



Department of the Interior

National Park Service

NATIONAL NATURAL LANDMARKS PROGRAM

**Guidelines for Evaluation of Potential
National Natural Landmarks**

July 2007

TABLE OF CONTENTS

I.	INTRODUCTION.....	1
A.	NNL Program Background.....	1
B.	NNL Program Regulations.....	1
C.	Conventions and Nomenclature.....	1
D.	Purpose, Organization and Use of this Guide.....	2
II.	NNL PROGRAM CONCEPTS.....	2
A.	Biophysigraphic Provinces.....	2
B.	Natural History Themes.....	2
C.	Primary Natural Features.....	3
D.	Secondary Natural Features.....	4
E.	National Significance Criteria.....	4
III.	EVALUATION OVERVIEW.....	4
A.	Evaluation Report Objectives.....	4
B.	Evaluation Report Audience.....	4
C.	Site Selection for Evaluation.....	5
D.	Initial Study Area.....	5
E.	Materials Provided by the NNL Program.....	5
F.	Collaboration with PNNL Owners.....	5
G.	Evaluation Report Submittal and Review.....	6
IV.	EVALUATION REPORT FORMAT.....	6
A.	Report Outline.....	6
B.	Title Page.....	7
C.	Table of Contents.....	7
D.	Lists of Tables, Figures, and Appendices.....	7
E.	Executive Summary.....	7
F.	Introduction.....	7
1.	Source of Site Proposal.....	7
2.	Evaluator(s).....	7
3.	Scope of Evaluation.....	8
G.	PNNL Site Description.....	8
1.	Brief Overview.....	8
2.	Natural History Themes and Sub-themes Represented.....	8
3.	Primary Natural Features.....	8
4.	Secondary Natural Features.....	9
5.	Physical Setting.....	9
6.	Land Use and Condition.....	9
7.	Threats.....	9
8.	Hazardous or Sensitive Resources.....	9
H.	Comparative Assessment.....	10
1.	Regional Site Inventory.....	10
2.	Site Descriptions.....	10
3.	Comparative Analysis & Discussion.....	10
I.	Evaluation Recommendations.....	11
1.	Summary Significance Statement.....	11

2.	Proposed Landmark Boundary and Ownership Maps	11
3.	Natural Landmark Brief.....	12
4.	Summary Presentation	12
J.	Supporting Documentation	12
V.	MAP REQUIREMENTS	12
A.	Proposed NNL Boundary.....	12
B.	Proposed Landmark Ownership Map	13
VI.	PHOTOGRAPH FORMATS.....	13
VII.	REFERENCES.....	13
VIII.	APPENDICES	14
	Appendix A. Biophysigraphic Provinces.....	14
	Appendix B. Geological and Ecological Natural History Themes	15
	Appendix C. National Significance Criteria	19
	Appendix D. Title Page Format	20
	Appendix E. Sample Landmark Brief.....	21
	Appendix F. Sample Landmark Boundary Map	22

I. INTRODUCTION

A. NNL Program Background

The National Natural Landmarks (NNL) Program was established in 1962 by the Secretary of the Interior to encourage the preservation of the best remaining examples of the biological and geological features composing the Nation's natural landscape. It is the only natural areas program of national scope that recognizes outstanding examples of biological and geological features in both public and private ownership. To date, nearly 600 sites in 48 states, 3 territories, and the Commonwealth of Puerto Rico have been designated as NNLs.

Primary goals of the Program are to:

- Encourage and support landowner's efforts to protect NNL resources,
- Strengthen public awareness and appreciation of the natural history of the Nation,
- Enhance the scientific and educational value of nationally significant sites, and
- Develop a National Registry of Natural Landmarks that illustrates the biological and geological character of the Nation's natural heritage.

To qualify for NNL designation, a site must be one of the best examples of a biological or geological feature within a biophysiological province. Potential NNLs are evaluated according to national significance criteria, which are defined in the Program's regulations. The Director of the National Park Service (NPS) determines national significance based on an evaluation by a qualified scientist and on peer and public review. Designation is conferred by the Secretary of the Interior, with owner consent.

B. NNL Program Regulations

The NNL Program operates under rules and regulations defined in the Code of Federal Regulations, Title 36, Chapter 1, Part 62 (36 CFR 62). Current Program regulations were published on May 12, 1999 in the Federal Register (v. 64, no. 91, p. 25708-25723). The regulations are accessible online: http://www.nature.nps.gov/nnl/Fed_Reg_NNL.pdf.

C. Conventions and Nomenclature

- National Natural Landmark, NNL, natural landmark, and landmark are used interchangeably.
- NNL Program and Program refer to the National Natural Landmarks Program.
- Potential NNL and PNNL refer to "an area that, based on recommendation or initial comparison with other areas in the same natural [biophysiological] region, seems to merit further study of its merits for possible National Natural Landmark designation" (Federal Register, 1999).
- PNNL evaluation and site evaluation refer to the process by which qualified scientists study the quality of a site's natural feature(s) according to national significance criteria.
- Designation is the action taken by the Secretary of the Interior to formally assign NNL status to a site. "Designation process" is used in a broader sense to include the evaluation, reviews of the evaluation, and owner and public comments.

D. Purpose, Organization and Use of this Guide

The purpose of this guide is to provide detailed instructions for evaluating and reporting on sites for possible NNL designation. This guide provides a brief description and background of the NNL Program, describes the concepts and methods used to identify and evaluate potential landmarks and provides specific instructions about organization, content, and format of the evaluation report.

