation levels and quality meet standards.
  - Management and use of notes documenting important field observations and other data collected is adequate.
  - Quality and status of ES concepts and STM development.
  - Consistency between developed ESD narratives and tabular information.
  - ES naming protocols are followed.
  - Crosscheck field data with interpretations, such as forestry productivity, for completeness and accuracy.
  - Rate of work and work progress.

- Completeness and accuracy of plant information.
- Management interpretations are supported by data cited in ESDs.
- Progression (milestones) and completion are reported in NASIS.
- All sampling data and ESDs are properly entered into NASIS and ES database.
- Supporting data and prior site descriptions are archived properly.
- Correlated to other appropriate classification systems and hierarchies.
- Action has been taken to correct any deficiencies and to complete agreed-to items noted during previous field reviews.

- Preparation of the Report.—The SSR ESS prepares a report of the progress review. The report includes a "Quality Assurance Progress Review Worksheet" (part 630, subpart G, section 630.67). In addition to the worksheet, the report includes the following:
  - List of commendable activities by the technical team.
  - List of agreed-to items, responsible personnel, and date scheduled for completion.
  - Statement of the accuracy of field data.
  - Progress map of ESs by correlated map unit components.
  - Notes recording important observations made during the field studies.
  - Record of additions, deletions, or other changes to the list of ESs.
  - Evaluation and comments on status of scheduled actions from earlier progress reviews.
  - Transmittal letter distributing the report according to part 630, subpart E, section 630.43E. The SSRD highlights significant issues and agreed-to items in the letter.

(4) Final Reviews

(i) A final QA review is conducted when all activities included in the project plan are complete. The final review ensures that completed work is of acceptable quality and meets all ES standards. The review also ensures that all necessary modifications are completed before field operations end, as appropriate.

(ii) Part 630, subpart G, section 630.68, is a template of the "Final Quality Assurance Review Worksheet." It provides an example of some important items to check before or during the final review. Most project activities are complete, and the collected data are available prior to the final field review. The activities to review include the following:

- Preparation.—Examine edaphic data, vegetation data, and interpretation information for correlation; complete draft of ESD with STM and database entries; complete any related investigations; enter correlated ES names in NASIS and ES database; and ensure photography is complete.
- Completion of Review.—The major portion of the review occurs in the office. Field checks take place if questions occur that can only be answered in the field. The activities noted for corrective action during the previous progress review receive special attention. Items to review include ES concepts and supporting information, STM and narrative, tables and associated data, and interpretations.
- Preparation of Report.—The QA reviewer prepares a report of the review. The report includes a "Final Quality Assurance Review Worksheet" (part 630, subpart G, section 630.68). It also includes the following:
  - List or legend of included ESs
  - List of correlated map unit components
  - Record of data collected in the project area
  - Evaluation of developed STMs
  - Evaluation and comments on the status of scheduled actions from any earlier progress reviews
  - List of commendable activities by the technical team

- List of agreed-to items
- Record of decisions made during the review
- Preliminary correlation memorandum, as described in part 630, subpart E, section 630.45
- Transmittal letter distributing the report according to part 630, subpart E, section 630.43E, in which the SSRD highlights significant issues and agreed-to items

C. Signature and Approval of Quality Assurance Review Reports

The QA reviewer is responsible for preparing and signing all QA review reports, preparing the transmittal letter, and preparing and transmitting copies of the report according to part 630, subpart E, section 630.43E for review and concurrence signatures. The SSRD provides the final signature on ES QA review reports, thereby assuring that the ES project work meets the standards and specifications of this handbook.

(i) Arrangements for managing QA review reports by participating cooperators can be documented in the MOU or project plan.
(ii) Signed document is maintained at the SSRO as part of the ES project record file.

D. Noted Deficiencies

(1) If significant issues or deficiencies in ESD documentation are noted, the QA review report is not signed. The SSR ESS informs the technical team and the SSL, who provides management oversight to address the issues. When all issues or deficiencies are resolved, the review process is resumed and the QA review report is signed.
(2) The SSR ESS must use discretion in determining which issues are significant enough to temporarily stop the review process and those that can be addressed through agreement and documentation in the review report.

E. Distribution and Review of QA Review Reports

(1) The SSRO distributes copies of all QA reviews within 30 days after the final day of the review. At least one copy of the QA review report and attachments and a letter of transmittal are sent to the following:
(i) SSL who is in charge of the project
(ii) QC reviewer for the project
(iii) Impacted STCs
(iv) SSSs, SRCs, and others on the management team
(v) Representatives from cooperating agencies
(vi) Others, as appropriate
(2) These people then sign the QA review document within 15 days of receipt to signify agreement with its contents.

630.44 Interim Release of ESDs

A. When an ESD has all the minimum components as outlined in part 630, subpart G, section 630.62, it may be made available to the public as advance information on an interim basis in the appropriate FOTGs and ES database. It will be labeled as an approved ESD.

Note: An approved ESD is not a completed ESD product.

B. Before being made available to the public, each approved ESD must undergo a QC review and at least one QA progress review to certify that minimum requirements, standards, and specifications are met. The “Quality Assurance for Interim ESD Release Worksheet” (part 630, subpart G, section 630.69) is completed by the SSR ESS.

C. The worksheet and associated documents and reports are reviewed and concurred by the QC reviewer, QA reviewer, SSL, SSRD, STC (or designee), and applicable partners. These people sign the “ESD Approval” sheet (part 630, subpart G, section 630.70), assuring that standards are met and ESDs are ready for interim release in the appropriate FOTGs and ES database.

630.45 Final Correlation of ESDs

A. An ES correlation document is developed and distributed after an ES project is complete. During or after the final QA review, the SSO, State, and SSRO staffs schedule a final correlation conference during which a correlation document is drafted. The correlation conference staff reviews the thoroughness of the progressive correlation and makes changes as needed, such as revision of ES concepts. Changes are recorded in NASIS as correlation notes. The draft correlation document then goes to the SSRD for final correlation.

B. Roles and Responsibilities

(1) Soil Survey Regional Offices

(i) SSRD—

- Participates in correlation conference.
- Completes final correlation.
- Prepares and signs final correlation document.
- Transmits correlated ESDs, final correlation document, ESD certification sheet, and associated materials to the impacted States and partners for certification.

(ii) SSR ESS—

- Coordinates and participates in correlation conference.
- Prepares draft final correlation document.
- Assists with final correlation, final correlation document, and ESD certification sheet, as assigned.

(2) State Offices

(i) STC (or designee) participates in correlation conference.

(ii) SRCs and SSSs may participate in correlation conference.

(iii) State technical discipline specialists on technical team—

- Help to ensure that all data to be reviewed has passed prior QC review.
- May participate in correlation conference, as assigned.

(3) SSO

(i) SSL—

- Participates in correlation conference.
- Ensures that all data to be reviewed has passed prior QC review.

(ii) ES specialist or other SSO staff members—

- Help to ensure that all data to be reviewed has passed prior QC review.
- May participate in correlation conference, as assigned.

(4) Partners may participate in correlation conference, as appropriate.

C. Correlation Document

A correlation document is a hard copy product that is developed and distributed after an initial ES project or update ES project, including fieldwork, is completed. Part 630, subpart G, section 630.71, is an example format for this document. It includes items such as the following:

(i) Heading

(ii) Introductory paragraph

(iii) List (or legend) of ESs established

(iv) Ecological sites dropped or deactivated by correlation

(v) Associated map unit concepts
(vi) Names of cooperators and credits
(vii) Prior ES publications
(viii) Notes accompanying ES concepts
(ix) Miscellaneous items
(x) QC and QA certifications
(xi) SSRD signature

D. Final Correlation

(1) Final correlation is done when an initial ES project is near completion. If effective progressive soil correlation has taken place during the course of an ES project, the final correlation is primarily a review of the progressive soil correlation decisions that have been made previously. The final correlation serves as a data check and identifies work that needs to be completed prior to certification of an ESD. During the final correlation—
(2) Review and confirm ES identification and concepts. Revise identification as needed.
  (i) Review and confirm ES common names and ensure that they conform to current naming convention and are consistent in project area.
  (ii) Review NASIS and ES database entries for accuracy, completeness, and consistency.
  (iii) Review interpretations for accuracy and consistency.
  (iv) Review draft correlation document and identify needed edits or changes.
  (v) Prepare and review supporting documents or information to be included in the correlation document. This may include items such as soil-vegetation-climate schema or models, special investigative studies, and references used throughout the course of the project.
  (vi) Record the location of all field documentation, field maps, and other supporting material and information to be archived.
(3) Review correlation notes in NASIS (from correlation conference) and ensure that the reason for the notes is also recorded.
(4) Record unique or unusual information about an ES that may be useful to future users.
(5) Summarize and process final edits to ESDs.
(6) Prepare final correlation document.

E. Signature and Approval of Final Correlation

Part 630, subpart G, section 630.71, includes the signature template. Templates may be adapted (i.e., new headings developed) to reflect the activities to be reviewed for a specific project; however, the signatures required do not change. The completed correlation document is approved and signed by the SSRD. The signed document is part of the ES record and is maintained at the SSRO. The ESD is then ready for State and partner certification.

F. Correlation Document Distribution

The SSRO transmits copies of the final correlation document to the impacted SSLs, management team members (including SRCs and SSSs), STCs, and others, such as appropriate partners.

  (i) The final correlation document is archived in the "ES Legend Correlation" table in NASIS.
  (ii) The original hard copy is maintained at the SSRO.
  (iii) Prior to certification of new ESDs, the archived final correlation document may be amended for an initial project and hardcopies redistributed. Amendments to the final correlation document are signed by and distributed to the same people as the original document.
  (iv) Once an ESD is certified, subsequent correlation decisions are recorded in NASIS but the original correlation document is not amended.

(v) For update ESDs—
- All changes made to ESs during the final correlation must be documented and recorded in NASIS. The archived correlation document, however, is not amended.
- In lieu of amending and redistributing a hardcopy of the correlation document, a report that identifies all changes will be generated from NASIS. This report can be printed and distributed as the SSRO deems necessary.
- A formal correlation document may be prepared and distributed, if needed (e.g., to satisfy an agreement with a cooperator).

630.46 Certification of ESDs

A. The final step is certification of the ESD by the State and appropriate partners. This is completed before the ESD is published in the FOTG and ES database for public use.

B. Roles and Responsibilities

The States and partners certify that the correlated ESDs meet the needs for conservation planning, implementation, monitoring, and assessment. The ESDs are then ready for use in conservation planning and related activities.

(1) STC (or designee)—
(i) Reviews correlated ESDs and correlation document.
(ii) Signs certification sheet.
(iii) Releases correlated ESDs for public use.
(iv) Notifies impacted parties of release.
(2) Partners review correlated ESDs and sign certification sheet, as appropriate.

C. Signatures

STCs (or designees) and applicable partners certify that ESDs meet the needs for conservation planning, implementation, monitoring, and assessment by signing the "Certification Sheet for Correlated ESDs" (part 630, subpart G, section 630.72). This sheet and all related documents are maintained at the SSRO as part of the ES project record file.

D. Publication of Correlated ESDs

Each STC notifies impacted parties of the public release of correlated ESDs and any subsequent amendments in the FOTG. Notification is done according to State-established policy for posting and distribution of FOTG materials.

630.47 Currently Approved ESDs that Meet Previous Standards

A. Currently approved ESDs that meet the standards in the National Range and Pasture Handbook (December 2003) or the National Forestry Manual (September 2010) may remain as approved documents in the ES database. Other documents in the database that do not meet those standards or the standards in this handbook must either be updated or deactivated according to the procedure outlined in part 630, subpart E, section 630.48.

B. Outdated but approved range site descriptions and woodland suitability groups may remain in section II of the FOTG. This information can be used by the field office until replacement ESDs have been developed.

630.48 Deactivation of ESDs

A. The SSRO deactivates established ESDs as appropriate. Support information and documentation as to the reason for deactivation of an ESD in the public database, including a recommendation for the disposition of the ES that has been deactivated, is needed. Before placing an ESD on the deactivated list, the SSRO sends a memorandum of intention and supporting documentation to all impacted State, area, and field offices. The memorandum includes the proposed reclassification to the appropriate ESs as described by the NRCS or its cooperators. The SSRO notifies other disciplines and cooperators who may use the ESD. Allow 45 days for filing of objections to the recommendation. If deficiencies are the reason for deactivation, notify impacted regions and work with local technical and management teams to determine if noted deficiencies should be corrected.

B. Deactivation is achieved by the SSRO checking the “unapproved” button in the ES database after waiting 45 days and making all efforts to mitigate the issues. List deactivated ESDs in the ESD classification file and store deactivated ESDs in a permanent archive file at the SSRO.

Part 630 – Policy and Procedures

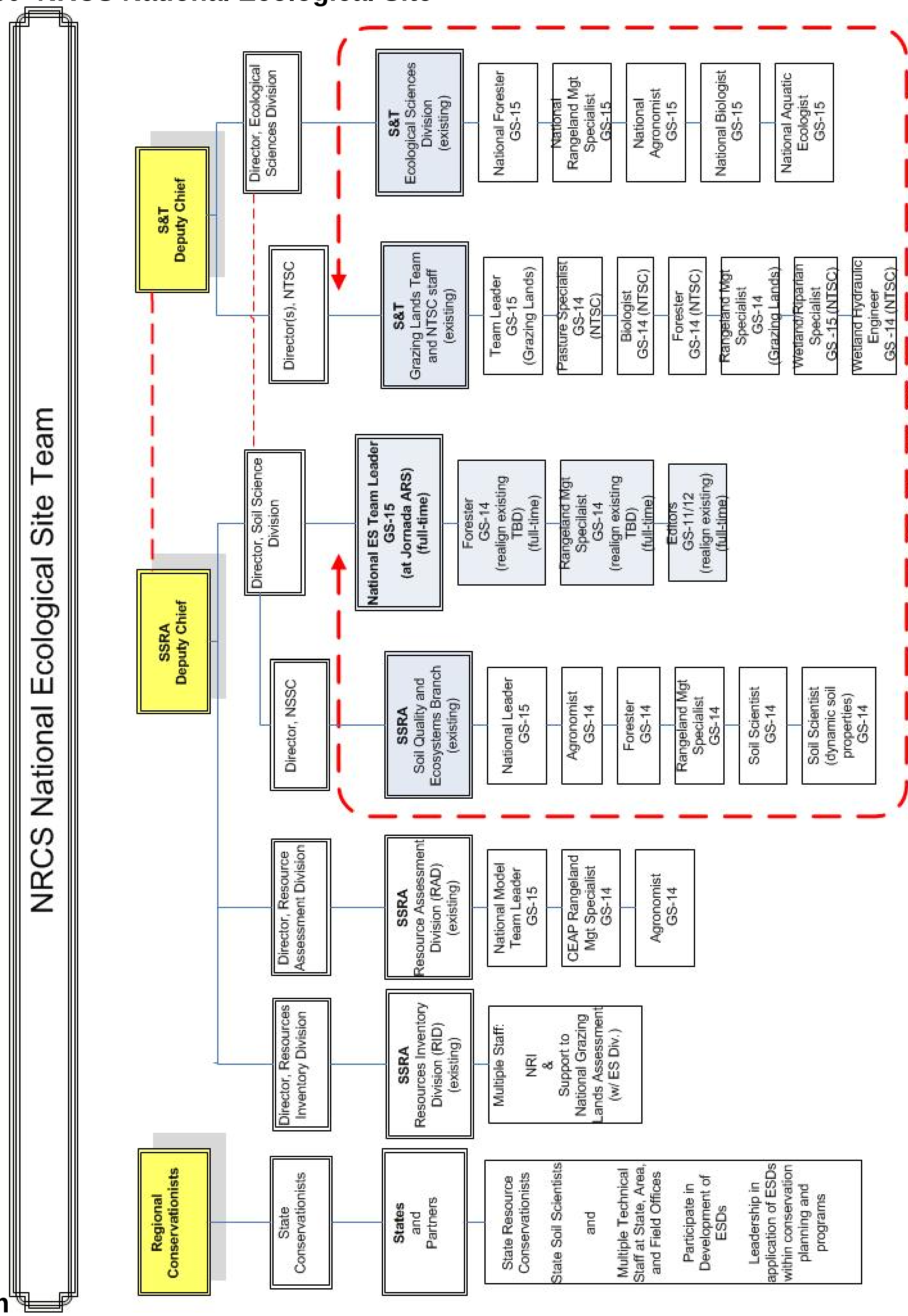
Subpart F – Job Certification for Ecological Site Quality Control

630.50 Reserved

Part 630 – Policy and Procedures

Subpart G – Exhibits

630.60 NRCS National Ecological Site Team



630.61 National ES Project Milestones

No.	Ecological site milestone name	Description
1	ES – Existing Information Located and Evaluated	Identify existing data and/or ESDs within the MLRA, including ES data from partners (non-NRCS) and any ecological unit classifications (e.g., subsections [USFS]). Group existing sites by MLRA, LRU, or other appropriate spatial hierarchy. Review current soil maps, and verify GIS layers or develop GIS product as appropriate. Perform initial literature search, and identify legacy data (including land use history and historical documentation).
2	ES – Initial QA Review & Assistance Completed	Initial QA review by SSR ESS completed. Review to include personnel resources, training needs, project plan contents, and development and use of technical team. Assist technical team with evaluation of existing ESDs for overlapping concepts, duplication among States, physiographic extent, and lack of soil-ES correlation.
3	ES – Low-Intensity Data Collection Completed	Low-intensity traverses focus on rapid characterization of plant communities and associated environmental settings to formulate ES concepts. If low-intensity data collection is in project plan, it should include GPS coordinates, photographs, verification of soils, identification of plants, ocular estimation of plant cover and/or production, and field notes, etc.
4	ES – Draft Site Concepts and Initial State-and-Transition Model (STM) Developed	Use identified climatic, soil, physiographic, and hydrologic features. Use available land type subsection and association maps, draft list of soil map unit components, conduct soil sortings or groupings, and verify soils by field observation. Consider all current and available data related to the ecological site. Involve interested local, State, and Federal partners and technical team members to establish a local workgroup for development of draft ES concepts and model.
5	ES – Provisional ESs Identified	Identify provisional ESs using draft site concepts, STMs, and narratives. ES concepts, STMs, and narratives will include disturbance regime, effects of management on ecological processes, and community pathways, transitions, and thresholds. Ecological site name and number are developed for each provisional ES. Reviews for quality control (initial/progress) and quality assurance must be completed.
6	ES – Site Key Developed	Develop draft ecological site key for MLRA or LRU. Use site characteristics matrix to develop key.

7	ES – Medium-Intensity Data Collection Completed	Medium-intensity data collection is intended to be rapid, focusing on sampling environmental range of draft ES concepts. Medium-intensity data collection, according to the project plan, should include qualitative and quantitative data collection, plant identification, soil verification, photographs of sites, recording GPS coordinates, recording field notes, testing ES concepts and site keys in field for ranges of variability, and refining geographic/ecological extent of ESs, etc.
8	ES – Data Analyzed, Managed, and Correlated	Maintain and manage all data (hard copy and electronic) throughout process; perform statistical analysis of field data, as appropriate; record and store metadata; standardize soil and vegetation data across political boundaries; and populate all applicable fields in the ES database.
9	ES – QA Progress Review Completed	Progress review by the regional ESS should include review of training, data collection protocols, tabular and spatial data, STM narrative and diagram, record/database management, and consultation with SSRO.
10	ES – High-Intensity Data Collection Completed	High-intensity sampling provides additional detailed information on a few modal sites that represent the ES concept. High-intensity data are collected according to the project plan requirements. Intensive soil characterizations are combined with high-intensity measurements of vegetation.
11	ES – State-and-Transition Model Completed	Complete final state-and-transition model using literature reviews, knowledge from local experts, and collected data, including diagram and narrative. Test and verify STM through field data collection.
12	ES – Plant Composition Lists Completed	Complete or update and verify plant species composition and structure for each community phase in the reference State. (Optional for others.)
13	ES – ESD Interpretations Completed	Develop or update narratives, including information on conservation management for grazing, wildlife, forests, recreation, and restoration as identified in the project plan.
14	ES – QC Review Completed	Quality control review of ESI tabular and spatial data, ESD narrative, and STM narrative and diagram by staff identified in project plan. Document comments, findings, and agreed-to items.
15	ES – Final Quality Assurance Review Completed	Final quality assurance review for adherence to ESD standards performed by SSR ESS.

16	ES – Approved ESDs	Approved ESDs completed according to standards, which includes quality control review, at least one quality assurance progress review, and appropriate signatures. May be published in ES database and FOTG for interim public use.
17	ES – Correlated ESDs	Final correlation document signed by SSRD. Product is ready for certification by State and partners.
18	ES – Certified ESDs	Correlated ESDs signed by STC and partners and ready for use in conservation planning, implementation, monitoring, and assessment. Published in ES database and FOTG.

630.62 Minimum Requirements for Approved ESDs*

To be released as approved, the ESD sections identified below must be complete and meet standards and data must be entered into the ES database. Before being made available to public as approved, ESDs must pass quality control review and at least one quality assurance progress review and receive appropriate signatures to designate that standards at the approved level have been met.

After the approved ESDs are signed by STCs and representatives of affected Federal land management agencies, the ESDs may be made available to the public in the ES database and FOTG.

General information section: Populate entire section.

Physiographic features section: Populate entire section.

Climatic features section: Populate entire section.

Water features section: Populate entire section.

Representative soil features section: Populate entire section.

States and community phase section:

Ecological dynamics of the site
State-and-transition diagram
Reference state—

- Narratives for states, community phases, transitions, and community pathways.
- Supporting community phase documentation.
- Community phase composition (for reference community phase).
- Species productivity (pounds per acre) (for herbaceous- and shrub-dominant reference community phase).
- Forest site productivity (for tree-dominant reference community phase).
- Total annual production (for herbaceous- and shrub-dominant reference community phase).
- Canopy and/or foliar cover by plant species (for reference community phase)
- Structure (for reference community phase).
- Ground surface cover (for reference community phase).
- Overstory canopy cover (for tree-dominant reference community phase).
- Overstory table (for tree-dominant reference community phase).
- Understory table (for tree-dominant reference community phase).

Each alternative state—

Narratives for states, community phases, transitions, community pathways, and restoration pathways.

Supporting information:

Associated sites
Similar sites
Inventory data references
Agency/state correlation
Other references

Rangeland health reference sheet:

Required if the reference community phase is classified as rangeland.

Rangeland health matrix sheet:

Recommended if the reference community phase is classified as rangeland.

* See part 641, subpart F, "Contents of Ecological Site Descriptions," for additional information on data in each section of an ESD.

630.63 Minimum Requirements for Correlated ESDs*

To be released as a correlated ESD, the ESD sections identified below must be complete (exceptions noted) and meet standards and the data must be entered into the ES database. Before being made available to the public as correlated, ESDs must pass a quality control review, a final quality assurance review, and final correlation and must receive appropriate signatures to designate that they meet standards at the correlated level.

After certification by STCs and affected federal land management agencies, correlated ESDs may be made available for public use the ES database and FOTG.

General information section: Populate entire section.

Physiographic features section: Populate entire section.

Climatic features section: Populate entire section.

Water features section: Populate entire section.

Representative soil features section: Populate entire section.

*States and community phase section**:*

Ecological dynamics of the site
State-and-transition diagram
Reference state—

- Narratives for states, community phases, transitions, and community pathways.
- Photographs – representative photograph required; additional photographs recommended.
- Supporting community phase documentation.
- Community phase composition (for reference community phase).
- Species productivity by pounds per acre (for herbaceous- and shrub-dominant reference community phase).
- Forest site productivity (for tree-dominant reference community phase).
- Total annual production (for herbaceous- and shrub-dominant reference community phase).
- Canopy and/or foliar cover by species (for reference community phase).
- Structure (for reference community phase).
- Ground surface cover (for reference community phase).
- Overstory canopy cover (for tree-dominant reference community phase).
- Overstory table (for tree-dominant reference community phase).

- Understory table (for tree-dominant reference community phase).
- Growth curve (for herbaceous- and shrub-dominant reference community phase).

Each alternative state—

- Narratives for states, community phases, community pathways, transitions, and restoration pathways.
- Photographs – representative photograph required; additional photographs recommended.
- Supporting community phase documentation.
- Community phase composition (recommended).
- Species productivity (recommended).
- Forest site productivity (recommended for tree-dominant state/community phases).
- Total annual production (recommended).
- Canopy or foliar cover (recommended).
- Structure (recommended).
- Ground surface cover (recommended).
- Overstory canopy cover (recommended for tree-dominant state/community phases).
- Overstory table (recommended for tree-dominant state/community phases).
- Understory table (recommended for tree-dominant state/community phases).
- Growth curve (recommended for herbaceous- and shrub-dominant community phases).

Ecological Site Interpretations:

Animal community
Hydrology functions
Recreational uses
Wood products
Other products

Supporting information:

Associated sites
Similar sites
Inventory data references
Agency/state correlation
Other references

Rangeland health reference sheet:

Required if the reference community phase is classified as rangeland.

Rangeland health matrix sheet:

Recommended if the reference community phase is classified as rangeland.

* See Part 641, Subpart F, "Contents of Ecological Site Descriptions," for additional information on data in each section of an ESD.

** If the reference state cannot be located, justification for omission in the ESD is required.

630.64 Ecological Site Project Plan Example

<u>ES – MLRA – 123A – Anywhere Mountains and Plateau ESD Project Plan</u>

A. Contact/Address: Jane Smith, SSO leader and address **Date:** 06/10/12

B. Justification: *Why should this proposed project be approved*?

Completion of this ES project will provide information about conservation management options in an area with deficiencies in the understanding of best practices. It will also provide a prototype ESD for use in similar areas. The completed ESDs will improve FOTG standards pertaining to seeding, wildlife management, and restoration. The ESDs will aide in the implementation of farm bill conservation programs focused on forestry, grassland, and management and restoration of declining habitats.

C. Priority Recommendation: *How important is this project*?

High. This project addresses ecosystem processes and management in a currently underserved area that is of interest to agency partners, including the Forest Service and National Park Service.

D. Project Objectives: *What are main tasks to be accomplished*?

The objectives include—

- Defining ESs within MLRA 123 based on similar physiographic and soil properties that support similar kinds and amount of plants and have similar responses to management actions and natural factors such as drought and other disturbances.
- Developing ESDs for the most common ESs within a project area.
- Providing a foundation for conservation planning and land management decisions that achieve desired future conditions.
- Serving private and public land managers by collaborating with identified partners within a project area.

E. Project Area: *Where is project located? What is areal extent*?

Anywhere Mountains and Plateau ESD Project, MLRA123 Anywhere Mountains and Plateau. Approximately 10,000 acres.

F. Project Personnel: *Technical team responsible for completing project*?

List name, title, agency, and contact information.

- Jane Smith, SSL (team lead), email
- Dave Jones, SSO ESS, email
- Mitch Adams, resource conservationist, email
- Chuck Green, area forester, phone number
- Stacy Williams, area resource soil scientist, email
- Kathy Sanchez, state rangeland management specialist (QC reviewer), email
- Bob Johnson, Forest Service, phone number
- Greg Redding, National Park Service, email

G. Milestones: *Table of key tasks, responsible person, and due date*.

Milestones are recorded in NASIS as well as in the project plan. Each milestone is unique. Progress can be reported on each task or subtask in NASIS.

Milestones	**Description**	**Responsible individual**	**Start date**	**Completion date**
ES – Locate and Evaluate Existing Information	Identify existing data and/or ESDs within the MLRA or LRU. Perform literature and historical data search.	Dave Jones, SSO ESS	11/1/12	1/30/13
ES – Initial QA Review and Assistance	Review by regional ES specialist to include personnel resources, training needs, and project plan contents.	SSR ESS & Jane Smith, SSL	12/15/12	3/15/13
ES – Develop Draft Site Concepts and Initial State-and-Transition Model	Consider all current and available data related to the ecological site. Involve interested partners and the technical team in establishing concepts and STM workshop. Coordinate development of site characteristics matrix and appropriate site name.	Dave Jones, SSO ESS	2/1/13	6/30/13
ES – Complete Medium-Intensity Data Collection	Includes qualitative and quantitative data collection, plant identification, additional soil verification, photographs, and record of GPS coordinates.	Chuck Green, area forester	3/1/13	2/30/14
ES – Analyze, Manage, and Correlate Data	Maintain and manage all data (hard and electronic copies) throughout process, perform statistical analysis on field data as appropriate, and record and store metadata.	Dave Jones, SSO ESS		Ongoing, check at each progress review
ES – Perform QC Review	Quality control review by person identified in project plan. Review ESI tabular and spatial data, ESD narrative, and STM narrative and diagram. Document comments, findings, and agreed-to items.	Kathy Sanchez, State rangeland management specialist		Ongoing, check at each progress review
Etc.				

H. Optional Attachments

Examples include project area map, soil map, draft ecological site concepts, vegetation maps, climate maps, legacy plants inventory data, and training, support, and equipment needs.

630.65 Ecological Site Quality Control Review Worksheet Template

A. QUALITY CONTROL (QC) REVIEW DOCUMENTATION

Project Leader (SSL):

Reviewer: Date:

Major Land Resource Areas:

Land Resource Units (if applicable):

This QC report ensures that the ecological site (ES) information is science-based, the MLRA concept is used for the ES keys and correlation to soil map unit components, and ESDs meet standards and specifications presented in sections II and III of the National Ecological Site Handbook. Each step can be reviewed at different times, depending on workflow during the year; however, each completed step must be reviewed within 1 year. After a step is reviewed, the corresponding QC document should be signed and sent to the soil survey region ecological site specialist (SSR ESS) for a quality assurance (QA) check.

General Information

Ecological sites reviewed:

Site ID Number	Site Name	New (N) or Revised (R) Site
_______________	____	_________
_______________	____	_________
_______________	____	_________

Individuals present at review:

Agency responsible for ESD development:

Cooperating agencies:

Status of memorandum of understanding:

Date of previous reviews:

Has a long-range plan been developed?

Has a project plan been developed and approved?

Does the project plan identify staffing, scheduling, and progress criteria?

Have the project plan and milestones been populated in NASIS?

Have all previous agreed-to items been completed?

ATTACH a list of soil map unit components currently correlated to the ecological sites and a spatial map.

Comments

Actions and/or Recommended Items

Additional Equipment and/or Training Needs

The above items have been reviewed for completeness and technical accuracy.

_________________________________ _________________________

Quality Control Reviewer **Date**

B. VEGETATION SUPPORT DATA

Number of representative sampling site locations, community phases, and states for each site.

Total number of vegetation data points for each site.

What sampling methods were used? Are they appropriate for the ecological sites under review, and do they reflect the needs as identified in the project plan?

Has the full geographic and ecological range of the ecological sites been sampled?

Describe and list other vegetation data or references used.

Comments.

Actions and recommended items.

Additional equipment and training needs.

The above items have been reviewed for completeness and technical accuracy.

____________________________________ __________________________

Quality Control Reviewer **Date**

C. ECOLOGICAL SITE DESCRIPTION

General Section

Has the ecological site concept been defined?

What criteria were used to separate the ecological site from others?

Is there a draft MLRA ES key, and does it correctly partition ES concepts?

Is the ecological site extent correctly correlated to soil map unit components according to the MLRA concept?

Are the overstory and understory plants used in the plant community name for the ecological sites included in the plant composition table for the reference community phase?

Have relationships to geographic framework classification hierarchies been listed?

Are reviewers, technical contributors, and authors correctly credited?

Physiographic Features Section

Is the narrative consistent with information contained in the other data elements in this section?

Do the data elements fit the described ecological site concept and match the modal concept and attributes of the soil map unit components to which the ecological site is correlated? If available, are visual or graphic interpretations included?

Do the physiographic features fit conceptually with the other sections of the ESD?

Climatic Features Section

Do the narrative and other data elements in this section fit the described ecological site concept and match conceptually with the other sections of the ESD?

Influencing Water Features Section

Do the narrative and other data elements in this section fit the described ecological site concept and other sections of the ESD?

Representative Soil Features Section

Does the soil information distinguish the ecological site from others?

Is the narrative consistent with the other data elements in this section?

Do the soil attributes of the correlated soil map unit components fit the described ecological site concept and match conceptually with the other sections of the ESD?

List the representative soil map unit components correlated to the ecological site.

Are soil map or map unit component updates needed in order to properly correlate the soils to the ecological sites?

Describe any additional follow-up work needed for soil/ecological site correlation.

States and Community Phases Section

Is the ecological site concept clearly defined within the context of the ecological dynamics narrative?

Are there unnecessary redundancies between the ecological dynamics sections and the community phase descriptions?

Does the state-and-transition diagram conform to the current format and numbering conventions?

Do all of the states, community phases, transitions, community pathways, and restoration pathways depicted in the diagram correspond to a narrative?

Does the information in the narrative match with the tabular data in the ESD?

Are the narratives correctly attributed to their respective elements?

Are the photographs representative of the state/community phases?

Are captions provided for the photographs? Are the date, photographer, and soil map unit and a brief description given for each photograph?

Do the narratives for the state/community phases identify and describe the indicators, feedbacks, at-risk community phases, and triggers?

Do the state narratives describe the process or feedback that prevents autogenic recovery and causes a change in function?

Are the narratives for the community phases, community pathways, transitions, and restoration pathways concise, brief, and informative?

Do the state-and-transition diagram concepts support the current concepts of the ecology of the plant species included?

Is evidence or actual observation data included for each community phase, community pathway, transition, or restoration pathway included? (Is there documentation or are there references to support reference community phases that no longer exist?)

Are there references as to how the states and community phases are separated (e.g., professional consensus, ordination software, etc.)?
Are there additional community phases or disturbance regimes that may exist but have not been documented? Is it feasible to document these in the future?

Are appropriate references incorporated in the text? Are all citations listed in the references section and formatted according to NRCS standards?

Does the available vegetation data support the species and percentages listed in the plant composition tables? If not, why are particular species included without actual documentation.

Are the plant species in the composition tables grouped appropriately?

Are the production values in the community phase table congruent with the values in the total annual production by growth form table? Does the data in these tables match the proportions and composition of the vegetation described in each of the community phase narratives?

Are the values in the cover and structure tables congruent with the plant community described in the community phase composition tables? Are the values supported by the available data?

Interpretations Section

Are community phases identified if appropriate?

Are the interpretations adequate for the uses and products associated with the site?

Supporting Information Section

Are the ecological sites listed in the associated and similar sites tables adequately described to indicate why they are associated or similar?

Are all of the references that were cited in the text listed?

Is the type location identified and representative of the ecological site concept? If not, why not?

Have all of the contributing authors and technical reviewers, including authors of prior versions, been credited?

Rangeland Health Reference Worksheet Section

Are the reference worksheet and rangeland health matrix complete?

Do the rangeland health reference worksheet values match the values reported for the reference state in the ESD?

Comments

Actions and Recommended Items

Additional Equipment and Training Needs

The above items have been reviewed for completeness and technical accuracy.

______________________________ ______________________

Quality Control Reviewer **Date**

D. DATABASES

Have the data from the ESD and associated rangeland health reference worksheet (if applicable) been entered into the ES database?

Are the data elements for the following sections complete?

- General
- Physiographic features
- Climatic features
- Influencing water features
- Representative soil features
- States and community phases
- Interpretations
- Supporting Information
- Rangeland Health Reference Worksheet

Have data validation checks been performed?

Have all associated vegetative data been georeferenced and entered into NASIS and the ES database? If not, explain why.

Have the appropriate data elements in NASIS, such as the "Non-Technical Descriptions," "Component Forest Productivity," "Component Existing Plants," and "Component Canopy Cover" tables, been updated?

For type locations, is the 232 soils investigation or soil pedon description complete and cross-referenced to its location in NASIS?

Are the ecological sites correctly linked to the soil map unit components in NASIS?

Comments.

Actions and recommended items.

Additional equipment and training needs.

The above items have been reviewed for completeness and technical accuracy.

__________________________________ _________________________

Quality Control Reviewer **Date**

E. DATA STORAGE AND DOCUMENTATION

Is there an official file established for the ecological site, and is it located according to policy?

Is there a spatial map that shows the extent of the ecological sites?

Are copies of data analysis documentation or reference location of data analysis documentation attached?

If the ESD is an update, are the historical range site/woodland suitability groups referenced and included in the ecological site documentation?

Is all ecological site documentation for both the digital and hard copies stored in a safe place and have backup procedures been implemented?

Are hardcopy and digital data stored according to guidance in part 641, subpart G (photographs, STMs, vegetation data, soil data, GPS data, GIS projects, data analysis, outside data sources, etc.)?

Are the most current ESDs and rangeland health reference worksheets in the ES database linked to section II of eFOTG?

Is the ecological site part of an ES key? If not, is there a plan to develop a key?

Comments**.**

Actions and recommended items.

Additional equipment and training needs.

The above items have been reviewed for completeness, technical accuracy, and adherence to standards.

____________________________________ ___________________________

Quality Control Reviewer **Date**

F. QUALITY CONTROL DOCUMENTATION

The following components have been reviewed for completeness and adherence to standards:

- General information
- Vegetation support data
- Ecological site description
- Databases
- Data storage and documentation
- Other

Ecological sites reviewed:

Site ID Number	Site Name	New (N) or Revised (R) Site
____________	________________________________	________
____________	________________________________	________
____________	________________________________	________
____________	________________________________	________
____________	________________________________	________
____________	________________________________	________

This quality control review assures that the above ecological site descriptions were reviewed for completeness and technical accuracy.

________________________________ ________________

Quality Control Reviewer **Date**

630.66 Initial Quality Assurance Review Worksheet Template

A. Supporting Documentation Needed Prior to Review (reference only if applicable)

Approved project, annual, and long-range plans

List of technical team members and their primary responsibilities

List of reference material

Available existing data (e.g., old range site descriptions, woodland suitability groups, provisional ESDs, supporting vegetation data, etc.)

Numerical legend of provisional ecological sites, including acreage and completion level

Alphabetical legend of provisional ecological sites, including acreage and completion level

Soil map unit and ecological site correlation table

Supporting GIS layers and material

Soil map units and draft provisional ecological sites

Preliminary ES concepts within the context of the MLRA

Draft MLRA ES key

Field notes supporting draft ES concepts

Ecological site progress report with completion dates

Draft state-and-transition models for new ecological sites from field review

Numerical list of all competing similar ecological sites

QC worksheets for project

List of action items from QC review

List of commendable items from QC review

Equipment and supply needs

B. Initial Review Checklist

Are preparations for QA review adequate?

Has the project area been identified, refined, and researched as needed?

Has review of literature and existing data been initiated?

Who are the members of the technical review team (list by agency affiliation)?

Do responsible individuals have access to appropriate databases needed to complete assigned tasks in the project plan?

Has a list of training needs, equipment, and supplies, etc., been identified for the individuals in charge of ecological site development?

Has the management team approved the project plan and has the board of advisors (BOA) reviewed the plan? Have they provided recommendations, as appropriate?

If there is an MOU, has it been reviewed by the management team and/or BOA, and have recommendations been provided to the SSRD or State Conservationist, as appropriate?