This guide is to be used by evaluators as a framework for preparing an evaluation report on a potential NNL. Draft evaluation reports will be reviewed for compliance with the requirements as described in this guide. Issues not addressed in this guide may emerge during the course of an evaluation. Evaluators should consult the NNL Program coordinator with any questions or unanticipated issues that arise.

II. NNL PROGRAM CONCEPTS

A. Biophysiological Provinces

Biophysiological provinces are large geographic areas with similar biological communities, geologic history, structures, and landforms (see map Appendix A). The provinces are based on the recognition that the general character of natural diversity is regionally distinct and correlated with broad patterns of physiography.

The provinces used by the NNL Program were defined by the NPS (1972) based on a modification of Fenneman's (1928) physiographic divisions. The modifications were to emphasize homogeneity in biological communities. As such, the NNL Program uses the more descriptive term "biophysiological province" to refer to these regions instead of the earlier NPS term, "natural region". To be eligible for NNL designation, a site must represent one of the best examples of a natural feature within its biophysiological province.

B. Natural History Themes

Natural history themes are broad, nationally applicable categories designed to encompass all biological and geological features. Sub-themes are a means to classify features at a finer scale. The theme/sub-theme hierarchy provides a general framework within which all natural features can be classified. The categorization of natural features in the NNL Program provides a basis for selecting sites with similar resources for the comparative analysis portion of a site evaluation. It also provides a framework to compare representation of natural features at potential NNLs with existing sites. Ideally, each new site evaluated for NNL designation would represent a new natural feature or a new aspect of an already represented feature.

Geological features are categorized thematically by landforms and geologic history. Biological features are categorized thematically by land and aquatic ecosystems. As the importance is focused on the interactions among biological components and between biological components and the abiotic environment, biological features are classified using ecological themes. See Appendix B for the list of geological and ecological natural history themes and sub-themes used by the NNL Program.

Not all natural history themes or sub-themes are present in every biophysiological province and the characteristics for each theme typically vary throughout its range, becoming more dominant from one province to another. Therefore, while the sub-themes listed in Appendix B are intended to be broad, nationally applicable categories, they only provide a basic framework within which to work. For better classification, sub-themes may be expanded upon or, if necessary, modified to classify regionally-specific sub-themes. For example, the “dry coniferous forest” ecological theme within the South Pacific Border biophysiological province was divided into “pinyon-juniper woodland,” “southern oak woodland,” “big-cone spruce-coulter pine forest,” and “yellow pine forest” sub-themes. However, within the Wyoming Basin province, this theme was divided into “ponderosa pine-douglas fir savanna or woodland,” “ponderosa pine woodland or forest,” “limber pine savanna or woodland,” “juniper woodland,” and “pinyon pine-juniper woodland” sub-themes.

Furthermore, while a primary natural feature may be significant for the feature itself, the significance of some features may be related to the process that created the feature, or the feature’s location, environment, etc. Therefore, part of the classification includes identification of the significant aspect of the natural feature. For example, both Joshua Tree Natural Area, UT and Grapevine Mesa Joshua Trees, AZ NNLs are significant because of the presence of Joshua Trees. Both sites would be classified under Theme 27. Deserts, and Sub-Theme b. Mohave Desert. However, as the Joshua Tree Natural Area is the northernmost stand of yucca trees in the U.S., the location of the feature is the significant aspect. The densest stand of old, tall Joshua trees in the U.S. is at the Grapevine Mesa site, thus the characteristics of the ecosystem at Grapevine is the significant aspect of the natural feature.

C. Primary Natural Features

A site’s primary natural features are a specific type of natural feature or limited set of feature(s) that are representative of a natural history theme/sub-themes hierarchy within a biophysiological province. Primary natural features include terrestrial and aquatic ecosystems; geological structures, exposures, and landforms that record active geological processes or portions of earth history; and fossil evidence for biological evolution. Typically, one or two primary natural features are selected for evaluation, although some sites may include a closely related set of features. For example, Barringer Meteor Crater, Arizona, is a single-feature meteor impact site, whereas, Anza-Borrego State Park, California, is a naturally diverse area with many different features. Sites may be simultaneously evaluated for both geological and biological primary natural features.

For a site to qualify for NNL designation, the primary natural features must be considered one of the best remaining examples of that type of feature within its biophysiological province. For example, Patagonia-Sonoita Creek Sanctuary, Arizona, was designated a landmark because its primary natural features, a cottonwood-willow gallery and mesquite bosque, are considered one of the best examples of a riparian-woodland system within the Mojave-Sonoran Desert biophysiological province with respect to the national significance criteria. The cottonwood-willow gallery and mesquite bosque at this site, are just one representation of biological features

that characterize the Deserts theme and the Sonoran Desert/Riparian-Woodland Systems sub-themes classification.

D. Secondary Natural Features

Secondary natural features are the other notable biological and/or geological features found at the site in addition to the primary natural features. Secondary natural features are used in the comparative analysis when applying the secondary significance criteria of diversity, rarity and value for science and education.

Continuing with the example above, some of the secondary natural features found at the Patagonia-Sonoita Creek Sanctuary include an exceptional and abundant bird-life, including several Mexican species rare to the rest of the United States, and five rare native fish species, one of which is restricted to Sonoita Creek. While these features do not directly apply to the characterization of the cottonwood-willow gallery or mesquite bosque, they add importance to the site.