Has a project plan been drafted and submitted to each member of the technical team for review?

Has the project plan been approved and integrated into the MLRA long-range plan?

Are milestones being used in the project plan, and are they entered into NASIS? Are milestones, timelines, and deliverables reasonable?

Are qualified persons responsible for ensuring timely accomplishment of milestones outlined in the project plan?

Has a qualified QC reviewer been identified in the project plan?

Has the technical team reached an agreement with the QA reviewer and SSRD on how progress on milestones will be reported?

Has the draft ES legend been compared to similar ESs?

Is the join adequate between soil map units and selected characteristics within the project area and adjacent map units?

Is documentation adequate for ecological sites being combined or deleted?

Are the provisional ES names, draft identification and differentiation of ESs, and modal concepts appropriate?

Is a filing system in place to store supporting documentation, including both digital and hardcopy data?

Does the ES key support the correct identification of ES concepts?

Comments.

Actions and recommended items.

Additional equipment and training needs.

The initial quality assurance review was completed by:

_______________________________________ __________________
Soil Survey Region Ecological Site Specialist **Date**

C. **Initial Quality Assurance Review Report Signature Page**

The initial QA review report was completed by:

____ ____________________

Soil Survey Region Ecological Site Specialist **Date**

Quality Assurance Concurrence

We, the undersigned, have reviewed the initial QA review report and concur with its findings.

________________________________ ______________________

SSO Leader **Date**

________________________________ ______________________

Partner(s) **Date**

________________________________ ______________________

State Soil Scientist(s) **Date**

________________________________ ______________________

State Resource Conservationist(s) **Date**

________________________________ ______________________

State Conservationist(s) **Date**

Quality Assurance Certification

As of __________________ (date), this ecological site project meets the standards and specifications of the National Ecological Site Handbook.

_______________________________________ ______________________

Soil Survey Regional Director, Region ______ **Date**

630.67 Quality Assurance Progress Review Worksheet Template

A. Field Reviews/Soil-Ecological Site Legend Reviews

Agency or entity in charge of ecological sites development:

Cooperating agencies or entities for each ecological site:

Participants present:

Prior to field review, documentation should be provided to the SSR ESS, including soil map unit components correlated to the ES, site keys, site concepts, vegetation data, and other supporting information and references. Were the following provided?

Answer yes (Y) or no (N).

____ A. Written descriptions of the sites currently being correlated to the soil map unit components in question, including draft site concepts, Landfire BpS descriptions, and heritage program native plant community descriptions, etc.

____ B. Existing vegetation data supporting the ES concept.

____ C. Information for all soils currently being correlated to the site, including OSDs, and maps, etc.

____ D. Photographs of the site.

____ E. GIS data relating to the site, including topographical maps, LIDAR derivative maps, native plant community maps, and NatureServe maps, as appropriate.

____ F. Correlation list of proposed ecological sites and soil map unit components.

____ G. List of all associated sites and soil components.

____ H. List of all similar sites and their differentiation.

____ I. Ecological site legend.

____ J. Draft STM for each ES.

____ K. ES key for MLRA.

B. Data Entry and Management

1. Have the following items been addressed or provided during a review of the quality and extent of data entry?

Answer yes (Y) or no (N).

____ A. List of tables and data elements in NASIS and ES database that have been or are being populated with ESI data.

____ B. List of locations where soil verification and vegetation data were collected.

____ C. In addition to agency databases, is an outside database being used to store vegetation data? If so, what is it and where is it located?

2. Are the QA review reports current?

3. Is the ecological site legend for the project area complete (i.e., has it been verified for the entire MLRA)?

4. If the legend is complete, have site concepts been supported by data and have they been reviewed by soil and vegetation specialists? Have naming protocols been followed?

5. Have issues been identified relating to correlating all soil map unit components in NASIS, finding consistent descriptions of the soil components, and locating other pre-existing ecological or range sites? If so, what is proposed to address these issues? Have all issues from previous reviews been addressed?

6. Are records for progressive correlation complete?

7. If ES is not new (has pre-existing site ID and data in ES database or has range site ID), have all existing data been gathered (including that from other states that share the ESD)?

8. Are proper methods, procedures, and protocol being used and reported?

9. Does the ESD meet minimum data requirements? If not, have the items needed to meet current NRCS standards been identified? Have steps been outlined for addressing these items?

10. What level of vegetation data collection has been conducted (i.e., low-, medium-, or high-intensity sampling and degree of completion)?

11. Are all sampling data and ESDs properly entered into the appropriate ES database? Do documentation and management of data meet standards?

12. Was correlation to other appropriate classification systems and hierarchies performed?

13. Are interpretations accurate and consistent with field data?

14. Is progress of work commensurate with project plan milestones and timelines, and is progress reported in NASIS?

15. What are the next steps needed to complete field verification and collection of data for development of the ES?

Commendable items.

Action items.

Deficiencies.

This quality assurance progress review worksheet was completed by:

____	__________________
Soil Survey Region Ecological Site Specialist	**Date**

C. State-and-Transition Model Workshops/Reviews

1. Participants present:

2. ESs being reviewed:

3. Have ESs been grouped for STM development? If so, was a list provided detailing which sites are in each group and the basic dynamics of each group?

4. Were the STMs developed and reviewed by appropriate specialists?

5. Have the STMs been developed using literature references, current academic principles, and ecological theories as well as low-intensity sampling?

6. Do the names and numbers in STMs follow approved NRCS standards?

7. Do the narrative sections for each community phase and state contain sufficient information to explain the dynamics, species composition, flora and fauna interactions, and other pertinent characteristics?

8. Do the narrative sections for each transition and restoration pathway detail the general disturbances and ecological processes involved?

9. Is an STM workshop needed, or are other followup action items needed for further development and review of STMs?

10. Has adequate field data been collected to verify the STMs? If data are extensive, provide a detailed attachment. List the type and level of data collected and number of representative sites used for each community phase and state in the STM for each ES.

Commendable items:

Action items:

Deficiencies:

This quality assurance progress review worksheet was completed by:

____ _________________
Soil Survey Region Ecological Site Specialist **Date**

D. Quality Assurance Progress Review Report Signature Page

This quality assurance progress review report was written by:

____   _________________

Soil Survey Region Ecological Site Specialist **Date**

Quality Assurance Concurrence

We, the undersigned, have reviewed the QA progress review report and concur with its findings.

_____________________________________ ________________________

SSO Leader **Date**

_____________________________________ ________________________

Partner(s) **Date**

_____________________________________ ________________________

State Soil Scientist(s) **Date**

_____________________________________ ________________________

State Resource Conservationist(s) **Date**

_____________________________________ ________________________

State Conservationist(s) **Date**

Quality Assurance Certification

As of __________________ (date), this ecological site project meets the standards and specifications of the National Ecological Site Handbook.

____   ______________________

Soil Survey Regional Director, Region ______ **Date**

630.68 Final Quality Assurance Review Worksheet Template

A. List of Ecological Sites Correlated (by number)

1. ______________________________	2. ______________________________
3. ______________________________	4. ______________________________
5. ______________________________	6. ______________________________
7. ______________________________	8. ______________________________
9. ______________________________	10. ______________________________

A. Final QA Review

Project Plan ID____________________

Administrative Information

1. Are the QC review reports complete? If not, identify deficiencies by ecological site.
2. Do the ESDs meet current standards and editorial guidelines?

Project Management

1. Are deficiencies and agreed-to items from previous QA reviews resolved?
2. Are policies and procedures in the NESH being followed?
3. Is progress reporting of the project complete?
4. If sites have been divided or recorrelated, are notes sufficient for needed followup? Where are notes stored?

Correlation

1. Has the ES been correctly correlated within the MLRA? Has work been completed for initial development, proper recorrelation throughout MLRA, and resolution of MLRA boundary issues?
2. Do the ES ID numbers and names conform to NRCS policy?
3. Have all the map unit components been updated to the current ES?
4. Do MLRA or LRU descriptions need to be updated?

Ecological Site Investigations

1. Was a thorough search conducted for literature and existing data to support the site concepts?
2. Do plant names follow current guidelines?
3. Has the appropriate sampling strategy been used for the ESs in this project?
4. Are the extent and intensity of data collected sufficient for the variability of the site?

5. Have all the field data collected for each ES been properly analyzed?
6. Were type locations available for investigation of the ES?
7. Is the criteria used to separate this site from others justified and documented?
8. Has there been a peer review of the site concept and STM?

Ecological Site Descriptions

1. Do the ESDs meet minimum requirements as outlined in Part 630, Subpart G, Section 630.63, “Minimum Requirements for Correlated ESDs”?
2. Are STM diagrams, boxes, and narratives written for all ecological sites?
3. Does the STM meet current standards and definitions?
4. Has the ESD been edited so that it is grammatically and editorially correct?
5. If the site name or number has been updated, is it noted in the final ESD?

Database Management

1. For new ecological sites, have all tables been populated in appropriate databases?
2. For sites that have been updated, have the appropriate changes been made in the databases?
3. Have the conversions and calculations for plot and vegetation data been done correctly?
4. Have field notes for site data been summarized, georeferenced, and stored according to policy?
5. Have the appropriate linkages in the appropriate databases been verified, such as the links for nontechnical descriptions, range and forestry production tables, existing plants and canopy cover, and other technical information?
6. Have photographs and other data been stored according to policy in part 630, subpart G?
7. Has the SDQS reviewed the map unit components and site concept correlation in the appropriate databases?
8. Can the data analysis be tracked?

Ecological Site Interpretations

1. Do ES interpretations meet policy as stated in part 630, subpart F, section 630.43, of the NESH?
2. Have appropriate disciplines participated in the development and review of the interpretations section?

B. Final Quality Assurance Review Report Signature Page

The final quality assurance review report was prepared by:

____ __________________

Soil Survey Region Ecological Site Specialist **Date**

Quality Assurance Concurrence

We, the undersigned, have reviewed the final quality assurance review report and concur with its findings.

SSO Leader **Date**

Partner(s) **Date**

State Soil Scientist(s) **Date**

State Resource Conservationist(s) **Date**

State Conservationist(s) **Date**

Quality Assurance Certification

As of __________________ (date), this ecological site project meets the standards and specifications of the National Ecological Site Handbook.

Soil Survey Regional Director, Region ______ **Date**

630.69 Quality Assurance for Interim ESD Release Worksheet Template

Ensure that all QC and QA worksheets and reports have been completed and signed ***before*** *submitting documents for interim release as an approved ESD.*

See Part 630, Subpart G, Section 630.62, “Minimum Requirements for an Approved ESD.”

1. Are all the sections, as stated in part 630, subpart G, section 630.62 complete?

2. Was the proper amount of data collected and appropriately analyzed for each section?

3. Have the issues outlined in the QC review been addressed?

4. Has each ESD been entered into the appropriate databases?

5. Does the name of the ES follow NRCS guidelines in part 641, subpart D of the NESH?

6. Has a formal English edit been completed?

This approved ESD worksheet was completed by:

____ __________________

Soil Survey Region Ecological Site Specialist **Date**

630.70 ESD Approval

The following ESDs meet the standards required for release as approved and have been entered into the appropriate databases:

Site ID	Site Name
____________	________________________________
____________	________________________________
____________	________________________________
____________	________________________________
____________	________________________________

The above ESDs have been reviewed for adherence to quality control standards.

________________________________ ______________

Quality Control Reviewer **Date**

These ESDs have received QA review for adherence to standards and specifications at the approved level. They meet the guidelines for identification, delineation, description, and interpretation.

________________________________ ______________

Soil Survey Region Ecological Site Specialist **Date**

________________________________ ______________

Soil Survey Regional Director, Region _____ **Date**

We, the undersigned, concur with this review. The listed approved ESDs can be used for conservation planning, implementation, monitoring, and assessment. They are ready for export to the Field Office Technical Guide.

SSO Leader	**MLRA**	**Date**
State Conservationist	**State**	**Date**
State Conservationist	**State**	**Date**
Partner (as needed)	**State**	**Date**
____________	____________	____________

Partner (as needed) Area of responsibility Date

630.71 Example Format for ES Correlation Document

This exhibit outlines the format and content of items and data ordinarily contained in a correlation document. It does not preclude the inclusion of other information pertinent to the project or the explanation of actions taken in the correlation.

A. Heading and Nondiscrimination Statement

UNITED STATES DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service

Identification of Ecological Sites
Any Area, Any MLRA, Any State

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers. If you believe you experienced discrimination when obtaining services from USDA, participating in a USDA program, or participating in a program that receives financial assistance from USDA, you may file a complaint with USDA. Information about how to file a discrimination complaint is available from the Office of the Assistant Secretary for Civil Rights. USDA prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex (including gender identity and expression), marital status, familial status, parental status, religion, sexual orientation, political beliefs, genetic information, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) To file a complaint of discrimination, complete, sign, and mail a program discrimination complaint form, available at any USDA office location or online at www.ascr.usda.gov, or write to:

USDA
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, SW.
Washington, DC 20250-9410

Or call toll free at (866) 632-9992 (voice) to obtain additional information, the appropriate office or to request documents. Individuals who are deaf, hard of hearing, or have speech disabilities may contact USDA through the Federal Relay service at (800) 877-8339 or (800) 845-6136 (in Spanish). USDA is an equal opportunity provider, employer, and lender. Persons with disabilities who require alternative means for communication of program information (e.g., Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

B. Introductory Paragraph

Persons participating in the ES project, date, location, data reviewed, basis for correlation, and other items, if pertinent, are included in this paragraph. For example, "John C. Smith, SSO ES specialist, and David G. White, AnyState office, Natural Resources Conservation Service; and Joseph I. Black, associate professor, AnyTown State University, AnyTown, AnyState, prepared this correlation the week of October 21-25, 2013. This correlation was based on information in the ES database and on field notes, interpretations, and material from related ESs."

C. Ecological Sites (ESs) Established by This Correlation

List of ESs correlated (by number)—

1. ______________________________	2. ______________________________
3. ______________________________	4. ______________________________
5. ______________________________	6. ______________________________
7. ______________________________	8. ______________________________
9. ______________________________	10. ______________________________

D. Ecological Sites Deactivated

List of ESs that were dropped or deactivated by the correlation. For example: “The XX-XX ES is made inactive by this correlation.” Enter “None” if no ESs were dropped or deactivated.

E. Associated Soil Map Unit Components

List soil map unit (MU) components associated with each ES and the estimated acreage of each ES.

ES	Associated MU Components	Total Acreage

F. Names of Partners

List of partners to be published with the ESDs.

G. Prior ES Publications

For ES updates, indicate the reference to prior ESDs that will be in the introduction of the updated ESD. Enter “None” if there are no prior publications.

H. Notes to Accompany the ES Concepts and Differentiation

Any general notes that contribute to the understanding of the correlation can be included as introductory material in this section. For example, “This ES project area is in a transitional zone between temperature regimes. Soils that have a mesic or thermic temperature regime are correlated to these ESs.”

In the notes, include items such as—

(1) Pertinent information about ESs being established.
(2) How similar ESs differ from the ES concepts.

I. Miscellaneous Items

Use additional headings, as appropriate, and include items pertinent to the correlation or publication of ESDs. For example, the soil-landscape-climate schema or concepts used for correlation of the survey area should be included. Another example might be a summary of special investigative reports that were used as guidance for the project.

J. Quality Control and Quality Assurance Certifications

The correlation document certifies that—

(1) ES concepts have been tested and verified.
(2) Supporting soil and vegetation data have been collected and archived appropriately.
(3) Documentation on modal soil properties used to correlate the site to appropriate soil map unit components is available.
(4) Documentation that characterizes the site concepts is available.
(5) Soil, ES, and management interpretations are complete and have been correlated across physiographic and political boundaries for the project area.
(6) Entire ESD product has been appropriately correlated by MLRA or other spatial unit in which the site occurs.
(7) Appropriate technical reviews have been performed by assigned SSRDs, SSLs, SRCs, and other agency staff, as appropriate.
(8) Appropriate QC was performed.
(9) Appropriate QA was performed by the SSRO staff.
(10) All appropriate databases and ESDs are updated.

K. Approval Signature and Date

These ESDs have received quality assurance review for adherence to ESD standards and specifications at the approved level. They meet the guidelines for identification, delineation, description, and interpretation.

________________________	____________	____________
Soil Survey Regional Director	**SS Region**	**Date**

630.72 Certification Sheet for Correlated ESDs

Correlated ESDs:

Site ID	Site Name
________________	____
________________	____
________________	____
________________	____
________________	____

We, the undersigned, certify that the listed correlated ESDs are ready for use in conservation planning, implementation, monitoring, and assessment and will be made available to the public in the appropriate databases and Field Office Technical Guide.

____________________________________	______________________	___________________
State Conservationist	**State**	**Date**
____________________________________	______________________	___________________
State Conservationist	**State**	**Date**
____________________________________	______________________	___________________
State Conservationist	**State**	**Date**
____________________________________	______________________	___________________
Partner (as needed)	**State**	**Date**
____________________________________	______________________	___________________
Partner (as needed)	**Area of responsibility**	**Date**

Part 631 – Ecological Site Concept and Description Development

Subpart A – Ecological Site Characterization Concepts

631.0 Purpose

An ecological site (ES) incorporates abiotic and biotic environmental factors such as climate, soils and landform, hydrology, vegetation, and natural disturbance regimes that together define the site. Each ES is identified, differentiated, and described based on the relationships among these environmental factors and how they influence plant community composition and other environmental processes. The information documented in an ecological site description (ESD) includes the following:

(1) Data used to define the distinctive properties, characteristics, and behaviors of the ES
(2) Biotic and abiotic characteristics that differentiate the site (e.g., climate, physiography, soil characteristics, plant communities, and hydrology)
(3) Ecological dynamics of the site that describe how changes in disturbance processes and management can affect the site, illustrated in a state-and-transition model (STM)
(4) Interpretations about the land uses, products, and ecosystem services that a particular ES can support
(5) Appropriate practices for achieving conservation and management objectives, such as maintaining or achieving a specific community phase

631.1 Definition

An ES is a conceptual division of the landscape that is defined as "a distinctive kind of land based on recurring soil, landform, geological, and climate characteristics that differs from other kinds of land in its ability to produce distinctive kinds, amounts, and proportions of vegetation and in its ability to respond similarly to management actions and natural disturbances." The fundamental assumption of an ES concept is that soils, climate, geomorphology, and plant species can be grouped with sufficient precision to increase the probability of success of site-specific predictions and decisions. Natural systems seldom include distinct boundaries in either space or time; therefore, ESs include a certain amount of variability and uncertainty. Accounting for and describing this variability is a key part of designing a credible, accurate, and usable ESD.

631.2 Defining the Ecological Site Concept

The identification and characterization of ESs are based on a fundamental premise that the composition, structure, and function of plant communities (and ecosystem functions) are governed by the environmental factors of energy, moisture, and nutrient availability as well as by disturbance regimes. These factors vary due to differences in climate, geology, topography (elevation, slope, aspect, and landform position), and soil characteristics. Collectively, they determine the soil temperature, moisture, and nutrient regimes that affect vegetation patterns and ecological processes associated with a particular ES. They are the basis for defining the physical and biological characteristics of an ES and predicting the recurring pattern of an ES across the landscape.

(1) Soil Properties

At the local level, soil temperature, moisture, and nutrient relationships are characterized by key soil properties that are used as differentiating criteria in defining an ES. Key soil properties are identified using direct measures of edaphic conditions, including relatively static soil properties, such as depth to diagnostic features (e.g., argillic horizon, calcic horizon, or water table), texture, water holding capacity, and pH, etc. Key soil properties are determined based on our knowledge of plant-soil-water relationships. In addition to soil properties, landscape position, slope, and hydrology play a major role in defining an ES because they affect runoff, flooding, ponding, root zone saturation, water table levels, and other factors. In some cases, indicator plants can be used to indirectly identify soil and microclimate properties that are otherwise difficult to identify in the field.