E. National Significance Criteria

The relative quality of sites as examples of regionally characteristic natural features is assessed according to national significance criteria defined in NNL Program regulations (Appendix C). Five criteria are specified in two tiers, primary and secondary. The primary criteria of illustrative character and present condition are the most strongly weighted and apply to the primary natural features. Secondary significance criteria (diversity, rarity, and value for science and education) are considered in the comparative assessment when two or more sites are equivalent in respect to primary criteria. In such instances, secondary natural features are considered in determining site significance.

III. EVALUATION OVERVIEW

A. Evaluation Report Objectives

The purpose of an evaluation report is to provide an assessment whether a site meets the national significance criteria for possible NNL designation. An evaluation consists of three main parts:

- Description of the evaluated site, including characterization and documentation of the primary and secondary natural features,
- Inventory and description of similar sites within the biophysiological province, and a comparative analysis of the natural features at the PNNL relative to these sites, and
- Final recommendation regarding the PNNL's fulfillment of national significance criteria, and preparation of proposed landmark boundary and ownership maps, natural landmark brief and summary presentation.

B. Evaluation Report Audience

Readers of the evaluation report may include non-NPS scientists, NNL Program staff, the National Park System Advisory Board, senior staff of the NPS Director, the Secretary of the Interior, property owners and the general public. Other than peer reviewers, the scientific backgrounds and levels of training of these parties may be diverse.

The report should be scientifically rigorous but understandable to persons unfamiliar with the resources under evaluation. Technical terms should be defined when they are introduced and a glossary may be provided, if numerous technical terms are used.

C. Site Selection for Evaluation

Potential NNLs (PNNLs) are identified through two avenues: by Program-sponsored systematic inventories (1969-1987) aimed at identifying PNNLs, and through proposals or suggestion by individuals and organizations.

The selection of a site by the NNL Program for evaluation is usually based on many factors. These may include the current representation of natural history themes and sub-themes, currency of recommendations and proposals, site recognition in the scientific literature, the amount of information available for a site, and the presence and condition of the primary natural features within properties whose owners support landmark designation.

The NPS will obtain written permission from owner(s) to visit and conduct an evaluation of their property. Properties of owners who do not provide consent are not considered in the evaluation.

D. Initial Study Area

The NNL Program, in consultation with the evaluator, will define an initial study area for the PNNL evaluation. PNNL boundaries typically originate from the source that identified the site for consideration of NNL designation (Inventory Studies or suggested PNNL proposals.) Delineation of the study area considers representation of the primary natural feature(s) with respect to land ownership patterns, disposition of owners toward NNL designation, current land use and resource condition.

E. Materials Provided by the NNL Program

In addition to this evaluation guide, the NNL Program coordinator will provide, where available:

- Maps delineating the PNNL area, and the limits of the biophysiological region in which the study area is located.
- Identification of the primary natural features and natural history themes and sub-themes to be considered. Evaluators may suggest modifications of the categories.
- Regional and/or thematic inventory studies related to the area under consideration.
- Copies of site proposal(s) submitted by individuals or organizations applicable to the site.
- Prior evaluation report(s), if any. Some areas were previously evaluated and recommended but were not designated as landmarks.
- Other pertinent information.

F. Collaboration with PNNL Owners

Evaluations are collaborative efforts in which the NNL Program coordinator and property owners may contribute supporting information and maps on ownership and land use, facilitate access, and provide other support on matters not requiring subject-matter expertise. Evaluators are expected to evaluate sites impartially. Support from owners or other interested parties should not influence site recommendations.

G. Evaluation Report Submittal and Review

Preliminary Draft. The evaluator submits two (2) draft copies of the report to the NNL Program coordinator. Evaluation reviews by the NNL Program will focus mainly on substantiation of national significance, documentation of the primary natural features, and programmatic requirements of evaluations; although, staff within the NPS may also conduct technical review of the evaluation.

Review Manuscript. After addressing comments from the preliminary draft review, the evaluator provides the NNL Program coordinator a complete report in five (5) print copies and an electronic copy readable with MS Word for Windows or Adobe (pdf). The evaluation report will be peer-reviewed by a minimum of three scientists selected by the NNL Program; these are usually not NPS employees. The peer-reviewers will have expertise in the primary natural feature(s) being evaluated and should be familiar with the particular area or occurrences of the feature within the region.

Final Report. At the discretion of the NPS, evaluators may be required to incorporate peer reviewer comments into the final evaluation report.

Final Deliverables. The evaluator submits to the NNL Program coordinator:

1. A final report, including all maps and graphics, in five (5) print copies,
2. An electronic copy of the final report readable in Adobe (pdf) with digital, images, graphics and maps also submitted as individual files, and
3. All GIS data files associated with landmark boundary and landownership maps.

IV. EVALUATION REPORT FORMAT

A. Report Outline

The following report outline is intended to provide a framework that is consistent, yet flexible. The following instructions on report content are organized by section headings of the outline.

Title Page

Table of Contents

Lists of Tables, Figures & Appendices

Executive Summary

Introduction

Source of Site Proposal

Evaluator(s)

Scope of Evaluation

PNNL Site Description

Brief Overview

Natural History Themes Represented

Primary Natural Feature(s)

Secondary Natural Features

Physical Setting

Land Use and Condition

Sensitive or Hazardous Resources

Comparative Assessment

- Regional Site Inventory
- Site Descriptions
- Comparative Analysis & Discussion

Evaluation Recommendations

- Summary Significance Statement
- Proposed Landmark Boundary and Ownership Maps
- Natural Landmark Brief
- Summary Presentation

Supporting Documentation

Acknowledgements

References

Appendices

B. Title Page

The title page states that this is an evaluation of a site for its eligibility as an NNL. A sample title page appears in Appendix D.