(2) Reference Condition

The inherent complexities of vegetation dynamics (i.e., how vegetation originated in an area and how it might change in the future) require an understanding of historic vegetation, disturbance regimes, climatic variability, and existing (current) vegetation. Long-term trends in historic vegetation spanning thousands of years can be predicted by using techniques such as pollen analysis and dendroecological studies. The relevance of ecological data diminishes over time because of differences in climate, disturbance regimes, and species distributions. Use of a 500-year period or shorter, such as immediately preceding European settlement, is reasonable for establishing reference conditions.

(3) Modal Concept

An ESD expresses the modal concept for an ES. Expert knowledge and data used to describe an ES are derived from sources that are both spatially and temporally variable. Therefore, specific information and data expressed in an ESD must be characteristic of the central concept of the site. The core concept of an ES is described in an ESD, not the entire range for the physical aspects of the site (e.g., exposure, slope, landform, soil surface texture, etc.). The same is true for the biological aspects described (e.g., species composition by weight, foliar cover, total production, etc.

(4) Reference State for ES Concept

The ES concept is based on reference conditions representing natural states, with state changes and transitions subsequently estimated based on understanding of thresholds of change. The reference state and the component community phases are developed within the historical range of variability due to dynamics following disturbance. Within the reference state, the community phase used to define an ES is termed the reference community phase.

(5) Reference Community Phase

The reference community phase is identified as the one that expresses the key vegetative characteristics of the reference state. The reference community phase develops as a result of the interaction of environmental factors, natural disturbance regimes, and physiological characteristics of species comprising the community. On landscapes that historically have been subject to relatively infrequent disturbances, late successional communities that required a long period of time to develop typically are selected as the reference community phase. On landscapes that are subject to frequent natural disturbances, however, the geographically dominant community phase in the reference state is more relevant. It is selected as the reference community phase since latter stages of succession seldom occur.

631.3 Interpreting Ecological Dynamics of the Ecological Site

A. Ecological dynamics describe changes in vegetation and soils on an ES and the causes of the changes. A state-and-transition model (STM) describes alternative states, range of variability within states, processes that cause plant community shifts within states, maintenance of a current state, transitions between states, and restoration of a previous state. An STM diagram provides a general graphical overview, and the accompanying narrative describes the ES in detail.

B. STMs may include single or multiple states, depending on the nature of the ecosystem, and incorporate the concepts of ecological resilience and resistance. Ecological resilience, as it applies to ESs, is a measure of the amount of change or disruption that is required to transform an ecosystem from being maintained by one set of mutually reinforcing processes and structures to a different set of processes and structures. The concept of resistance, or the ability of an ecosystem to resist change following disturbance, is embedded in this definition of ecological resilience. This definition is distinct from that of engineering resilience, or the rate at which ecosystems return to their original stable state following disturbance. The conditions sufficient to modify the structure and function of a state beyond the limits of ecological resilience result in the formation of an alternative state.

631.4 Components of a State-and-Transition Model

A. An STM for an ES has five fundamental components. Refer to part 631, subpart D, section 631.35, for examples and details concerning STM diagram formatting, labeling, naming, numbering, and lettering.

B. States

The state (large boxes in part 631, subpart H, section 631.85) is a single community phase or suite of community phases that interacts with the environment to produce a characteristic plant species composition, functional and structural groups, and soil functions within the range of variability as determined by the natural disturbance regime. The state is defined with reference to community phases, dynamic soil properties, and animal populations that are linked to one another through feedback mechanisms. Inherent natural ranges of variability of plant species composition (production and canopy or foliar cover), soil properties (inherent and dynamic), ground cover, and disturbance processes should be described. At least one primary ecological process differs in alternative states, including the hydrologic (water) cycle, nutrient cycle, and energy capture and transformation (energy flow).

(i) Reference State

- A reference state (part 631, subpart H, section 631.85) is recognized in each STM. It describes the ecological potential and natural range of variability resulting from the natural disturbance regime of the ES. A description of the reference state should include native plant communities, dynamic soil properties, and animal communities.
- Due to natural disturbance regimes and climatic processes, reference conditions can be represented by more than one community phase. Only one community phase may be recognized in the reference state in some ESs, such as some grass-dominant sites and some udic forest sites. ESs that are subject to natural fire regimes generally have more than one community phase in the reference state. Cessation of natural disturbance typically results in transition to an alternative state.

(ii) Alternative States

- Persistent changes in vegetation and related processes recognized through states and transitions can involve the interaction of several factors. The causes of state changes may be associated with processes at different spatial scales (e.g., land use changes at a meso scale that are interacting with directional changes in climate at a macro scale), with episodic events (e.g., extreme rainfall events), and with time lags (e.g., gradual plant recruitment following episodic events). Consequently, the assertion of an alternative state commonly is inherently uncertain and should be treated as an hypothesis that can be tested through long-term observation of ecosystem behavior (e.g., evidence of slow or episodic recovery of formerly dominant species) and repeated application of conservation and restoration practices (e.g., successful recovery of ecosystem structure through fire management). States should be re-evaluated and refined continually. Evidence of the existence of alternative states and the varying constraints to recovery to previous conditions should be sought and evaluated over long periods of time.

- Importance of Alternative States.—The designation of alternative states in STMs denotes changes in ecosystem properties that cross a certain threshold. Either intensive efforts are needed for restoration or the changes are practically impossible to reverse. The presence of alternative states can be used to support a need for different management; therefore, evidence of alternative states should be carefully identified and evaluated. The assumptions, methods, and supporting data or literature used to define alternative states and thresholds in STMs should be documented, peer reviewed, and further developed, if needed. These include careful description of the properties of the reference and alternative states, description of the ecological mechanisms causing transitions and precluding recovery of reference states or other states, identification of evidence sources and assumptions, and level of confidence in portions of the STM based on the evidence. Care should be taken not to confuse dynamics between community phases with transitions between states that cross certain thresholds.

C. Transitions

(1) Transitions (arrows labeled with an initial "T" in part 631, subpart H, section 631.85) describe the biotic or abiotic variables or events, acting independently or in combination, that contribute directly to loss of state resilience and result in shifts between states. Transition is the trajectory of system change between states that will not cease before the establishment of a new state. A transition can be triggered by natural events, such as climatic events or fire; by management actions, such as grazing, burning, fire suppression, recreational use, harvesting, and application of fertilizer and pesticide; or by both.

(2) Because alternative states are persistent and exhibit characteristic feedbacks and primary ecological processes, transitions commonly are irreversible. The trajectories of change between states that alter ecological structure and function require intensive management to reverse. Some transitions occur quickly, such as those that are a result of a fire, flood, hurricane, or other catastrophic event, and others occur over a long period of time. In general, changes that require the use of intensive management and restoration practices to cause a return to a previous state can be considered transitions.

(i) Thresholds

Whereas transitions describe the drivers and mechanisms for shifts between states, thresholds describe the conceptual boundary between two states in which conditions sufficient to modify the structure and function of the ecosystem beyond the limits of ecological resilience result in the formation of alternative states.

(ii) Transition Descriptions

Descriptions of transitions between states emphasize the soil and vegetation indicators that are related to feedbacks and the processes that reduce the resilience of a state. The approximate period of time required for triggers and feedbacks to reduce resilience and for alternative states to develop should be included, if possible.

(iii) Using Dynamic Soil Properties to Determine Risk of Transition

Changes in dynamic soil properties, such as soil organic matter, bulk density, pH, salinity, and aggregate stability, can parallel changes in community phases or transitions between states. These changes may be due to feedbacks between plant cover and dynamic soil properties. Dynamic soil properties can be used to help understand the risk of transition, especially if it is not easily determined by observation of the vegetation.

D. Restoration Pathways

Restoration pathways (arrows labeled with an initial "R" in part 631, subpart H, section 631.85) describe the environmental conditions and ecological feedback mechanisms of a state that has undergone a transition and the management actions required to recover the state. Remediation is included.

(i) Indicators

Indicators of residual ecosystem properties of former states that are present in the alternative state should be identified.

(ii) Residual Properties

The residual ecosystem properties, such as seed sources, species composition, nutrient content, and hydrologic properties, greatly influence the rate and probability of successful restoration and the management required for restoration pathways.

(iii) Management Inputs

Practices that require significant energy inputs, such as chemical or mechanical treatment or planting, prescribed fire, management of wildland fire, fencing, water development, and grazing management, are needed.

E. Community Phases

(1) Community phases (small boxes within the larger state boxes in part 631, subpart H, section 631.85) are unique assemblages of plants and associated dynamic soil properties that can develop over time within a state. Identified community phases generally have important management or ecological significance. For states that attain a steady equilibrium, community phases are equivalent to seral or successional stages that may undergo orderly changes in response to natural disturbance, management, and succession. For states that do not attain equilibrium, community phases may shift from one to another, depending on climate, natural disturbance, and management. Community phases included in a single state may have similar floristic or functional groups, but the dominant or subordinate species may differ. The floristic or functional groups may be quite different, however, if disturbances such as fire cause changes in plant composition and structure. Collectively, the community phases represent the range of variation within a state, including conditions that place the state at risk for transition.

(2) An at-risk community phase is vulnerable to degradation and may be designated within the reference state or in alternative states. It is most vulnerable to exceeding the resilience limits of the state and transitioning to an alternative state. An at-risk community phase is considered to be a stage in a transition process that is reversible if management is changed.

(i) Indicators

Indicators for the phase that help land managers recognize vulnerability to a threshold should be identified and described. For example, presence of large bare areas or small shrubs may indicate that a grassland state is at risk of transitioning to a shrub-dominant state in semiarid and arid ecosystems.

(ii) Management Actions

Management actions that can cause a transition or are needed to avert a transition should be identified. It may be more effective and economical to implement management actions that avert a transition to an alternative state rather than to implement management actions after a transition has taken place.

(iii) Exceptions

Designation of an at-risk community phase is not needed if transitions are equally likely to occur in multiple community phases of a state or if a state has only one community phase. Indicators of an imminent transition and management actions needed to avert a transition should be explicitly described in these cases.

F. Community Pathways

Community pathways (arrows between community phases within a state box in part 631, subpart H, section 631.85) describe the causes of shifts between community phases. Community pathways can include the concepts of episodic plant community changes as well as succession and seral stages. Community pathways in STMs can be used to represent both linear and non-linear plant community changes. In contrast to transitions between alternative states, shifts in community phases are reversible through succession, natural disturbances, short-term climatic variations, and use of practices such as grazing management.

631.5 Role of State-and-Transition Models

A. STMs are conceptual diagrams with accompanying narratives. They illustrate the ecological dynamics of the site, using the states and community phases connected by the transitions and pathways (i.e., ecological processes) (see part 631, subpart A, 631.4). STMs are developed iteratively using published literature, expert knowledge, field reconnaissance and inventory data, existing agency inventory and datasets (e.g., National Resources Inventory, Forest Inventory and Analysis data, agency legacy datasets), newly collected inventory data, and research data. Ideally, STMs are developed using the following types of information:

(1) Inventory data of soil properties and vegetation
(2) Historical reconstructions, using long-term monitoring data, historical records, and photography
(3) Recent monitoring data, including responses to climate variability and management actions
(4) Process-based research and studies that test for the mechanisms causing or constraining ecosystem responses
(5) Expert knowledge, including that of long-term residents and land managers

B. STMs are developed to provide a conceptual understanding of the ecological dynamics that can occur on an ES, the mechanisms of ecosystem change, and the management actions that can be used to influence change.

C. Ecological Dynamics and Management Alternatives

(1) STMs provide information about the ecological dynamics of an ES and can provide management and restoration alternatives. Individual states are separated by thresholds induced by natural or human events. Each state may have at least one community phase that represents the ecosystem dynamics within the limits of the state. The dynamics of a community phase may be driven independently or in combination with natural events such as succession or disturbance or human activities such as land management.
(2) STMs also provide information about plant succession, nonequilibrium dynamics, and functional and structural change in response to natural and human-induced disturbances. STMs describe relationships among vegetation, soils, animals, hydrology, and disturbances such as fire, lack of fire, grazing and browsing, drought, unusually wet periods, insects and disease, and management actions. They describe existing soil-vegetation relationships,

historical vegetation and dynamics as well as restoration outcomes referenced to soils, and ecosystem properties and processes that occur within a state (e.g., cover, soil aggregate stability, erosion rates, net primary production).

631.6 General Guidelines for Developing State-and-Transition Models

When developing STMs—

(1) All states and community phases that are typical and known to occur on an ES should be described. If empirical data are lacking, expert knowledge can be used as a basis for describing states and community phases but the basis should be identified. The long-term goal is to support each state and community phase description with empirical data.

(2) Abandoned cropland and other disturbed sites that are naturally revegetated and planted or seeded grassland and forestland are considered to be alternative states if ecological functions such as the dynamic soil properties and plant community are not fully restored to the former state. These intensively modified ecosystems may transition to a nonreference state.

(3) Plant communities that establish naturally and consist dominantly of nonnative or exotic species are considered to be an alternative state.

(4) Describe “at-risk community” phases, if applicable.

(5) Include explicit reference to dynamic soil properties, applicable rangeland health indicators, and other indicators that provide information on expectations when transitions occur between states.

(6) If the time scales of community pathways or transitions are known or estimated, describe in the STM narratives.

(7) Include all relevant drivers and natural and human-induced disturbances, such as the impact of wildlife and livestock, wildland fire or lack of fire, recreation activities, and management actions.

631.7 Recognizing a State Change Versus a Different Ecological Site

A. Alternative states persist for many decades without evidence of recovery to the reference state. If the soil and physiographic characteristics used to define the ES concept remain unchanged or if historic knowledge provides evidence of the soil and physiographic characteristics, a different ES should not be developed.

B. In most cases, the ecological potential for a site is not permanently altered merely because an alternative state persists. The inability to restore an alternative state to a reference state due to cost or lack of knowledge or technology does not mean that a new ES is needed. Alternative states are recognized and described if the physical or ecological processes on a site are severely altered and cross a threshold.

C. Some ESs have been invaded or planted with nonnative species. These nonnative species may become well established, or naturalized, on a site. They may be dominant on a site or persist in community phases of states that have recovered much of their historic structure and composition. Invasion or introduction of nonnative species is always an alternative state and is not a basis for establishing a new ES.

D. In some areas of the United States, naturalized plant communities have largely replaced native plant communities, including parts of Hawaii, the Caribbean, and the annual grassland of California. These changes occurred before the flora and fauna of the areas were extensively documented; thus, it is impossible to reconstruct the reference state with reliability by use of historic data or by sampling current sites. For these areas, the naturalized plant communities are used to define the reference state for the ESDs; however, approval from the national program leaders of the cooperating agencies must be obtained.

Part 631 – Ecological Site Concept and Description Development

Subpart B – Steps for Ecological Site Differentiation and Development of Ecological Site Descriptions

631.10 Purpose

A. The process and methods for differentiation and description of ecological sites (ESs) involve several steps (part 631, subpart H, 631.80). The steps are grouped as follows:

(1) Preliminary stages
(2) Iterative stages
(3) Final stages

B. The preliminary and iterative stages focus on identification and differentiation of ESs. As abiotic and biotic factors are identified and tested, ES concepts are formulated and differentiated. Development and use of a landform-based ES key is an example. The final stage focuses on the steps needed to complete an ecological site description (ESD). It includes the characterization of community phases, description of ecosystem dynamics associated with the site, and documentation of reference and alternative states.

C. Strong interdisciplinary participation is critical to the ES development process. Ideally, this process is done concurrent with active soil survey projects. Validation of existing ESs for areas in which soil survey activities have been completed and a soil survey manuscript has been published will be conducted concurrently with soil and vegetation specialists and others.

631.11 Preliminary Stages

A. Establish Local Workgroups

To make use of local expert knowledge, an interdisciplinary workgroup should be formed at the local level. People living on and managing the land on a regular basis may have practical knowledge about the ecosystem functions and should be included in this group. For ESs that include both private and public land, the local workgroup should also include personnel from the agency managing the public land. Every effort should be made to involve local experts such as scientists, academics, agency professionals, conservation partners, landowners, and land managers.

B. Define Geographic and Ecological Extent

(1) For current development needs in differentiating the geographic extent of a single ES, the MLRA and LRU or ecological sections and subsections concept will be used.
(2) Some ESs may extend beyond the boundaries of an MLRA. Most MLRAs have small areas (typically tens of square miles or less) that do not fit within the overall description of that particular MLRA but may fit within the description of an adjacent or nearby MLRA (USDA Agriculture Handbook 296, 2006). Generally, immediate adjustment of the MLRA boundary is not required, but any issues should be identified for consideration in the next MLRA update.
(3) When developing a new ES project, it might also be useful to refine the geographic and ecological extent of the study area to a smaller area than an MLRA or LRU. The area of study could be based on certain landforms and parent material within an MLRA or LRU. This narrows the focus and makes it easier to prioritize the analysis of existing information

and literature available. It also reduces the area that needs to be covered during the reconnaissance phase.

Note: Future development of a unified spatial hierarchy for the NRCS, Forest Service, and Environmental Protection Agency will provide an interagency application for establishing the geographic extent of ESs. This unified spatial hierarchy will enable a crosswalk between the respective agency systems and will be used to describe the appropriate geographic extent of sets of related ESs. Adjustments to the boundaries and descriptions of MLRAs and Forest Service ecoregions will be coordinated by interagency teams under the direction of the National interagency workgroup.

C. Gather Background Information

(1) Review ecological literature, data, and local expert knowledge relevant to the area covered by the defined geographic and ecological extent, including information on local climate, geology, soils, and current and historic vegetation. Published literature as well as mapping of the area should be reviewed. Existing ecological and vegetation classifications provide knowledge and information useful for developing ecological site concepts. These classifications, such as potential natural vegetation (PNV) or habitat type classifications, commonly describe ecologically significant plant species (indicator species) or potential plant communities associated with soil moisture, nutrient, and temperature gradients and differences in ecological potential within landscapes. The final ESD supplements the information provided by these classifications.

(2) Types of background information include, but are not limited to—
- (i) Current community ecology (synecological) information.
- (ii) Historical literature documenting the historic vegetation (journals, survey notes, prior investigations, etc.).
- (iii) Past vegetation data.
- (iv) Vegetation and ecological classifications and descriptions.
- (v) Plant species (autecological) information.
- (vi) Natural disturbance regimes.
- (vii) Botanical references.
- (viii) Physical environment.
- (ix) Soil surveys and other land inventories.
- (x) Hydrologic information.
- (xi) Zoological information.
- (xii) Farm, ranch, and research station data and records.
- (xiii) Interviews with longtime residents and land managers to collect information on management actions (grazing, use of fertilizer or herbicides, timber harvesting, haying, etc.), vegetation, disturbances, and other factors.

D. Evaluate Existing Data

(1) Existing data sources provide information previously collected for an area that can be used in the development of ES concepts and descriptions. Assemble and review all of the most useful and relevant data currently available for the defined geographic and ecological extent. The completeness, precision of estimation, accuracy, and methods of measurements of the data may vary. Depending on the source, type, and quality of the data (plot data, data from remote sensing systems, etc.), some may be suitable for—
- (i) Developing the ES concept.
- (ii) Stratifying the landscape for reconnaissance or further sampling.
- (iii) Using as community phase data for developing state-and-transition model (STM).

(iv) Using as interpretations for the descriptions, such as data on wildlife habitat and fuels, etc.