C. Table of Contents

Provide a table of contents with major headings and page numbers.

D. Lists of Tables, Figures, and Appendices

Provide a list of the titles of figures, tables, and appendices with corresponding page numbers.

E. Executive Summary

Briefly summarize the conclusions of the evaluation report. This section should identify the site as a potential NNL, the county, state, and biophysiological province in which the site is located, the natural history themes and sub-themes represented, the primary and secondary natural features, and the final recommendation regarding NNL designation. If the PNNL is recommended for designation, state the size and provide a 2-3 sentence summary significance statement. All measurements throughout the document should be reported using the English system.

F. Introduction

1. Source of Site Proposal

State the source(s) of the site proposal(s). Sites identified in a Program-sponsored PNNL inventory study are considered to be proposed by the author(s) of that inventory study. For sites proposed by an individual, cite his/her name and affiliation. If an organization suggested the site as a PNNL, state the name of the organization, and the name of the person(s) submitting the proposal on behalf of the organization.

2. Evaluator(s)

State name(s), institutional affiliation(s), position(s), and current address(es) and briefly describe professional and scientific experience.

3. Scope of Evaluation

Briefly explain activities used to complete the site evaluation including; materials researched, dates of field study, other scientists contacted, and so on.

G. PNNL Site Description

This section provides a detailed description of the site under evaluation, including: 1) Brief Overview, 2) Natural History Themes and Sub-themes Represented, 3) Primary Natural Features, 4) Secondary Natural Features, 5) Physical Setting, 6) Land Use and Condition, and 7) Sensitive or Hazardous Resources.

1. Brief Overview

Provide a brief description of the site including; site name, location (state, county, distance to nearest city/town), general ownership information, whether the site is open to the public, other designations, and so on.

2. Natural History Themes and Sub-themes Represented

List and explain the geological and ecological natural history themes and sub-themes represented by the primary natural features considered in the evaluation (see Appendix B for list of Natural History Themes).

3. Primary Natural Features

Primary natural features are addressed at two scales; a site-specific discussion and a general discussion of the natural feature(s) across its range of occurrence.

a) Site Specific Discussion

Provide a specific description and characterization of the primary natural feature(s) at the PNNL. Other (secondary) natural features found at the site will be described in a following section.

- **Geological Primary Features:** Where directly related to the primary natural features, describe relevant geological processes, history or timeframes. Organize the description in a logical order, as appropriate to the feature: for example, this may be a temporal order for a site that represents geologic history, with sub-organization by scale of components that together contribute to the overall feature.
- **Biological Primary Features:** Where directly related to the primary natural features, describe major vegetation types, dominant or co-dominant species of plants, and resident and migratory animal species and their relationships to plant species, plant communities, or other animals. If needed, flora and fauna lists can be provided in an appendix, in which scientific and common names are listed. Distinguish rare, threatened, and endangered species, the listing agency, and the geographic scope of the listing.

b) General Discussion

Describe the overall geographic distribution for the primary natural feature(s) as it occurs across the biophysiological province in which the PNNL is located. For features whose distribution extends beyond this, first describe the broader distribution, then discuss distribution within the province under study.

Describe the physical and geological context that influences the distribution of the features. For biological communities, discuss factors influencing their distribution, such as topography, past and present climate, fire regime, geology, and soils.

Describe variations in the primary natural feature within its entire distribution, paying particular attention to its representation within the biophysiological province. Focus on province-scale variations rather than unique local environments.

4. Secondary Natural Features

Briefly describe other notable biological and geological features at the site. Although these features may not be present over a large area or are not necessarily the best examples of the type of feature, they may be considered under the secondary significance criteria of “Diversity, Rarity and Value for Science and Education” as contributing to the merits of the site in the comparative assessment.

5. Physical Setting

Characterize the physical setting of the PNNL with respect to geography, climate, elevation, topography, water, and so on. Emphasize physical features and processes that have a major influence on the site’s primary natural features.

6. Land Use and Condition

Historic Land Use: Describe historic land use and previous modifications of primary natural features due to anthropogenic activities (e.g., grazing, logging, waterway modifications, road construction, mining) and natural events (e.g. fire, floods, eruptions, landslides). Discuss resulting impacts of these activities on the site’s present condition.

Current Land Use and Present Condition: Describe current land use and site condition. Discuss impacts of current activities on the present condition of primary natural features and processes. Discuss restoration efforts, if applicable. For evaluations with biological primary features, discuss the effects of any nonnative species present. Note mineral rights, leases, conservation or agricultural easements, or other types of ownership reserved from fee title that relate to land use within the study area, even if such rights are not currently exercised.

7. Threats

Describe any known or anticipated potential threats to the site’s primary or secondary natural features. Threats may result directly or indirectly from human activities (construction, contamination, etc), natural disturbances (hurricanes, erosion, etc) or changes in natural systems or processes (fire suppression, exotics, etc). Where possible describe the agent (source) of the activity threatening the resources, the probability of occurrence and the potential impacts.