(2) This information may include vegetation, soil, and other physical data collected concurrently from integrated plots or vegetation data only. Vegetation data should be assessed to determine the metrics recorded (e.g., production, cover, density, frequency), the concepts used (e.g., foliar or canopy cover), and the techniques used (e.g., double sampling, harvesting, estimating). Data may differ in how plant species attributes were determined (e.g., species production, species canopy cover, basal cover, vegetation structure) and in the method used to describe the soils (e.g., not a full soil pit description, soil only described to a shallow depth, no actual soil pit description).

(3) Sources include maps, data from remote sensing systems, university research, publications related to ecological sites, and inventory and monitoring plot data from government agencies and nongovernment organizations. Ensure that the soils correlated to the data have been verified. Because of the scale used in soil mapping, data from Web Soil Survey and published soil surveys may not be accurate enough to be used as plot-level data because of the minor components and inclusions. The map unit section should include a description of the minor components and inclusions if they are not delineated on a map (if one exists). A 232 evaluation, or a similar evaluation, at the sampling site is preferred, if possible.

(4) The product from the research should be a rudimentary grouping of climate and elevation zones, parent material, soil properties, and vegetation communities. Literature-based research should be combined with field reconnaissance and resulting data collection covering the extent of the preliminary ES concept. This ensures that the complete range of variation in the area is considered in developing the ES concepts.

E. Conduct Reconnaissance – Low-Intensity Traverses

(1) The ES concepts are formulated in the reconnaissance stage. It is helpful to determine the sampling strategy and design for ES differentiation. Reconnaissance is a traverse of the area to become familiar with the general features of the landscape, such as landforms, vegetation patterns, plant species, surficial geology, and soils. Low-intensity inventory techniques (part 631, subpart H, 631.81) are used to form a rapid characterization of plant communities and associated environmental settings, which is then used to formulate the ES concept. Spend adequate time gathering information, but avoid strategies that significantly increase the time spent at a sampling point.

(2) Traverses are used to observe environmental gradients within, and sometimes outside of, the defined geographic and ecological extent. Many points are subjectively observed, and changes in vegetation or landform patterns associated with environmental factors and disturbance processes are documented. At these points, auger core samples or shallow pits are used to examine the soils and determine the taxonomic family or series classification. Commonly, these points are selected while driving along roadways in the defined geographic and ecological extent and are used to traverse major landforms, landform components, and distinct plant assemblages that may be observed. Previous soil surveys, digital elevation models, and small-scale vegetation maps provide insight into patterns associated with environmental gradients and disturbance processes and help to identify traverse routes during the reconnaissance phase. Reconnaissance may include field checking of pre-existing plot data or developments. Several particular soil or ecological map units established in previous soil surveys or ecological unit inventories may be targeted for observation.

(3) Initial concepts for ESs, states, and community phases are identified through the reconnaissance process. Soil characteristics, landform, slope, aspect, and vegetation community relationships are documented, including GPS coordinates. Digital photographs may also be taken for later examination and use in creating guides. These data are used to

evaluate vegetation-soil-landform relationships, especially if coordinates are projected on existing geospatial coverages.

(4) Local workgroup members can provide valuable information about historical events, biotic-abiotic relationships, common land use practices, and management actions in the area of extent during the reconnaissance process.

(5) It is important to recognize that the primary objective of this phase is to cover the range of environmental gradients within the geographic and ecological extent of the project area and to gain understanding about vegetation, soil, and landscape patterns. Possible sites for medium-intensity sampling should be documented (part 631, subpart B, section 631.12A).

F. Develop STMs

(1) STMs are developed using historical information, local and professional knowledge, and inventory, monitoring, and experimental data. Background information and existing data can be combined with local and professional knowledge from workgroups to develop initial diagrams and narratives for each component of a STM.

(2) STM development typically begins with the identification and description of the natural disturbance regime and the resulting impact on ecological dynamics. Changes in the natural disturbance regime and the resulting impacts are then described. This is followed by description of the community phases associated with the ES concept that were identified during review of existing data and field reconnaissance. Community phases are grouped based on structures (e.g., dominant species, functional groups) that control feedback mechanisms and ecological processes to develop the state concepts. Narratives describing the states, community phases, community pathways, transitions, and restoration pathways are then developed (part 631, subpart A).

(3) As the ES development process continues and new information or data are collected, STMs should be revised as needed.

(i) Formation of STM Development Team.—STMs are best developed as a team consisting of individuals that are knowledgeable about the ecological dynamics of the ES concepts. A team approach ensures, by consensus, that the ES concept is developed with a solid foundation of expert information and research.

(ii) STM Workshops

- After the STM development team has been identified, holding an STM workshop is an efficient way to draft STM diagrams and narratives. It is important not to hold the workshop until essential preplanning and preparation has been done. All of the information previously collected should be assembled and made available at the workshop.
- Once the field reconnaissance, data collection, data analysis, and field testing of the ES concepts and STMs have occurred, another workshop that includes the entire local workgroup should be held. Holding this workshop after some field testing and data collection has occurred helps the group to focus on the specific ecological dynamics of the ES concepts being developed.

G. Develop Sampling Strategy

(1) Initial ES concepts identified during the reconnaissance phase are used to develop the sampling strategy and to design the medium-intensity field inventory to test and refine the concept. Sample locations across the project area include those selected using maps, aerial photography, or applicable Web-based data, and those documented during the reconnaissance phase. It is important to determine and document the data collection strategy that will best capture the spatial and temporal variations of ESs across the landscape. Each sampling site should have relatively uniform landform, topographic position, and vegetation. The specific protocol or combination of protocols used should be sufficient to characterize the soil

diagnostic horizons and their properties (e.g., soil texture, soil texture modifiers, depth to a restrictive layer); landform; topographic features (slope and aspect); plant species; variations in plant species production, cover, and structure; and soil surface properties.

(2) The sampling strategy selected depends on whether soil surveys have been completed for the project area or not. If soil surveys have been completed and ESDs are being developed or revised, sampling can be stratified by soil map unit component. If terrestrial ecological unit inventories have been completed on land managed by the Forest Service, sampling is stratified by ecological unit. If soil surveys or ecological unit inventories have not been completed for the area or are being completed concurrently with the ESD development, sampling is stratified by elevation, landform, slope, aspect, geologic parent material, and vegetation patterns using information gathered during the reconnaissance phase, aerial photography, and spatial data. Aerial photography and data from remote sensing systems can be useful for stratifying the landscape prior to or during field sampling.

H. Select Sampling Methods

Select sampling methods best suited for meeting the ES criteria, descriptive attributes, and end user interpretations chosen for the ES concept development and description. Vegetation plots and soil pedon descriptions comprise an integrated plot. Sampling methods should be described during the ES concept development process, included in project plans, and designed with consideration of data analysis. Some common sampling methods, but not all, used for different land types are listed in part 631, subpart C. Data from remote sensing systems, such as LIDAR, LandSat, and others, must be evaluated and tested for accuracy on the ground.

(i) Detailed descriptions of appropriate plot size, plot shape, and vegetation sampling methods are in existing handbooks and technical guides and references, including the following:

- Sampling Vegetation Attributes (Cooperative Extension Service; USDA, Forest Service; Natural Resources Conservation Service, Grazing Land Technology Institute; USDI, Bureau of Land Management; 1996; revised in 1997 and 1999)
- Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems (Herrick and others, 2009)
- Ecological Site Inventory; USDI, Bureau of Land Management Inventory and Monitoring Technical Reference 1734-7 (Habich, 2001)
- National Vegetation Classification Standard, Version 2 (Federal Geographic Data Committee, 2008)
- Terrestrial Ecological Unit Inventory Technical Guide (Winthers and others, 2005)
- Existing Vegetation Classification and Mapping Technical Guide, Version 1.1 (USDA, Forest Service, 2005)
- National Range and Pasture Handbook, chapter 4 (USDA, Natural Resources Conservation Service, 1997; revision in 2003)
- National Forestry Handbook (USDA, Natural Resources Conservation Service, 2001)
- National Resources Inventory (NRI) Grazing Land On-Site Study Handbook of Instructions (2013)

(ii) Methods for soil data collection are in the following:

- Field Book for Describing and Sampling Soils, Version 3.0 (Schoeneberger and others, 2012)
- Soil Survey Manual (USDA, Soil Survey Division Staff, 1993)
- National Soil Survey Handbook (USDA, Natural Resources Conservation Service, 1996)

- Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys, Second Edition (USDA, Soil Survey Staff, 1999).

(iii) Determining Number of Samples and Locations

- The number of samples necessary should be assessed based on complexity, amount of existing inventory information available, and staff and funding available. Different tools are available to assist in determining the number of sample locations (plots) or the number of samples per plot needed to capture the most information and variation.
- The sampling locations should be determined based on the ES concepts and draft STM. Sampling locations should adequately represent the community phase. Transitional zones, unique minor soil components, and ecotones should be avoided to ensure that data reflect only the modal concepts for specific ESs.

631.12 Iterative Stages

The iterative stages implement the sampling strategy and methods identified in the preliminary stages. They involve initial field sampling, analysis of data, defining ES characteristics, field testing of differentiations, and modification as needed. Differentiation of ESs and associated community phases in reference or alternative states consists essentially of testing a working hypothesis. The differentiation can be refined or augmented as new information or knowledge becomes available. Medium-intensity sampling is required to formalize the ES concept.

(1) Data Collection – Medium-Intensity Sampling

(i) Medium-intensity sampling is intended to be a rapid process, focusing on sampling the environmental range associated with initial ES concepts (part 631, subpart H, 631.81). Data are collected to determine relationships among climate, vegetation, soil properties, landforms, and relief. Relationships among disturbance processes, vegetation composition and structure, and dynamic soil properties can also be considered.

(ii) Collect field data according to the sampling strategy, using sampling methods identified in part 631, subpart C. Ideally, soil scientists, range management specialists, vegetation ecologists, biologists, and other specialists (as needed) work together as an interdisciplinary team.

(iii) The following data typically are used to validate the ES concept:

- Full species list for each described community phase
- Canopy cover, by species; growth form; and vertical strata
- Production by species (e.g., dry-weight rank and comparative yield, site index and culmination of mean annual increment (CMAI))
- Overstory tree basal area by species
- Vegetation vertical structure
- Inherent soil properties
- Topography (landform, slope, aspect, elevation, and slope shape)
- Ground surface cover (bare ground, basal vegetation cover, litter, gravel, rock, and biological soil crust (includes mosses, lichens, and cyanobacteria))
- Photographs that capture landscape setting and dominant vegetation components
- Canopy gaps
- Basal gaps
- Responses to management actions

(iv) Integrated sample plots with relatively homogenous vegetation, landform, and topographic position, reflecting similar environments, are located. Data are collected within fixed area plots (e.g., 20 x 20 meters, 1/10 acre) so that soil properties, site factors, and plant species can be related to one another. Partial soil profile descriptions are used to identify key soil characteristics. These soil characteristics can be verified by examining soil auger cores or shallow soil pits. Ecologically important soil attributes are observed (e.g., soil horizons, soil structure, rock fragments, depth to argillic layer, depth to root-restrictive layer) and samples of horizons are gathered for possible laboratory analysis. This information is used to test and refine initial ES concepts by identifying relationships among key soil properties, site factors, and indicator plant species that differentiate sites.

(v) Ocular estimation coupled with quantitative calibration in medium-intensity sampling is important to establish consistency and to minimize variability among examiners. Variability associated with ocular estimates commonly is negated by the larger sample size used in medium-intensity sampling. Ocular estimation is calibrated at the start of an inventory project and periodically throughout the field season and the duration of the project.

(2) Data Analysis

A variety of analytical methods and tools are used to differentiate sites based on biotic and abiotic factors. Rather than specifying use of one standard analysis method or tool, it is best to select the method or methods that will meet the objectives for completing the differentiation. Methods used to differentiate ESs may be different than those used to identify community phases for describing ES dynamics. Analysis methods include gradient analysis, ordination programs, and cluster analysis that result in plant association (e.g., constancy/cover) tables. References for classification analysis include those by Mueller-Dombois and Ellenberg (1974), Gauch (1982), Ludwig and Reynolds (1988), Kent and Coker (1992), Jongman et al. (1995), and Peck (2010).

(3) Define Differentiating Characteristics

(i) Differentiating characteristics of ESs are determined either by synthesizing existing information or by more objective analyses of abiotic and biotic data collected during the development process of the ES concept. The central concepts and range of variation for the ES are described (i.e., the range of soil and plant community properties). Characteristics include a summary of soil properties or soil map unit components to which the site is provisionally correlated, site characteristics (i.e., slope, aspect, landform, elevation, and climate), and vegetation composition of associated community phases. This step is based on more than one integrated plot sample, represents a modal concept, and does not include entire data ranges.

(ii) When developing ecological site concepts, the following criteria are recommended to differentiate one ecological site from another:

- Significant differences in species or ecologically significant species groups in the reference community phase
- Significant differences in the relative proportion of species or species groups in the reference community phase
- Significant differences in the total annual production of the reference community phase
- Soil factor differences that determine plant production and composition, hydrology of a site, or the ecological processes of the water cycle, nutrient cycle, and energy flow

(iii) Initial guidelines for determining significant differences in herbaceous communities include, but are not limited to—

- Presence (or absence) of one or more species that make up 10 percent or more of the reference community phase, by air-dry weight.

- 20 percent (absolute) change in composition, by air-dry weight, between any two species in the reference community phase.
- Difference in average annual herbaceous production:
  - 50 percent at 200-500 lbs/ac.
  - 30 percent at 500-1,000 lbs/ac.
  - 20 percent at 1,000 lbs/ac or more.
- Any differences included in guidelines above, either singly or in combination, significant enough to indicate a different use potential or to require different management.

(iv) The above guidelines are intended for initial comparisons and are not definitive for site differentiation or combination.

(4) Field Test of ES Concept

Test the differentiating characteristics in the field to validate the ES concepts. The differentiation process is complete when the ES concept works well in the field with a variety of end users. Final soil-ES correlation and field review by soil scientists and vegetation specialists (ecologists or range management specialists) can occur during this step.

631.13 Final Stages

A. Data Collection – High-Intensity Sampling

(1) High-intensity sampling provides additional detailed information for a few modal sites once the ES concept is established (part 631, subpart H, 631.81). Modal sites are those that adequately represent the properties of an ES.

(2) The sample sites should be uniform in vegetation, soils, and landform and large enough to include the complete vegetation plot and soil pit. Obvious ecotones or sites that are not uniform are not suitable for sampling. Soil and vegetation specialists should jointly conduct the detailed characterization. Intensive soil characterizations are combined with high-intensity measurements of vegetation. The number of vegetation and soil characterizations that represent the concept of a reference state may vary, but a minimum number of characterizations should be included in the project plan. Minimum sampling criteria for alternative states and community phases should also be defined in the work plan. The characterizations should represent the geographic extent, environmental range, disturbance regimes, and temporal variability (e.g., within year, yearly, decadal) of the ES.

(3) The resulting values and associated ranges derived from high-intensity sampling data provide quantitative benchmarks to aid in the documentation of states and community phases in ESDs. See part 631, subpart F, for required state and community phase data elements of an ESD. These quantitative benchmarks can support development of the rangeland health reference sheet and other management interpretations.

B. Type Location Data

Once a number of sample sites, areas, or plots have been observed and concepts of states are firmly established, several areas may be chosen as modal types to provide quantitative values for communicating state concepts. For each ES, a minimum of three reference type locations should be described at the high-intensity sampling characterization level. In many cases, however, more than three are needed to ensure that the ES concepts and range of variability have been characterized. If a type location of the reference state no longer exists or cannot be found, another typical community phase from an alternative state is chosen in order to meet minimum sampling requirements.

C. Develop Management Interpretations

Management interpretations are based on the vegetation, soil, and environmental characteristics of the ES that are relevant to land use and resource management decisions. Interpretations may be based on vegetation attributes, soil properties, successional relationships between community phases, or expected response to disturbance regimes or management actions. Additional information may be obtained by monitoring or observing vegetation, soil properties, wildlife habitat, and response of animals to management or disturbance. This information can be incorporated into the ESD to validate and quantify assumptions about ecosystem properties and dynamics associated with STMs.

D. Correlation

Correlation ensures consistency in the identification, delineation, description, and interpretation of ESs. It requires interdisciplinary and interagency input and a formal review and quality control process. The correlation process is described in part 640, subpart E, section 640.45.

Part 631 – Ecological Site Concept and Description Development

Subpart C – Sampling Methods

631.20 Reserved

Part 631 – Ecological Site Concept and Description Development

Subpart D – Ecological Site Naming Protocol

631.30 Purpose

A. Ecological site (ES) names will be based on concepts defined in this handbook (part 631, subpart A). Each ES within a major land resource area (MLRA) or land resource unit (LRU) must have a unique ID and name. The ES name includes a short common name and a plant community name.

B. The ES common name is based on applicable abiotic site characteristics and may include a vegetation component based on the ES reference community phase. The ES common name must use the minimum number of descriptors necessary to adequately characterize and differentiate one ES from another within an MLRA or a LRU. The ES common name should be short, so it can be easily understood by the general public and communicated to land managers through the conservation planning process. Specific plant names are not acceptable for the ES common name; they are included in the ES plant community name. All descriptors must have a single definition, as found in references in this part or as provided in part 631, subpart F, section 631.51.

C. The ES plant community name describes the ES reference community phase and may be composed of as many as three strata (tree, shrub, and herb) and as many as two plant species names for each stratum, as applicable. The scientific plant names will be followed by the common names, and plant names in the USDA PLANTS database will be used.

631.31 Ecological Site Common Name

A. Each ES common name within a LRU or an MLRA must be unique. It will be based on at least one abiotic site characteristic category, as given in A through E of this part, but include as few descriptors as possible to characterize and differentiate each ES. A landform, landscape, or hillslope typically should be used as a primary descriptor. Additional descriptors are used to differentiate ESs on the same landform, landscape, or hillslope. The descriptors are defined in the order in which they commonly occur in legacy and current databases. A vegetation component (part 631, subpart D, section 631.31G) based on the reference community phase of the ES may be added as the last descriptor in the common name, if needed to differentiate an ES. Naming terms will be concatenated to form the ES common name. Examples of ES names are given in part 631, subpart H, section 631.82, and flowcharts outlining the naming process are given in part 631, subpart H, section 631.83.

B. Soil Characteristic Descriptors That Differentiate Similar ESs (as Many as Three, if Needed).—For example, a Clayey Upland ES on shallow soils is named “Shallow Clayey Upland” and a Clayey Upland ES on deep soils might be named “Clayey Upland.” These terms are specific to soil characteristics as described in chapter 3 of the Soil Survey Manual (SSM) and Title 430, National Soil Survey Handbook (NSSH), Part 618, and are used for consistency. In the following, relevant NSSH and SSM references are given in parentheses.

(1) Soil depth (e.g., shallow, deep) (SSM, Chapter 3, root restricting depth)
(2) Rock fragment classes (e.g., cobbly, bouldery, gravelly, stony) (430-NSSH, Part 618, Subpart A, Section 618.9; SSM, Table 3-11)
(3) Soil temperature regime (e.g., mesic, frigid, thermic) (430-NSSH, Part 618, Subpart A, Section 618.63, “Taxonomic family temperature class”)
(4) Soil chemical properties (SSM, Chapter 3, selected chemical properties)
  (i) Reaction class (e.g., alkaline, acidic, standard soil reaction class)
  (ii) Salinity and sodicity (e.g. saline, sodic).

(5) Soil moisture status (e.g., dry, moist, wet) (SSM, Chapter 3; soil water, internal classes) or water table hydrology (e.g., seasonally wet, permanently wet, perched water table).
(6) Drainage class—subaqueous, very poorly drained, poorly drained, somewhat poorly drained, well drained, moderately well drained, excessively well drained (430-NSSH, Part 618, Subpart A, Section 618.16; SSM, Chapter 3, natural drainage classes).