8. Hazardous or Sensitive Resources

Note any hazardous conditions that might present a risk to personal safety or public health for unsupervised visitors, and the presence of any sensitive resources. However, if disclosure of

sensitive resources and their location may put them at risk, this should be discussed with the NNL Program coordinator prior to completion a draft report.

H. Comparative Assessment

The comparative assessment includes 1) a regional site inventory, 2) site descriptions, and 3) comparative analysis and discussion.

1. Regional Site Inventory

The evaluator is responsible for developing an inventory of sites within the biophysiological province that represent the primary natural feature(s) considered in the evaluation. The evaluator develops this roster on the basis of literature and database search, personal experience, consultation with other scientists, and field review of sites if appropriate and feasible. Some or all of these sites will be used for the comparative analysis.

Sites should be listed in ranked order with respect to the primary features under consideration, with higher quality sites listed first. Higher quality sites are those whose primary natural feature(s) are more illustrative and in better condition and overall, the site exhibits a more diverse set of components. This subset of sites are the ones that will be used in the comparative analysis with the PNNL. Lower quality sites are those that exhibit some notable qualities, but either represent the primary feature at a lower quality than the highest quality sites or, represent only some features and are not particularly illustrative. Explain the rationale for establishing rankings.

2. Site Descriptions

Detailed descriptions are provided for the highest quality sites. These descriptions summarize and gauge the merit of each site's natural features. For each of the highest quality sites, provide the following information:

- Site description (location, size, ownership), and
- Description of the primary and secondary natural features

For lower quality sites, provide a brief summary description (one or two paragraphs) of primary natural feature(s) and their relative quality. It should be clear why these sites are not included among the highest quality sites and therefore not used in the comparative analysis.

3. Comparative Analysis & Discussion

Compare and contrast the natural features at the PNNL with each of the highest-ranking sites with respect to the NNL significance criteria. Each site's primary natural features should first be compared using the primary criteria of illustrative character and present condition. If two or more sites are considered equivalent in respect to these criteria, then secondary natural features should be considered with respect to the secondary criteria of diversity, rarity, and value for science and education. The comparative analyses should be thorough and sufficiently documented as this assessment provides the greatest justification and support necessary for the recommendation presented in the next section of the report.

I. Evaluation Recommendations

On the basis of the comparative analysis, the evaluator makes a final recommendation regarding whether the site qualifies for designation as a National Natural Landmark. For site's recommended for landmark designation, the evaluator provides 1) a summary significance statement, 2) proposed landmark boundary and ownership maps, 3) a natural landmark brief and 4) a summary presentation.

1. Summary Significance Statement

Provide a concise statement, in one or two sentences that encapsulates the significance of the natural features at the site. This statement should incorporate an appropriate phrase characterizing the quality of the site (one of the best, largest, most complete, most pristine, only remaining, etc.) in respect to the primary natural feature(s) and relate this superlative to the region over which the significance applies.

2. Proposed Landmark Boundary and Ownership Maps

The extent of the primary natural features contributing to site significance is the principal consideration in delineating a landmark boundary. However, the proposed boundary should also take into account secondary natural features that contribute to significance, ownership patterns, site condition, and pragmatic considerations related to definition and communication of the boundary.

Since the quality and condition of natural features may vary within the study area, evaluators are advised to view the area broadly rather than attempting to precisely excise areas of relatively low quality. Delineation should avoid creating a “checkerboard” with numerous in-holding parcels excluded and, in most cases, should not include a “buffer zone,” or unrepresentative area peripheral to significant natural features.

Due to the requirements of obtaining owner permission for an evaluation, modifications to the study area boundary may require obtaining additional written permission. If an evaluator identifies adjoining or nearby areas that represent the primary natural feature at a quality comparable to that of the initial PNNL study area, those additions may be considered only after the NPS receives written permission from the landowner(s) to evaluate those areas. Conversely, reduction of the initial PNNL study area may be required for a variety of reasons, including diminished site quality since the area was proposed as a PNNL or poor delineation of the original area (e.g., includes unrepresentative areas). Such changes do not require landowner permission; however, the NPS will notify those landowner(s) originally granting permission that their property is no longer under consideration.

In addition to a proposed landmark boundary, the evaluator must create an ownership map for the proposed NNL boundary. The map should include delineation of separate parcels and the corresponding landownership information. For sites with numerous landowners, a separate table detailing ownership information may accompany the map. Specific guidelines for map requirements are provided in Section V.

3. Natural Landmark Brief

The natural landmark brief contains two summary paragraphs: an abstract of the natural features, and a highly condensed statement of site significance. It also lists basic information on site location, ownership, evaluators, and evaluation date. Owners are identified by category of owner, rather than by owner name. Entry for designation date is left blank. A sample brief is shown in Appendix E.

4. Summary Presentation

For sites recommended for designation, evaluators should provide a short (12 slides maximum) Powerpoint® summary presentation. Presentations should include a summary of the site's natural features and their significance, how the site compared to similar sites with respect to the significance criteria, the proposed landmark boundary map, and photographs depicting the significant natural features. The NNL Program may use the presentation, in whole or in part, for future steps in the process of possible designation for the site.

J. Supporting Documentation

Letters in support of the NNL designation or additional documentation about the resources at the site can be provided. However, documentation about the resources should only be provided to give the reader further information and not used in place of evaluation report requirements as outlined in these guidelines.

V. MAP REQUIREMENTS

All maps must be created as a georeferenced coverage using GIS software, preferably ESRI® ArcGISTM software (8.0 or later). If GIS software other than ArcGIS is used, the digital map files must be provided in formats that are readily imported into ArcGIS as layers of georeferenced coverages. If maps created in GIS are exported into a graphics program for enhancement (e.g., Illustrator), provide original and enhanced-graphics files. All spatial data sets must have Federal Geographic Data Committee (FGDC) compliant metadata in either ASCII text, HTML, or SGML format.

All map files must be provided in a format that enables digital editing. After the evaluation, owners may opt to exclude property from designation, which will necessitate revision of the boundary and ownership maps. The NNL Program delineates the final boundary of a site recommended for designation.

The following provides specific guidelines for generation of boundary and ownership maps.

A. Proposed NNL Boundary

USGS 7.5-minute topographic map(s) (1:24,000) are the preferred base map; however, depending on the size of the proposed NNL, a smaller or larger scale map may more accurately depict the proposed boundary. Consult with the NNL Program coordinator before making base map substitutions in lieu of the USGS 1:24,000-scale map.

The proposed NNL boundary map should include the following elements (see Appendix F for sample boundary map):

- Proposed boundary (excluded in-holdings must be clearly distinguished)
- Nearest city/town
- Nearest highway/roads
- Water ways

B. Proposed Landmark Ownership Map

This map is identical to the proposed landmark boundary map with the addition of delineation of ownership (parcel) boundaries and landownership information. Use colors or numbers to correspond to a list of landowners either in the map legend or in a separate table if necessary.

VI. PHOTOGRAPH FORMATS

Digital or film cameras may be used to take photographs for inclusion in the evaluation report. Provide captions, including photo credits, directly on sheets with the photographic prints. Images are to be provided in print copy (in the report) and, where available, as digital files.

Photographs Taken with a Digital Camera: Where possible, take and save images directly as TIF files rather than as JPEG images. Images should be captured at a pixel size of 3.2 megapixels (mp) or higher.

Photographs Taken with a Film Camera: Where possible, convert film (photograph or slide) images to digital images by scanning at high-resolution. Scan 35-mm film at a minimum resolution of 300 dpi (dots per inch). Save scanned images directly as TIF files and provide digital image files on a CD.

VII. REFERENCES

Federal Register, 1999, National Natural Landmarks Program; Final Rule, Rules and Regulations, 36 C.F.R., part 62, v. 64, no. 91, p. 25707-25723, May 12, 1999.

Fenneman, N. M., 1928. Physiographic Division of the United States. Association of American Geography Annals 18: 261-353.

National Park Service, 1990, Natural History in the National Park System and on the National Registry of Natural Landmarks: U.S. Dept. of Interior, National Park Service Natural Resource Report NPS/NR/NRTR-90/03, Sept. 1990, 99 p.

National Park Service, 1972, Part Two of the National Park System Plan, Natural History: U.S. Dept of Interior, NPS, U.S. Government Printing Office, O-421-307, 140 p.

Appendix B. Geological and Ecological Natural History Themes

(From NPS 1972 and NPS 1990)

Geological Themes and Sub-themes

Land Forms of the Present (Group 1)	
<p>Themes in this group are manifestations of geologic events and processes that have determined the size, shape, composition and structure of the major feature. Within each theme, geologic landforms are further classified into sub-themes including whether the significance relates to:</p> <ol style="list-style-type: none"> 1. The product (i.e., size, shape, composition or structure of the landform.), and/or 2. The geologic event or process that created the feature. 	
Themes	Sub-themes
1. Plains, Plateaus, and Mesas	<ol style="list-style-type: none"> a. Plains b. Plateaus c. Mesas
2. Cuestas and Hogbacks	<ol style="list-style-type: none"> a. Cuestas b. Hogbacks
3. Mountain Systems	<ol style="list-style-type: none"> a. Folded b. Fault block c. Dome d. Volcanic
4. Works of Volcanism (Includes landforms created by the movement of molten masses of magma)	<ol style="list-style-type: none"> a. Extrusive (e.g., lava flows, cinder cones, craters, necks, etc.) b. Intrusive (e.g., dikes, sills, batholiths, laccoliths, etc.)
5. Hot Water Phenomena (Includes landforms that require water and sources of heat to be produced.)	<ol style="list-style-type: none"> a. Geysers b. Hot springs c. Fumaroles d. Bubbling paintpots e. Hydrothermally altered or colored terrain f. Siliceous sinter terraces
6. Sculpture of the Land (Includes landforms produced by erosive action of water and wind, landslides and other physical or chemical landshaping events or phenomena.)	<ol style="list-style-type: none"> a. Eroded landforms (e.g., buttes, pinnacles, etc.) b. Superposition of drainage systems (e.g., canyons, gorges, valleys, etc.) c. Badland topography d. Mass wasting (e.g., landslides, talus, mudflows, slumping, etc.)
7. Eolian Landforms	<ol style="list-style-type: none"> a. Sand dunes b. Loess deposits c. Other wind-shaped landforms
8. River Systems and Lakes	<ol style="list-style-type: none"> a. Mountain streams b. Valley streams and rivers c. Lakes
9. Works of Glaciers (Includes landforms produced by both mountain and continental glaciers.)	<ol style="list-style-type: none"> a. Glacial deposition (e.g., moraines, eskers, drumlins, kames, erratics, etc.) b. Glacial erosion (e.g., U-shaped canyons, hanging valleys, cirques, arêtes, tarns, fjords, etc.) c. Periglacial features (e.g., patterned ground, rock glaciers, etc.)