C. Soil Texture or Parent Material Origin Terms to Differentiate ESs

(1) Soil texture terms (part 631, subpart H, section 631.84) (e.g., sandy, loamy, clayey, silty, specific soil texture classes). Commonly, general broad groups or classes of texture rather than specific texture classes are used. Surface texture rather than subsurface texture generally will be used to define a texture name, but it may be necessary to account for subsurface texture differences to differentiate sites that have the same surface texture.
(2) For nonmineral, fragmental, or cemented soil material, use a generalized term in lieu of texture (part 631, subpart H, section 631.84).
(3) General soil texture groups may be modified with generalized compositional modifier terms to provide information about the nature of the material. Both a modifier and a general texture group may be used as a single term (part 631, subpart H, section 631.84).
(4) Soil parent material (use only one, if needed) (SSM, chapter 3, parent material).
  (i) Geologic material, kind, or origin (e.g., limestone, sandstone, shale, gneiss, schist, slate, chert, basalt, mixed geology)
  (ii) Soil deposits and parent material moved by water, wind, glaciers, or gravity (e.g., alluvium, colluvium, volcanic ash, lava, loess)
  (iii) Organic material accumulations (e.g., sedimentary peat, moss peat, woody peat)

D. Other ES Descriptors (as Many as Two, if Needed)

(1) Flooding frequency class—nonflooded, rarely flooded, frequently flooded, or very frequently flooded (modified from 430-NSSH, Part 618, Subpart A, Section 618.26)
(2) Wetland class, according to the hydrogeomorphic classification of wetlands (e.g., riverine, fringe, depressional, slope) (Brinson, 1980)
(3) Stream type or fluvial term for geomorphic channels, using appropriate channel descriptions that occur on the ES (e.g., Rosgen Classification, Channel Evolution Model Stage)
(4) Slope class/complexity (e.g., nearly level, hilly, steep, very steep, undulating) (SSM, chapter 3, soil slope, table 3-1)
(5) Slope shape; e.g., concave, convex, or linear (SSM, Chapter 3, soil slope, figure 3-2)
(6) Aspect (e.g., exposed, protected, north, south) (especially applicable in mountainous/hilly areas)

E. Landscape, landform, or hillslope description (only one, if needed). Refer to 430-NSSH, Part 629, Subpart A, Section 629.02; 430-NSSH, Part 629, Subpart B, Exhibit 629-1; and Field Book for Describing and Sampling Soils (Schoeneberger and others, 2002). Note that some terms, but not all, apply to both landscapes and landforms.

(1) Landscape terms (e.g., upland, breaks, basins, lowlands, mountains, plateaus)
(2) Landform terms (e.g., hills, canyons, basin floors, plateaus, cliffs, terraces, ridges, depressions, flood plains, moraines)
(3) Hillslope position terms (e.g., backslopes, summits, footslopes, shoulders)

F. Geographical or climate zones (only one, if needed) (e.g., elevation zones, precipitation zones, precipitation-evaporation zones, temperature zones). When establishing these zones, current data will be used.

G. General type of vegetation representing the reference community phase (only one) (e.g., woodland, savannah, grassland, tall grass prairie, mixed hardwood forest, deciduous forest) (National Vegetation Classification System, Federal Geographic Data Committee, 2011).

631.32 Ecological Site Plant Community Name

An ES plant community name will be based on—

(1) Scientific and common plant names as in USDA PLANTS database.
(2) Plant names for as many as three strata can be used (tree, shrub, and herbaceous). Each stratum can have two relevant dominant or ecologically significant indicator plant species representing the reference community phase.
(3) Among the plant species chosen for the name, those in the same stratum or growth form are separated by a hyphen (-) and those in different strata are separated by a slash (/). Plant species in the uppermost stratum are listed first, and those in lower strata follow, successively. The order of plant species names within a stratum or growth form generally reflects decreasing levels of dominance, constancy, or another diagnostic value.

631.33 Ecological Site ID Alphanumeric Coding

Ecological sites will be assigned an eight-character alphanumeric ID as follows:

(1) The first element of the ID is a three-digit number and a single capital letter that designates the MLRA (default is "X" for MLRAs that do not include a letter). Examples are 102A and 112X. Leading zeros will be used for MLRAs that have less than three digits (e.g., 002).
(2) The second element is a single capital letter (A to Z) that designates the LRU (default is "Y" if an LRU is not identified or used).
(3) The final element is a unique three-digit number, assigned in ascending numerical order (001 to 999).
(4) Only one ID is given to an ES in an LRU or MLRA. In some cases, an ES and soil map unit components in an ES cross LRU or MLRA boundaries. In these cases, the LRU or MLRA that has the most acres of a given ES will be used for the ID.
(5) Example ES ID Alphanumeric Coding
    (i) 123XY001—MLRA 123, X (no MLRA letter), Y (no LRU), 001 (unique site number)
    (ii) 004CA010—MLRA 004, C (MLRA letter), A (LRU letter), 010 (unique site number)

631.34 State or Community Phase Name

A. An ES may consist of one or more states. One state will be defined as the reference state. If there are multiple community phases in the reference state, one phase will be designated the reference community phase. Each state and community phase will be assigned a name that matches the STM diagram. Refer to part 631, subpart A, for guidance on developing a STM. Names for alternative states will reflect the dominant process that caused the transition, such as eroded state or invaded state, etc. Common plant names or land types may be added to further differentiate alternative states, such as eroded grassland or cheatgrass-invaded shrub steppe.

B. Community phases will be named based on representative plant species. If alternative naming conventions are used, the community phases that are supported by data should be crosswalked to vegetation types in the National Vegetation Classification System, Version 2 (Federal Geographic Data Committee, 2008).

(1) Community phase names will include both scientific and common plant names of the relevant dominant or ecologically significant indicator species that represent each community phase.

STM diagrams, however, will display only the common plant name or the scientific plant name for each community phase, not both. The relevant dominant or ecologically significant indicator species used to name a community phase must be included in tabular plant species summaries of the community phase and include at least one plant species from the dominant stratum of the plant community.

(2) Names in the USDA PLANTS database will be used. Plant species within the same stratum or growth form are separated by a hyphen (-), and those in different strata are separated by a slash (/). Plant species in the uppermost stratum are listed first, and those in lower strata follow, successively. As many as three strata and two plant species in each can be listed. The order of plant species within a stratum or growth form generally reflects decreasing levels of dominance, constancy, or another diagnostic value.

(3) Example Community Phase Names

(i) *Pascopyrum smithii-Nassella viridula* (Western wheatgrass-green needlegrass)

(ii) *Abies concolor-Pinus jeffreyi/Arctostaphylos patula-Chrysolepis sempervirens* (white fir-Jeffrey pine/greenleaf manzanita-bush chinquapin)

(iii) Juniperus virginiana/Bromus inermis-*Carex scoparia* (Eastern redcedar/smooth brome-broomsedge)

631.35 Labeling in State-and-Transition Model (STM) Diagrams

Formatting, labeling, naming, and numbering STMs will be completed as follows (see part 631, subpart H, section 631.85):

(1) Diagrams will be labeled with a header that includes the ES common name and ID to ensure that it matches the correct ES (e.g., Loamy Upland, 123XY001).

(2) Bold-outlined exterior boxes will represent a state, and interior boxes will represent community phases within the state. Bold lines represent thresholds.

(3) All states will be identified with the integer number (1, 2, 3...), and the state name in the STM will match the state name for the ES. Reference states will be assigned the number "1."

(4) All community phases will be identified by a decimal number (1.1, 1.2, 1.3…). The first value represents the state, and the second value (decimal) identifies the community phase within the state.

(5) Either common or scientific plant names will be used in the community phase names, not both.

(6) Arrows between community phase pathways identify feedback mechanisms. Arrows are labeled with the number of the originating community phase followed by a capital letter (e.g., 1.1A). A separate sequential letter will be assigned to each arrow departing from any one community phase.

Example: The symbol "1.1A" indicates that the action, or arrow, originated from community phase 1.1. The letter A indicates that it is the first arrow from that community phase. A second arrow from the same community phase is labeled 1.1B.

(7) Transitions from one state to another are identified by an arrow and a sequential number-letter combination. The label includes a "T," a number that represents the state of origin departed from, and a sequential capital letter for each departure point from the state. For example, T1A is a transition that originates from state 1 and is the first labeled departure. A second transition from state 1 would be labeled T1B.

(8) Restorations, or management actions that lead to re-establishment of a state that has undergone transition, are identified with an arrow and a sequential number-letter combination. The label includes an "R," a number that represents the state of origin, and a sequential capital letter for each departure point from the state. For example, R2A is a

restoration that originates from state 2 and is the pathway to the reference state or the state closest to the reference to which a restoration can be made. A second restoration arrow from state 2 would be labeled R2B.

(9) A simple legend may be developed, but it must be kept separate from the STM diagram and labeled with the ES name and ID to ensure that it matches the correct ES. Legends should briefly describe actions represented by arrows and specific actions and triggers of change. Arrows in the diagram may not include acronyms representing conservation practices, best management actions, triggers, etc. Detailed descriptions of these will be included in applicable restoration, transition, or community pathway narratives.

Part 631 – Ecological Site Concept and Description Development

Subpart E – Ecological Site Keys

631.40 Purpose

A. An ecological site (ES) key is an important tool for accurate identification of ESs and for differentiating one ES from another. It is developed along with site concepts to assist in ES classification. As ES concepts are tested and accepted and ESs are correlated to soil map unit components, the ES key is finalized. The ES key must be kept current as concepts are changed. The key also aides in ES data organization and analyses.

B. An ES key is based on specific soil, topography, climate, hydrologic, and other abiotic characteristics that differentiate ESs and facilitate identification of individual ESs across the landscape. Since an ES may have a variety of states and community phases, plant species will not be used in an ES key. In certain cases, indicator or dominant plant species that are persistent features of an ES can be footnoted as typical for the site and used on a local basis to aide in ES site identification. These species are not part of an ES key, however, because they may not be present or may have been removed. The ES key is based on abiotic factors because these factors are relatively stable and unlikely to change as a result of management. Ideally, ES concepts are developed for an entire major land resource area (MLRA) or a subunit, such as a land resource unit (LRU); therefore, similar or associated ESs can easily be keyed, using appropriate abiotic factors. The ES key should be developed for the MLRA or subunit in most instances; however, some MLRAs may be very similar and therefore one ES key could be developed that covers more than one MLRA or subunit. An ES key can be crosswalked to ecological sections or subsections if the National Hierarchical Framework of Ecological Units developed by the Forest Service is used.

631.41 Abiotic Factors Used in Ecological Site Keys

Examples of abiotic factors used in ES keys to differentiate one ES from another:

(1) Soil (soil properties such as texture, restricting layers, depth, water table, pH, salinity, and parent material, etc.)
(2) Topography (landform, slope, aspect, slope position, elevation, etc.) (part 631, subpart H, section 631.86)
(3) Hydrology (groundwater, runoff, flooding, ponding, frequency, duration, timing, etc.)
(4) Climate (precipitation, temperature, growing season, etc.)

631.42 Ecological Site Key Types

A. Depending on landscape complexity, an ES key may be constructed using a dichotomous format (true-false, yes-no, agree-disagree, wet-dry, etc.), flow chart, or matrix or by using diagnostic characteristics. Part 631, subpart H, sections 631.87 and 631.88 illustrate various formats that may be used to develop an ES key. ES keys are based on ES concepts that have been tested, confirmed, and at least preliminarily correlated to soils.

B. An ES key can be developed using specialized classification terminology or commonly understood terminology (part 631, subpart H, section 631.87). Specialized terminology could include soil properties, topographic factors, and other abiotic factors used by specialists for identification and differentiation of ESs. This kind of key typically is developed for an MLRA or smaller area.

C. An ES key developed with common terms may be used by personnel and the general public to identify ESs in the field. This kind of ES key may be developed for an entire state or for multiple MLRAs.

Part 631 – Ecological Site Concept and Description Development

Subpart F – Contents of Ecological Site Descriptions

631.50 Purpose and Background Information

A. This subpart describes each element of an ecological site description (ESD) and includes the requirements for each. An ESD represents the modal concept for an ecological site (ES). The modal concept does not include the extremes or total range of values that may exist for any given element. The modal concept is developed using a variety of data and information sources (part 631, subpart A, section 631.2C).

B. Sources used to support the ESD and shown in the appropriate ESD section may include site specific experimental data and other experimental data, models, specific references, general ecological research and literature, expert opinion and experience, inventory or monitoring data, historical documentation, and other pertinent data or information. See part 631, subpart F, section 631.58C, for details on inventory data references; part 631, subpart F, section 631.58G for documenting other kinds of data and information used to support information in an ESD; and part 631, subpart F, section 631.56D(2) for citation documentation for community phases.

631.51 General Information Section

A. Ecological Site Name

(1) See part 631, subpart D, for guidance on ES naming conventions. The ES name includes a descriptive abiotic common name and a biotic plant community name that includes both the scientific and common plant species names.

(2) The following is an example of an ES name using the naming convention detailed in part 631, subpart D:

Clay Loam Upland 13-17" p.z. (precipitation zone)

Artemisia tridentata ssp. wyomingensis/Pascopyrum smithii-Bouteloua gracilis (Wyoming big sagebrush/western wheatgrass-blue grama)

B. Ecological Site ID

ESs will be assigned an eight-character alphanumeric ID (e.g., 123XY987) as per guidance in part 631, subpart D.

C. Hierarchical Framework Relationships

List the name (and code, if applicable) of the higher land or ecological group geographic framework element. Approved spatial classification systems include the major land resource area (MLRA) and land resource unit (LRU) concept (NRCS, 2006) and the ecological subregion, section, and subsection concept (McNab and others, 2007) of the National Hierarchical Framework of Ecological Units (Cleland and others, 1997). An additional option is the Level-III and Level-IV ecoregions system (Omernik, 1987, and EPA, 2011). If this system is used, a crosswalk to one of the other approved systems is required.

D. Ecological Site Concept

(1) See part 6312, subpart A, section 631.2, for guidance on defining the ES concept. Describe microclimate, geology, topography (elevation, slope, aspect, and landform position), hydrology, and soil characteristics. Collectively, these factors determine soil temperature,

moisture, and nutrient regimes that affect vegetation patterns and ecological processes associated with a particular ES. These controlling factors become the basis for defining the physical characteristics of an ES and predicting the recurring pattern of an ES across the landscape.

(2) Summarize the overall ES concept and how it is differentiated from that of other ESs. The information includes that which specifically characterizes the ES from another (i.e., what was used as the basis for ES delineation) and the literature and research data used to support reference state and community phase descriptions.

631.52 Physiographic Features Section

Describe the physiographic features of the ES, such as landscape position, landform, geology (lithology and stratigraphy), aspect, site elevation, slope, water table, flooding, ponding, and runoff potential. Use standard physiographic terminology and definitions from Title 430, National Soil Survey Handbook (USDA, 1996) and Field Book for Describing and Sampling Soils (Schoeneberger and others, 2012). Document the capability of the site to generate runoff or receive runoff from other sites, or both.

631.53 Climatic Features Section

Describe the climatic features that typify the ES and relate to its potential, and characterize the dynamics of the ES, including storm intensity, frequency of catastrophic storm events, and drought cycles. Climatic features include frost-free period, freeze-free period, mean annual precipitation, monthly moisture and temperature distribution, and location of climate stations. If climate data are available, include information (averages and ranges) from throughout the entire area of extent for the ES. Many ESs occur in areas for which appropriate climate station data are not available. Climate data may be extrapolated using climate models (e.g., PRISM). Distinguish between information that is supported by weather station data and information that is extrapolated from existing weather station data (e.g., PRISM data). Include a link to local weather stations. Indicate how close the weather station is to the representative ecological site, and describe any microclimate concerns because of the location of the weather station.

631.54 Influencing Water Features Section

Describe water features of the ES or adjacent wetland or riparian water regimes that influence the vegetation or management of the site and make the site distinctive from other ESs. Example water features include subsurface waterflow, seasonal groundwater levels, overland flow, streams, springs, wetland, and depressions. Use terminology associated with Wetland Classification (Cowardin and others, 1979), Rosgen Stream Classification (Rosgen, 1996), or another established water- or hydrology-related classification system.

631.55 Representative Soil Features Section

A. Describe inherent soil properties that make an ES distinctive from others. Differentiate between inherent, attainable, and actual values for the selected properties, as appropriate. Give special attention to properties that significantly affect plant-soil-water relationships and hydrology. Representative soil features include parent material, surface and subsurface texture, surface and subsurface fragments, drainage class, hydrologic conductivity (permeability class), depth to diagnostic horizons, soil depth, electrical conductivity, sodium adsorption ratio, calcium carbonate equivalent, soil reaction (pH), and available water capacity.

B. Describe the soil and hydrologic indicators that characterize the reference community phase. For example, describe the extent of rills and gullies, extent of waterflow patterns across the soil surface during overland flow, amount and pattern of pedestals and terracettes caused by wind or water, size and frequency of wind-scoured areas, susceptibility of the site to compaction, expected nature of the surface organic layer, and expected physical and chemical crusts. For land classified as rangeland, describe the hydrologic rangeland health indicators.

C. A list of soil map unit components that are correlated to the ES may be included.

631.56 States and Community Phase Section

A. Ecological Dynamics of the Ecological Site

Describe the general ecological dynamics of the ES. Describe states based on growth form, lifeform, or functional group. If appropriate, identify successional or seral stages. Describe the changes that are expected as a result of variation in weather or climate and the possible effect on the dynamics of the ES. Identify the disturbances and the frequency and intensity of the disturbances affecting site development (fire regime, fire dependent or not, native herbivory, and other disturbances). Other general information regarding the dynamics of the site should be described, such as human management impacts. Identify assumptions used in describing ecological dynamics. Cite scientific literature and experts consulted in the “Other References” section of the ESD.

B. State-and-Transition Diagram

(1) Include a diagram of the state-and-transition model (STM) for the ES. It should include states, community phases, community pathways, transitions, and restoration pathways. Label all parts of the STM. See part 631, subpart A, for further guidance on components of STMs and part 631, subpart D, for guidance on labeling STMs.

(2) The assumptions, methods, and supporting data or literature used in defining alternative states should be documented, peer reviewed, and further developed, if needed. These include careful description of the properties of reference and alternative states, description of the ecological mechanisms causing transitions and precluding recovery of the reference state or other states, identification of evidence sources and assumptions, and level of confidence in portions of the STM as a result of the evidence.

C. Photographs

One or more photographs will be included for each state and community phase described in an STM. Landscape photographs are desirable. Consider including other photographs that capture unique properties of the ES, such as vegetative structure and soil surface. Photographs should convey characteristics of the natural landscape setting and should not include people, livestock, or vehicles, etc. If reference to scale is important, include a tool such as a range pole in the photograph.

D. Reference State

(1) Narratives.—Describe the reference community phase and state identified in the STM diagram. Document whether the community phases are supported by empirical data or are provisional communities. Describe the rationale for separating community phases based on ecological processes. At a minimum, describe the dynamics of the community phase and the causes or triggers of community pathways and transitions. Identify and describe the thresholds between the reference state and other states. Provide information on the water cycle, nutrient cycle, and energy flow and an evaluation of the function of these ecological processes. Explain causes for shifts or changes and how they will affect ecological functions.

Describe changes in hydrologic and erosion characteristics of the ES as a result of shifts. Include descriptions of elements such as amount and distribution of expected litter, patterns of plant mortality, and expected or measured changes in dynamic soil properties.