10. Seashores, Lakeshores, and Islands	<ul style="list-style-type: none"> a. Seashores (e.g., coral limestone, swampy coast, sandy beach, eroded cliffs, rocky promontory, boulder beach, mangrove beach, stacks, barrier beaches, hooks, stacks, etc.) b. Lakeshores (e.g., eroded cliffs, sandy beaches, rocky beaches, etc.) c. Marine islands (e.g., barrier islands, land-bridge islands, volcanic islands, etc.)
11. Coral Islands, Reefs and Atolls	<ul style="list-style-type: none"> a. Coral islands b. Fringing reefs c. Barrier reefs d. Atolls
12. Caves and Springs	<ul style="list-style-type: none"> a. Solution caves b. Lava caves c. Talus caves d. Sea caves e. Springs f. Karst topography



Geologic History (Group 2)

Themes in this group are based on records of the geologic history of the earth, which can be read in the rocks/landforms and the fossils they contain. Within each theme, features representing the geologic history are further classified into sub-themes including whether the significance relates to:

1. The time period, and/or
2. The location, and/or
3. The environment (e.g., past or depositional environment), and/or
4. The types of fossils present (e.g., diversity, quality, quantity).

Themes	Sub-themes
13. Precambrian Era—The Morning of Life (3 billion - 600 mya.)	a. Precambrian Era
14. Cambrian-Early Silurian Periods—Age of Primitive Invertebrates (~600 - 420 mya.)	<ul style="list-style-type: none"> a. Cambrian Period b. Ordovician Period c. Early Silurian Period
15. Late Silurian-Devonian Periods—Rise of Vertebrates & First Forests (~420 - 350 mya.)	<ul style="list-style-type: none"> a. Late Silurian Period b. Devonian Period
16. Mississippian-Permian Periods—Development of Land Life & Changes in Marine Life (~350 - 220 mya.)	<ul style="list-style-type: none"> a. Mississippian Period b. Pennsylvanian Period c. Permian Period
17. Triassic-Cretaceous Periods—Age of Reptiles (~220 - 70 mya.)	<ul style="list-style-type: none"> a. Triassic Period b. Jurassic Period c. Cretaceous Period
18. Paleocene-Eocene Epochs—Emerging Dominance of Mammals (~70 - 40 mya.)	<ul style="list-style-type: none"> a. Paleocene Epoch b. Eocene Epoch
19. Oligocene-Recent Epochs—Golden Age of Mammals (~40 mya & extending to the present.)	<ul style="list-style-type: none"> a. Oligocene Epoch b. Miocene Epoch c. Pliocene Epoch d. Pleistocene Epoch e. Holocene Epoch

Ecological Themes and Sub-themes

Land Ecosystems (Group 3)	
<p>Themes in this group are derived from some of the more common biological communities characterized by the land-dwelling plants and animals and their associations. Within each theme, biological features are further classified into sub-themes including whether the significance relates to:</p> <ol style="list-style-type: none"> 1. The ecosystem (e.g., high quality, unique composition, habitat for wildlife, etc) and/or 2. The location (e.g., relict populations, range extremes, microhabitats, etc). 	
Themes	Sub-themes
20. Tundra	<ol style="list-style-type: none"> a. Arctic tundra b. Alaskan wet meadow tundra c. Alaskan shrub/tussock tundra d. Alaskan alpine tundra e. Alpine tundra
21. Boreal Forest	<ol style="list-style-type: none"> a. Eastern (white spruce/paper birch/balsam fir/jack pine) b. Appalachian highlands (red spruce/yellow birch/Fraser fir) c. New England and Maritime (white spruce/red spruce) d. Rockies (sub-alpine fir/Engelmann spruce) e. Cascades & Sierra Nevada (red fir/silver fir)
22. Pacific Forest	<ol style="list-style-type: none"> a. High altitude forests (white fir/giant sequoia/Douglas fir/sugar pine) b. Low altitude forests (western arborvitae/Douglas fir/western hemlock/redwood/Sitka spruce) c. Northern Olympic peninsula (hemlock/Sitka spruce) d. Southern Olympic peninsula (Douglas fir/redwood)
23. Dry Coniferous Forest	<ol style="list-style-type: none"> a. Douglas fir forest b. Ponderosa pine forest c. Mixed conifer forest d. Oak-pine forest e. Pinyon-juniper woodland f. Oak woodland g. Savanna
24. Eastern Deciduous Forest	<ol style="list-style-type: none"> a. Oak forest b. Beech-maple forest c. Northern hardwoods d. Mixed mesophytic forest e. Southern mixed forest f. Pine forests
25. Grassland (steppe)	<ol style="list-style-type: none"> a. Tall-grass prairie (eastern plains) b. Short-grass plains (western and central plains) c. Steppe (Rockies and Cascade-Sierra valleys) d. Eastern grassland e. Desert grassland f. Montane grassland
26. Chaparral	<ol style="list-style-type: none"> a. Coastal shrub b. Mixed c. Montane d. Chamiso-redshank e. Interior
27. Deserts	<ol style="list-style-type: none"> a. Great Basin Desert b. Mohave Desert c. Sonoran Desert d. Chihuahuan Desert
28. Tropical Ecosystems	<ol style="list-style-type: none"> a. Lowland rainforest b. Summer-deciduous forest c. Woodland and scrub formation d. Swamp and mangrove formations e. Savanna f. Montane rainforest g. Alpine vegetation