(2) Supporting Community Phase Documentation.—For the reference community phase and all other community phases supported by empirical data, document the number and type of plots and the methods used to gather data. For community phases not supported by quantitative data, document the source of information (e.g., historical data, local expertise, photographs, notes) used as the basis for describing the phase. If possible, identify the sampling site locations used to describe the community phases.

(3) Community Phase Composition.—For the reference community phase and all other data-supported community phases, a detailed plant species list will be incorporated into plant association or constancy cover tables. For community phases that are dominantly tree species, understory plants will be included. Both common and scientific names and plant symbols will be included for all species. Scientific names and symbols will be obtained from the USDA PLANTS database (USDA, 1995). If plant groups are used, they must identify whether individual species within the group have a production limitation or whether a single species is not limited and can account for most of the production of the plant group. Numerous items must be considered when placing plant species into functional groups for the purpose of ESD development, including kind, structure, and size of plant; rooting structure; lifecycle; production; niche; and photosynthetic pathway.

Examples of plant groups include cool-season grasses, warm-season tall grasses, warm-season mid-grasses, annual grasses, perennial forbs, biennial forbs, annual forbs, shrubs, deciduous trees, evergreen trees, and cacti. Professionals describing sites may identify additional attributes and relationships to define useful groupings. For example, two or more groups of warm-season mid-grasses may be described because different niches exist, such as structure, elevation, and climatic adaptations, which in turn may result in differences in production.

(4) Species Productivity.—The type of species production data to collect for defining and describing an ES will be determined at the project planning level, based on the species that occur in the community phase.

(i) For the reference community phase and all other data-supported community phases that are *dominantly herbaceous or shrub species*, show the low to high range of production by species (designating the range of variability for each species across the extent of the community phase). It should be expressed in pounds per acre of air-dry weight. If an estimate of tree species production is desirable and feasible, site productivity is expressed as site index and culmination of the mean annual increment (CMAI).

(ii) For the reference community phase and all other data-supported community phases that are *dominantly tree species*, show the range of site productivity expressed as site index and CMAI. If an estimate of understory production is desirable and feasible, show the low to high range of understory production by species (designating the range of variability for each species across the extent of the community phase). It should be expressed in pounds per acre of air-dry weight. If desired (likely for carbon sequestration), the total biomass of trees may also be estimated.

(iii) For the reference community phase and all other data-supported community phases that *are not dominantly herbaceous, shrub, or tree species* (e.g., mosses, lichens, bare ground, open water, rocks), the type of production data needed to define and describe the ES will be determined during project planning.

(5) Total Annual Production

(i) For the reference community phase and all other data-supported community phases that are *dominantly herbaceous or shrub species*, show the total annual production by growth form, expressed in pounds per acre of air-dry weight, and the fluctuations expected during favorable, normal, and unfavorable years (weather variability, primarily a result of timing, amount of precipitation, and temperature). If an estimate of total production for primary tree species is desirable and feasible, site productivity is expressed as site index and CMAI.

(ii) When the reference community phase or any other data-supported community phase is *dominantly tree species*, show total annual production by primary species, expressed as site index and CMAI. If an estimate of total production for understory is desirable and feasible, show the total annual production by growth form, expressed in pounds per acre of air-dry weight, and the fluctuations expected during favorable, normal, and unfavorable years (climatic variability, primarily a result of precipitation).

(iii) If the reference community phase or other data-supported community phase is *not dominantly herbaceous, shrub, or tree species* (e.g., mosses, lichens, bare ground, open water, rocks), the type of total annual production data needed to define and describe the ES will be determined during project planning.

Note: Total annual production by growth form should not be confused with species productivity (part 631, subpart F, section 631.56D(4)), which is annual production and variability by species throughout the extent of the community phase.

(6) Canopy or Foliar Cover.—For the reference community phase and all other data-supported community phases, show either canopy or foliar cover, as appropriate to describe the ES. Identify the type of cover and the data collection method. Methods used to gather data should be standardized and documented according to guidance in part 631, subpart C. Summarize and show the range of canopy or foliar cover and constancy by species for each community phase. Show the canopy cover by height class.

(7) Structure.—Describe both vertical and horizontal structure for the reference community phase and all other data-supported community phases.

(i) Describe *vertical structure* by characterizing vertical strata of vegetative cover by growth form. Define both the height of the respective vertical strata and the type of cover (canopy or foliar). Vertical strata can also be broken down into three primary strata (tree, shrub, and herb), which can be broken down even further with groupings such as height ranges for canopy or foliar cover. Use as needed to describe vertical structure.

(ii) Describe *horizontal structure* by characterizing vegetation patterns within an ES. For ESs with little or no vegetation, this section may not be applicable.

- Examples of characterizing vegetation patterns in tree-dominant community phases include defined sociability classes, such as grows solitarily or slightly grouped; tussocks; small or large patches; and large almost pure population stands.
- Examples of characterizing vegetation patterns in herbaceous and shrub-dominant community phases include canopy gaps, basal gaps, foliar cover, and clumps, etc.

(8) Ground Surface Cover.—For the reference community phase and all other data-supported community phases, show ground surface cover. Ground surface cover is the percentage of the ground surface actually occupied by bare soil, basal vegetation, litter, downed wood, gravel, rock, or soil biological crust, including mosses and lichens.

(9) Overstory Canopy Cover.—For the reference community phase and all other data-supported community phases, show the overstory canopy cover if the community phase contains overstory trees typically more than 5 meters tall. Methods should be standardized and documented as per guidance in part 631, subpart C.

(10) Understory.—For the reference community phase and all other data-supported community phases that are dominantly trees with an understory, show the low and high range of the estimated canopy cover (by percent) for the understory plants that typically reach a height of less than 5 meters and can be broken down into strata that group understory plants.

Understory can include stands of young trees, such as seedlings and saplings typically less than 5 meters tall, and associated other woody and herbaceous vegetation. Other understory data can include the bottom and top height of live crowns for each understory grouping and high and low values for the hard and soft snags per acre (part 631, subpart C).

(11) Community Phase Growth Curves.—For the reference community phase and all other data-supported community phases that are dominantly herbaceous and shrub species, include a generalized chart or graph showing percent growth by month or season.

E. Alternative States

(1) Narratives.—Describe each alternative community phase and state identified in the STM diagram. Document whether the community phases are supported by empirical data or are provisional communities. Describe the rationale for separating community phases in different states based on ecological processes. At a minimum, describe the dynamics of the community phase and causes or triggers for community pathways and transitions. Identify and describe the thresholds between states. Provide information on the water cycle, nutrient cycle, and energy flow and an evaluation of the function of these ecological processes. Explain causes for shifts or changes and relate how they will affect ecological functions. Describe changes in hydrologic and erosion characteristics of the site as a result of these shifts. Include descriptions of elements such as amount and distribution of expected litter, patterns of plant mortality, and expected or measured changes in dynamic soil properties.

(2) If community phases are data-supported, follow the guidance in part 631, subpart F, sections 631.56D (2)-(11).

631.57 Ecological Site Interpretations

A. Interpretation for uses, products, and management of an ES are described as appropriate. Some interpretations are listed below, but others may be described as needed.

B. Wildlife Habitat

(1) Interpretations needed for wildlife will be identified early in project planning. Wildlife interpretations can be used by planners and managers to help in determining proper manage of targeted wildlife habitat. The State Conservationist’s designee in consultation with the state wildlife committee determines the scope of selected species, species habitats, life history events, geographic scale of the wildlife habitat interpretations, and other State-specific interpretations. At a minimum, habitat for keystone and indicator species will be described. Habitats for obligate species; commercially important species (i.e., hunted); Federal endangered, threatened, proposed, and candidate species; and State and Tribal species of concern should also be considered.

(2) Terrestrial wildlife species rarely complete their entire life history on a single ecological site. Discuss habitat relationships among associated ecological sites and the habitat requirements of wildlife species met by specific sites. Habitat needs for specific life history events, such as nesting, fawning, brood rearing, and thermal cover, that coincide with specific ecological states (e.g., reference state) or community phases will be noted. Identify these events and the time of year that they occur for integration with use and management of a site, such as timber harvesting, livestock grazing, and forage harvesting. If appropriate, identify specific ecological states or community phases that provide critical source or sink habitat or life history requirements for specific species. This information can be used to mitigate impacts by proper timing of management actions and to determine land use that benefits specific species. Identify changes in fauna and habitat quality that will result from changes in ecological state or community phase.

(3) Descriptions must include information on how the timing, intensity, and duration of management actions affect the quantity and quality of essential habitat elements. Both positive and negative impacts at the site level and population impacts at the landscape level must be addressed. For instance, describe how prescribed grazing management can provide localized nesting or fawning cover. At a landscape level, discuss how retention of snags affects populations of cavity nesters. When developing wildlife habitat interpretations, consider areas where land management actions targeting reduction of fuel loads can improve habitat at the landscape level. Careful management to maintain essential habitat elements for keystone species can provide for regeneration of habitats locally and throughout the ecosystem.

(4) To facilitate timely development of wildlife habitat interpretations (WHI) with limited resources, States should consider developing generalized wildlife interpretations for similar ecological sites. This can be done by developing WHIs at a larger geographic scale (e.g., Level III ecoregions, LRUs, MLRAs). Using this approach, WHIs would be developed for all similar ecological sites with a similar dominant plant community (e.g., woodland, shrubland, grassland). The interpretations would then be adapted to each respective ESD. WHIs for ESDs with unique habitat elements and wildlife species should be described independently.

(5) State biologists will approve the WHIs for the ESDs in their State. They may give approval authority to other biologists in the State.

C. Domestic and Feral Animals

General descriptions for use of the site by livestock, domesticated wildlife, and feral animals must also be included. Suitability of the site for grazing, by kind and class of livestock, and potential management problems (poisonous plants, topography, physical barriers, protection from extreme weather, etc.) must be described. Describe interactions between wildlife and livestock and competition for resources. Include forage preferences for livestock and wildlife by plant species or various parts of a plant species for each season of the year. Much of this information is likely more relevant at a higher order of land classification; therefore, if it is contained in a higher order description, a reference to that description is acceptable.

D. Hydrology Functions

Indicate changes in hydrology functions that may occur with shifts in community phases within states and between states. For each community phase, describe the changes in infiltration and runoff expected with specific rainfall events (e.g., 10-year 24-hour storm) as a result of changes in plant species composition, amount and timing of plant growth, and soil surface characteristics. For example, if the composition of a plant community shifts from blue grama to buffalograss, runoff typically is accelerated as a result of a change in plant growth form and root morphology characteristics. Information about water budgets for each community phase should be considered for inclusion. In areas of wetland and on flood plains, drainage, diversions, channel degradation, land leveling, and other actions change the probability, frequency, and duration of surface water and groundwater.

E. Recreational Uses

Indicate the potential recreational uses that the ES can support or that may influence the management of the site. List the plant species that have special aesthetic or landscape value. Consider species affected by management, such as timber or forage harvesting and the timing of harvesting. Much of this information is likely more relevant at a higher order of land classification; therefore, if it is contained in a higher order description, a reference to that description is acceptable.

F. Wood Products

Describe uses or potential uses of wood products from significant species that may influence the management of the ES. Describe management considerations for woody species that have potential commercial value.

G. Other Products

Describe uses or potential uses for other products, such as landscape plants, nuts and berries, mushrooms, mulching material, and biomass used for energy production. Include a clear heading for each use or product. Strongly consider potential effects from overharvesting or removal of products from the ES.

631.58 Supporting Information

A. Associated Sites

Identify and describe other ESs commonly located adjacent to or in coordination with the ES. Note how they are connected on the landscape.

B. Similar Sites

Identify and describe ESs that resemble or are similar to the ES and can be confused with it. Note the significant differences between the sites.

C. Inventory Data References

List plots and other supporting inventory data for site identification and community phases. Show the data source (i.e., sample methods, historical inventory data, or photographs) and identification of each plot. A compilation of inventory data types is described in part 631, subpart F, section 631.56D(2). Landowner permission is required to list specific locations on non-Federal land.

D. Agency and State Correlation

Enter the agencies and States that have reviewed and approved the ESD.

E. Type Locality

Enter the location of a typical example of the ES. Indicate the township, range, and section or longitude and latitude and the specific location. Landowner permission is required to publish this information for non-Federal land.

F. Relationship to Established Frameworks and Classification Systems

Describe how the ESD spatial unit (e.g., MLRA/LRU or ecoregion section) relates to other established geographic frameworks, such as Level-III and Level-IV ecoregions defined by EPA. Crosswalk each data-supported community phase to the existing vegetation types in the National Vegetation Classification, if published. If applicable, include how the ES relates to existing potential natural vegetation classifications, habitat type classifications, and biophysical setting classifications. This information is particularly important for Federal land where other classification systems and mapping hierarchies are used in multilevel or above-ES-level resource assessments, land and resource management planning, and monitoring.

G. Other References

Show other reference information and data used for the ESD or for understanding ecological dynamics of the site. List specific references for information and data that are not included in part 631, subpart F, section 631.58C. Examples include information such as literature references, historic information, site specific notes, interviews, local expertise, and all other relevant information and data.

631.59 Rangeland Health Reference and Matrix Sheets

Provide reference state conditions for the 17 indicators included in Interpreting Indicators of Rangeland Health (Pellant and others, 2005) if the reference community phase is classified as rangeland. Describe the range of variability for each indicator as expected for the natural disturbance regime in the reference state.

631.60 Ecological Site Description Signatures

A. Authorship

Record the names of the original authors and the date signed. Include the names of the authors and the date signed in revisions.

B. Quality Control (QC) Documentation

The identified QC reviewer signs and dates to affirm that information in the ESD has been reviewed for completeness and technical accuracy.

C. Final Quality Assurance (QA) Review

The SSR ESS signs and dates the QA review documentation to affirm that the ESD meets standards and is properly entered in the ES database.

D. Ecological Site Description Correlation

The SSRD signs and dates to assure consistency in ESD identification, delineation, description, and interpretation.

E. Certification

Record the signatures, titles, and agency affiliations of the STCs and partners and the date signed to affirm that the ESD meets state and partner needs for conservation planning, implementation, monitoring, and assessment.

Part 631 – Ecological Site Concept and Description Development

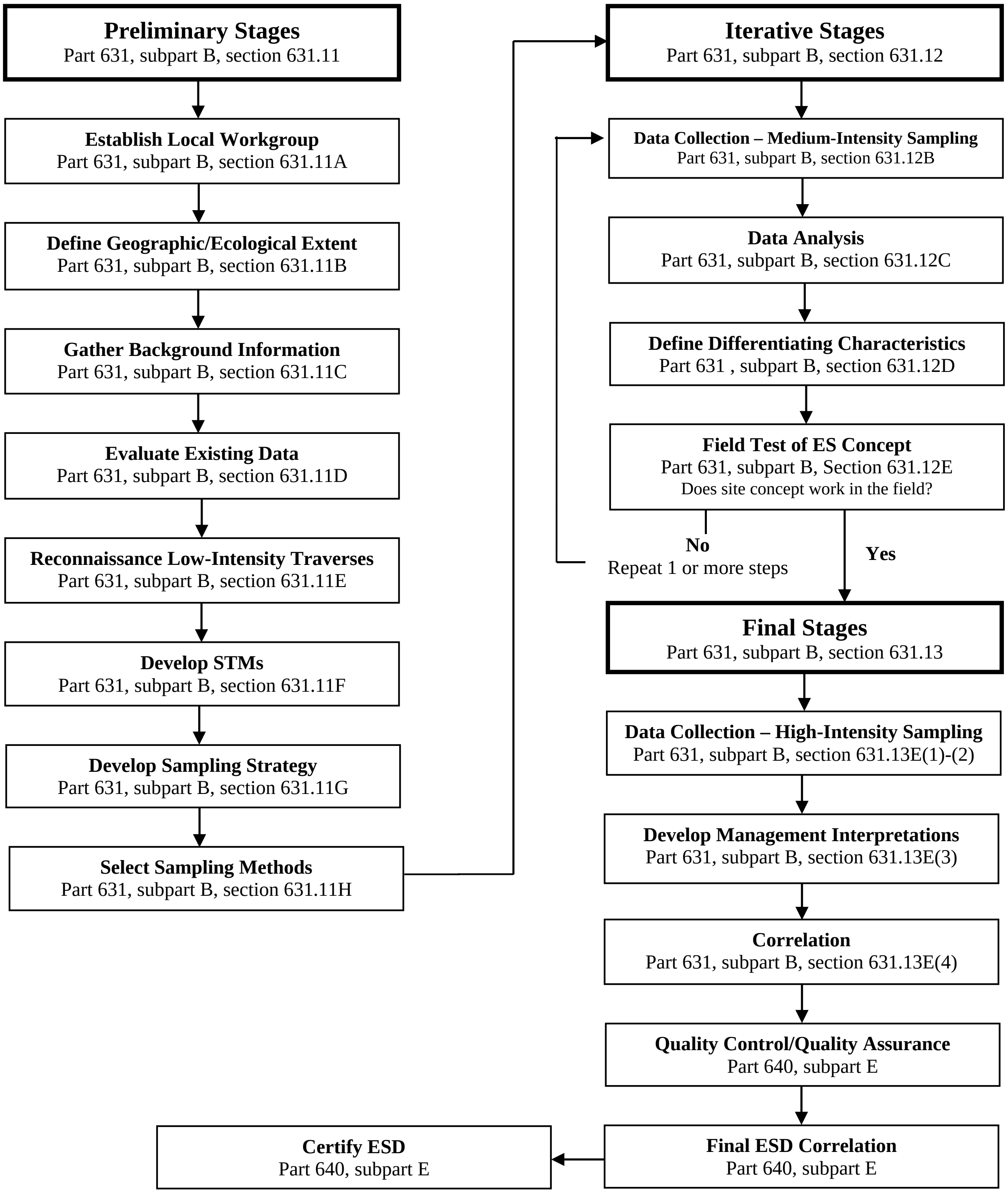
Subpart G – Data Storage

631.70 Reserved

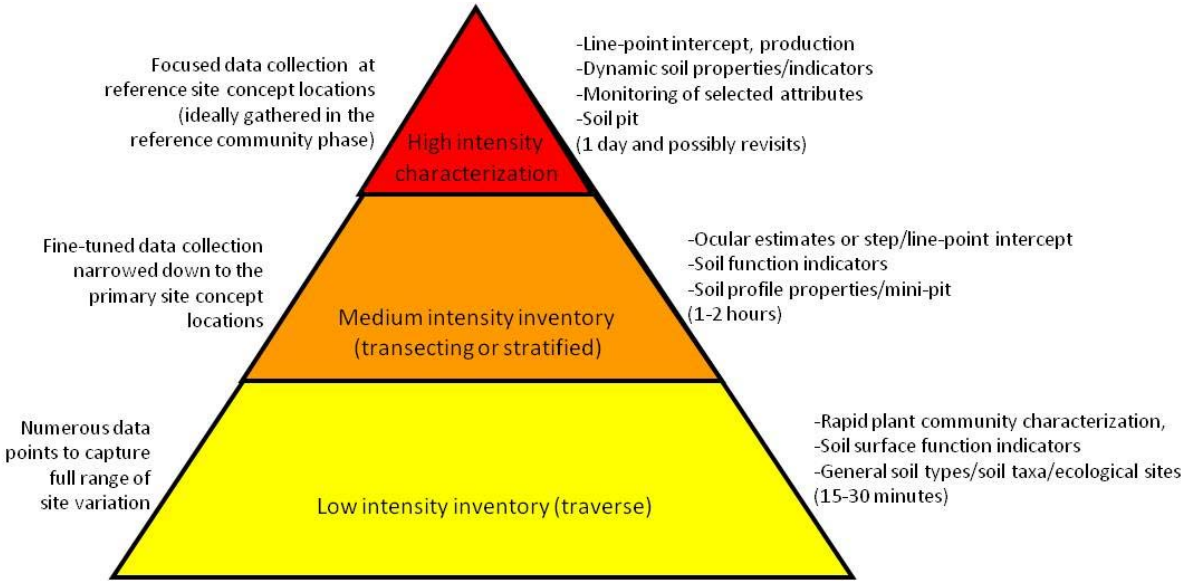
Part 631 – Ecological Site Concept and Description Development

Subpart H – Exhibits

631.80 Ecological Site Differentiation and Development Process



631.81 Ecological Site Data Collection Strategy



631.82 Example Ecological Site Names

Example 1: Shallow Sandy Upland; *Artemisia tridentata ssp. wyomingensis*/*Pascopyrum smithii-Bouteloua gracilis* (Wyoming big sagebrush/western wheatgrass-blue grama)

Example 2: Siltstone Summit Woodlands; *Quercus alba-Carya ovata/Carex pensylvanica* (white oak-shagbark hickory/Pennsylvania sedge*)*

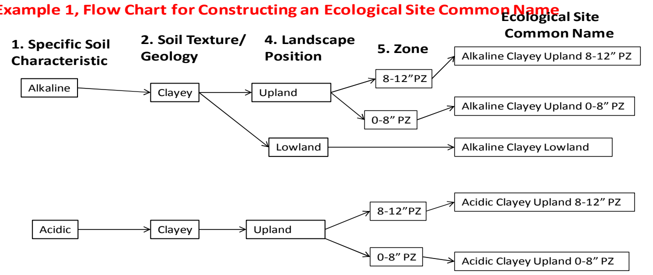
Example 3 (using one term from all six categories in part 631, subpart F, section 631.37): Alkaline Clayey Playa Depression Precipitation Zone 4-8”; *Atriplex canescens*/*Sporobolus airoides-Muhlenbergia asperifolia* (fourwing saltbush /alkali sacaton-scratchgrass muhly)

Example 4: Lava Mountains Low and Intermediate Elevation Zone Forest; Metrosideros polymorpha-Acacia koa/*Cibotium glaucum-Broussaisia arguta*/*Dryopteris wallichiana* ('ohi'a lehua-koa/hapu'u-kanawao/alpine woodfern)

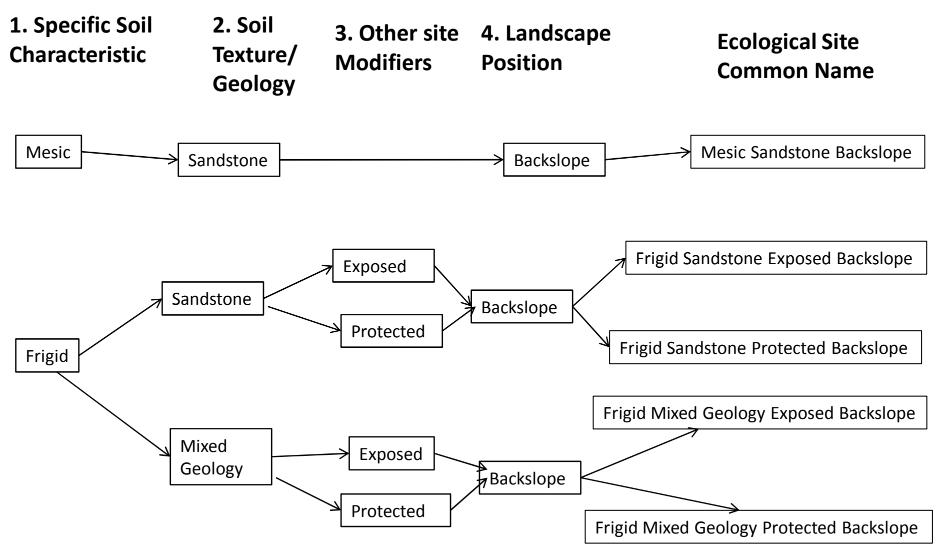
631.83 Example Flow Charts for Naming Process

The following examples illustrate processes used to construct an ES common name.

Example 1, Flow Chart for Constructing an Ecological Site Common Name



Example 2, Flow Chart for Constructing an Ecological Site Common Name



631.84 Soil Texture Terms Used in Ecological Site Common Names

Modifiers[++] used to augment general texture groups (only one, if needed)		General soil texture groups and soil texture class or subclass (only one, if needed)		Generalized terms used in lieu of texture** (only one, if needed)	
Modifier	*Description of modifier*	*General soil texture group*	*Texture class or subclass*	*Term*	*Description of term*
Volcanic	Material with andic soil properties (includes hydrous, medial, and ashy)	Sandy	Coarse sand, sand, fine sand, very fine sand, loamy coarse sand, loamy sand, loamy fine sand, and loamy very fine sand	Rock fragment	Any size rock fragments
Highly organic	Saturated and unsaturated mineral material with high organic material content (includes mucky, peaty, and highly organic texture modifiers)			Pararock fragment	Any size pararock fragments
		Loamy*	Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, clay loam, sandy clay loam, silty clay loam, silt loam, and silt	Cemented/ consolidated	Solid mass, less than 10 percent loose material (e.g., bedrock)
				Muck	Highly decomposed organic material (sapric)
Limnic	Limnic layers composed of fecal pellets, diatoms, or calcareous mud	Silty*	Silt loam, silt, and silty clay loam	Peat	Slightly decomposed organic material (fibric)
				Mucky peat	Moderately decomposed organic material (hemic)
Anthropogenic	Contains 15 to less than 90 percent artifactual material			Gypsic material	Coarse or fine gypsic material (more than 40 percent gypsum)
Cemented	Cemented material; does not slake	Clayey	Sandy clay, silty clay, and clay		
Gypsiferous	Contains 15 to less than 40 percent gypsum by weight				
Permafrost	Permanently frozen				

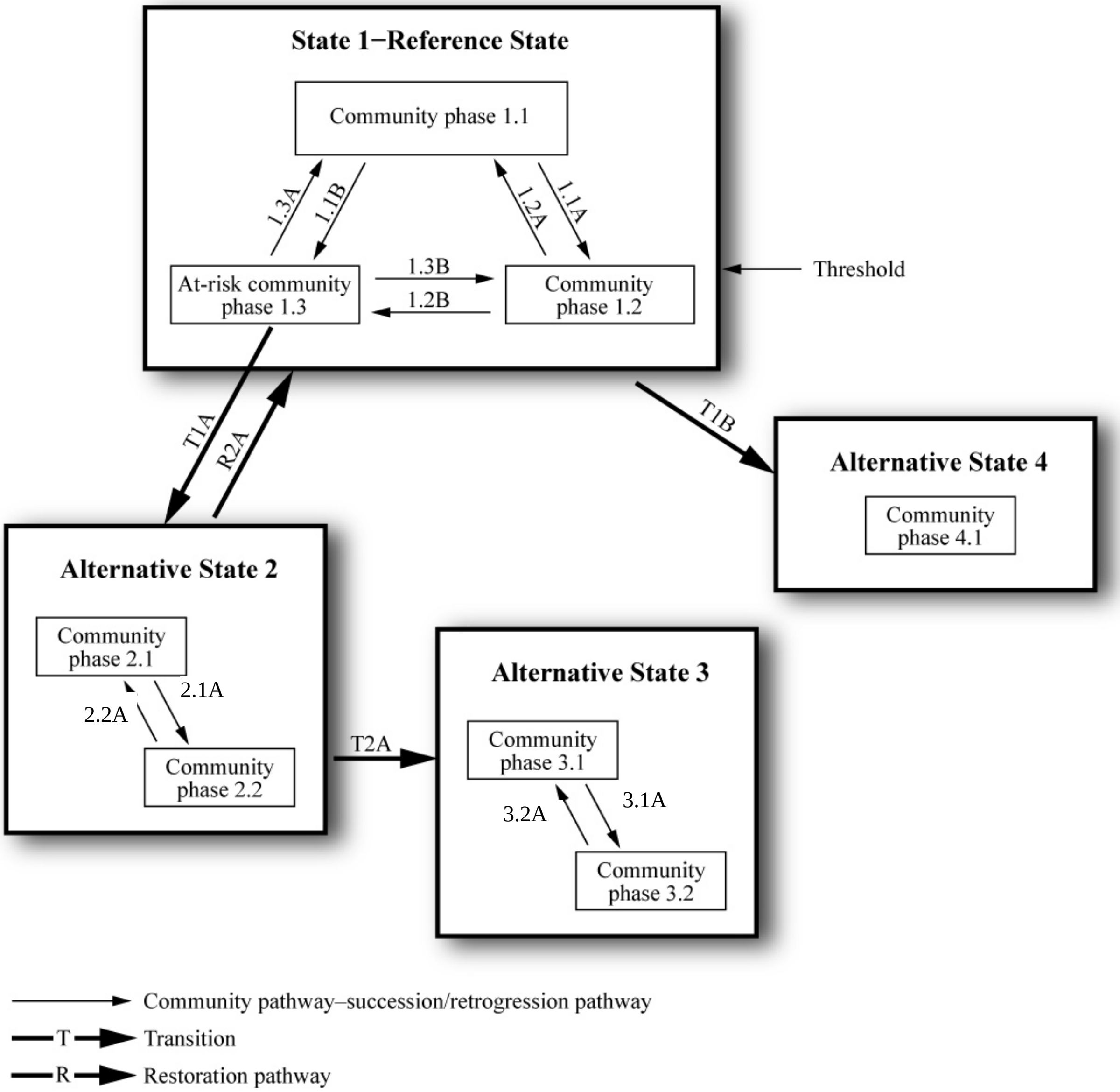
[+] Terms from pages 2 to 41 in the Field Book for Describing and Sampling Soils, Version 3.0 (adapted from NSSH Part 618, Subpart A, Section 618.67.H.viii). If these terms are used as a modifier for a general texture group, they are considered one term.

[++] Adapted from SSM Chapter 3, Grouping of Soil Texture Classes.

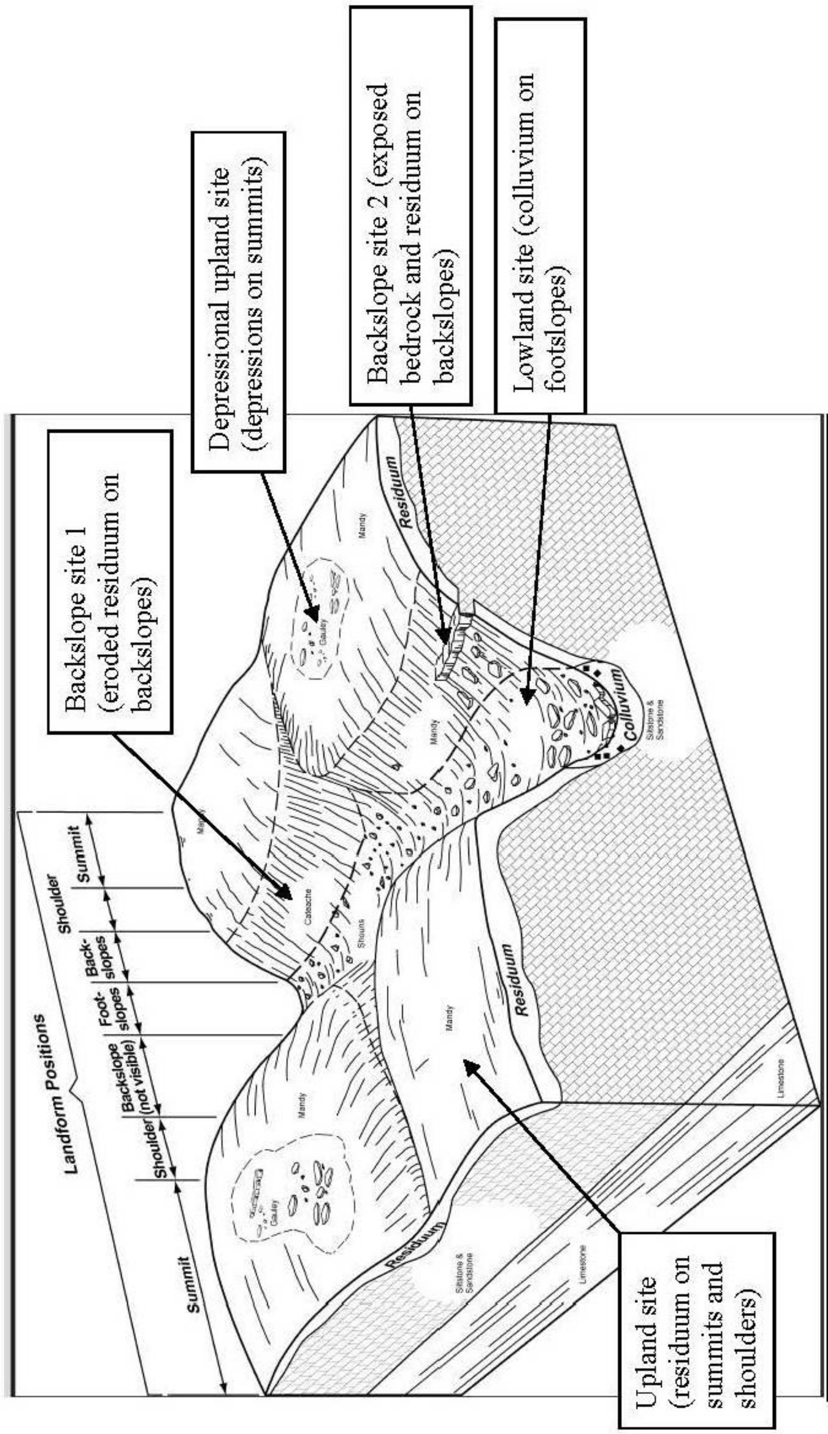
* Silt loam, silt, and silty clay loam may be in either a loamy or silty general texture group, whichever it behaves most similar to under local conditions.

** These terms are used instead of soil texture terms if general texture groups are not appropriate (e.g., no mineral soil material present). Terms are from pages 2 to 43 in the Field Book for Describing and Sampling Soils, Version 3.0

631.85 Generic State-and-Transition Model Labeling



631.86 Topographic and Soil Features Important for Ecological Site Keys


Backslope site 1 (eroded residuum on backslopes)
Depressional upland site (depressions on summits)
Backslope site 2 (exposed bedrock and residuum on backslopes)
Lowland site (colluvium on footslopes)
Upland site (residuum on summits and shoulders)
Landform Positions
Summit
Shoulder
Backslope (not visible)
Foot-slopes
Back-slopes
Shoulder
Summit
Residuum
Residuum
Residuum
Colluvium

631.87 Dichotomous Ecological Site Key Examples

Desert (0 to 8" annual precipitation) ES Key

A. Technical ES Key

I. Flooded (bottom position, flooded from the valleyside or overbank flow)

- A. Soils that have a seasonal or perennial high water table (<3 feet from surface)
  - 1. Sandy, gravelly, and cobbly soils with redoximorphic feature .... Wet Sandy Bottom
  - 2. Loamy to clayey soils with redoximorphic features .... Wet Loamy-Clayey Bottoms
- B. Soils that do not have a seasonal or perennial high water table (>3 feet from surface)
  - 1. Sandy soils .... Sandy Bottom
  - 2. Sandy loam to clay loam soils .... Loamy Bottom
  - 3. Clayey soils (vertic) .... Clayey Bottom

II. Not flooded (upland position, receives only precipitation)

- A. Slopes less than 15 percent
  - 1. Soils that are calcareous throughout
    - a. Shallow soils (less than 20 inches deep)
      - 1. Soils that have a lime-cemented hardpan .... Shallow Limy Hardpan Upland
      - 2. Soils underlain by limy schist, diorite, or diabase .... Shallow Limy Upland
    - b. Soils that are moderately deep or deep (>30 inches)
  - 1. Soils that have an argillic horizon .... Limy Claypan Upland
  - 2. Soils that do not have an argillic horizon .... Limy Upland

B. Non-Technical ES Key*

1—Site receives no water except normal precipitation.

2—More than 12" annual precipitation .... Use upland ES key
2—Less than 12" annual precipitation .... See number 3

3—0 to 8" annual precipitation (big sagebrush not present) .... Use desert ES key

Dunes Desert
Sandy Desert
Loam Desert
Silt Loam Desert
Clayey Desert
Desert
Desert
Desert
m Desert
Desert
nay not be present or

631.88 Matrix Ecological Site Key Example

Slope position	Surface texture	Subsoil texture	Depth to seasonal high water table	Ecological site name
Summits and shoulders	Coarse sand	Coarse sand	>60 inches	*Coarse Sand Ridge*
Summits, shoulders, and backslopes	Sandy	Sandy	>60 inches	*Sandy Upland*
Summits, shoulders, and backslopes	Sandy	Loamy	>60 inches	*Loamy Upland*
Footslopes, concave backslopes, and other water-receiving upland positions	Sandy or loamy	Clayey	12 to 30 inches	*Lowland*
Drainageways or flood plains	Mucky loam or loam, or organic material	Sandy or loamy	Surface to a depth of 12 inches	*Overflow*
Depressional areas	Fine sandy loam	Sandy clay or sandy clay loam	Surface to a depth of 12 inches	*Depressions*

Part 632 – Delineation and Mapping, Hierarchies, and Other Vegetation Classification and Stratification Schemes

Subpart A – Related Stratification Schemes

632.0 Reserved

Part 632 – Delineation and Mapping, Hierarchies, and Other Vegetation Classification and Stratification Schemes

Subpart B – Delineation and Mapping of Ecological Sites

632.10 Reserved

Part 632 – Delineation and Mapping, Hierarchies, and Other Vegetation Classification and Stratification Schemes

Subpart C – Benchmark Ecological Sites

632.20 Reserved

Part 632 – Delineation and Mapping, Hierarchies, and Other Vegetation Classification and Stratification Schemes

Subpart D – Ecological Site Relationships with Other Classification and Mapping Hierarchies

632.30 Reserved

Part 633 – Abbreviations, Glossary, and References

Subpart A –Abbreviations

633.0 List of Abbreviations

The following abbreviations apply to the National Ecological Site Handbook:

(1) BOA—board of advisors
(2) ES—ecological site
(3) ESD—ecological site description
(4) ESI—ecological site inventory
(5) ESS—ecological site specialist
(6) FOTG—Field Office Technical Guide
(7) LRU—land resource unit
(8) MLRA—major land resource area
(9) NASIS—National Soil Information System
(10) NCSS—National Cooperative Soil Survey
(11) NEST—National Ecological Site Team
(12) NESH—National Ecological Site Handbook
(13) NGLT—National Grazing Lands Team
(14) NGO—nongovernmental organization
(15) NHQ—National Headquarters
(16) NSSH—National Soil Survey Handbook
(17) NTSC—national technical and support center
(18) QA—quality assurance
(19) QC—quality control
(20) SDQS—soil data quality specialist
(21) SQE—soil quality and ecosystems
(22) SRC—State resource conservationist
(23) SSD—Soil Science Division
(24) SSL—soil survey office leader
(25) SSO—soil survey office
(26) SSO ESS—soil survey office ecological site specialist
(27) SSR—soil survey region
(28) SSR ESS—soil survey region ecological site specialist
(29) SSRD—soil survey regional director
(30) SSRO—soil survey regional office
(31) SSS—State soil scientist
(32) STC—State Conservationist
(33) STM—state-and-transition model
(34) WHI—wildlife habitat interpretations

Part 633 – Abbreviations, Glossary, and References

Subpart B – Glossary

633.10 Reserved

Part 633 – Abbreviations, Glossary, and References

Subpart B – Glossary

633.10 Reserved

Part 633 – Abbreviations, Glossary, and References

Subpart C – References

633.20 Reserved