Aquatic Ecosystems (Group 4)			
<p>Themes in this group are based on geomorphological and other physical aspects of the environments of aquatic ecosystems. Within each theme, biological features are further classified into sub-themes including whether the significance relates to:</p> <ol style="list-style-type: none"> 1. The ecosystem (e.g., high quality, unique composition, habitat for wildlife, etc) and/or 2. The location (e.g., relict populations, range extremes, microhabitats, etc). 			
Themes	Sub-themes		
29. Marine Environments	<ol style="list-style-type: none"> a. Exposed coastline and rocky substrate b. Exposed coastline with unconsolidated sediment c. Coral reefs d. Protected coastline with rocky substrate e. Protected coastline with unconsolidated sediment f. Lagoons g. Tidal salt marshes h. Mangrove swamps i. Areas with extensive kelp beds 		
30. Estuaries	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <ol style="list-style-type: none"> a. Flooded river valley b. Tectonic c. Bar-built d. Fjord-type </td> <td style="width: 50%; vertical-align: top;"> <ol style="list-style-type: none"> e. Salt-wedge f. Partially mixed g. Well mixed </td> </tr> </table>	<ol style="list-style-type: none"> a. Flooded river valley b. Tectonic c. Bar-built d. Fjord-type 	<ol style="list-style-type: none"> e. Salt-wedge f. Partially mixed g. Well mixed
<ol style="list-style-type: none"> a. Flooded river valley b. Tectonic c. Bar-built d. Fjord-type 	<ol style="list-style-type: none"> e. Salt-wedge f. Partially mixed g. Well mixed 		
31. Underground Systems	<ol style="list-style-type: none"> a. Cave ecosystems b. Underground streams c. Underground lakes 		
32. Lakes, Ponds and Wetlands	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <ol style="list-style-type: none"> a. Lakes; large deep/large shallow/complex shape b. Crater lakes c. Kettle lakes and potholes d. Oxbow lakes e. Dune lakes f. Sphagnum-bog lakes g. Saline lakes h. Lakes fed by thermal streams i. Tundra lakes and ponds </td> <td style="width: 50%; vertical-align: top;"> <ol style="list-style-type: none"> j. Sinkhole lakes k. Unusually productive lakes l. Lakes of low productivity and high clarity m. Swamps n. Marshes o. Bogs p. Fens q. Wet meadows r. Springs </td> </tr> </table>	<ol style="list-style-type: none"> a. Lakes; large deep/large shallow/complex shape b. Crater lakes c. Kettle lakes and potholes d. Oxbow lakes e. Dune lakes f. Sphagnum-bog lakes g. Saline lakes h. Lakes fed by thermal streams i. Tundra lakes and ponds 	<ol style="list-style-type: none"> j. Sinkhole lakes k. Unusually productive lakes l. Lakes of low productivity and high clarity m. Swamps n. Marshes o. Bogs p. Fens q. Wet meadows r. Springs
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33. Streams:	<ol style="list-style-type: none"> a. Rapidly flowing streams b. Slow meandering streams c. Deltas (both at seashore and at lakeshore) d. Thermal waters e. Spring fed streams 		

Appendix C. National Significance Criteria

Primary Criteria		
Criterion	Description	Example
Illustrative character.....	Area exhibits a combination of well-developed components that are recognized in the appropriate scientific literature as characteristic of a particular type of natural feature. Should be unusually illustrative, rather than merely statistically representative.	Alpine glacier with classic shape, unusual number of glaciological structures like crevasses, and well-developed bordering moraine sequences.
Present condition.....	Area has been less disturbed by humans than other areas.	Large beech maple forest, only a small portion of which has been logged.
Secondary Criteria		
Criterion	Description	Example
Diversity.....	In addition to its primary natural feature, area contains high quality examples of other biological and/or geological features or processes.	Composite volcano that also illustrates geothermal phenomena.
Rarity.....	In addition to its primary natural feature, area contains rare geological or paleontological feature or biological community or provides high quality habitat for one or more rare, threatened, or endangered species.	Badlands, including strata that contain rare fossils.
Value for Science and Education.....	Area contains known or potential information as a result of its association with significant scientific discovery, concept, or exceptionally extensive and long-term record of on- site research and therefore offers unusual opportunities for public interpretation of the natural history of the United States.	Dunes landscape where process of ecological succession was noted for the first time.

Appendix D. Title Page Format

Evaluation of the [site name]

County, State

for its Merit in Meeting National Significance Criteria as a
National Natural Landmark

in Representing

[Title(s) of Primary Natural Feature(s)]

in the [Biophysiological Province Name] Province

by

Author A. Name1, Author B. Name2 and Author C. Name2

Date

1 Institution One, Address One
2 Institution Two, Address Two

Appendix E. Sample Landmark Brief

U.S. Department of the Interior
National Park Service
National Natural Landmarks Program



Name: **Dinosaur Valley**

Location: **Somervell County, Texas**

Description:

Dinosaur Valley, located about four miles west of Glen Rose, Texas within Dinosaur Valley State Park, contains fossil footprints of large, middle Cretaceous dinosaurs preserved in limestone. Stream erosion has exposed them in the bed of the Paluxy River and tributary creeks. These footprints give insight into the habits and locomotion methods of sauropods. This site provided clear evidence that the largest of the dinosaurs walked on land, in spite of their bulk, and that they moved more like elephants than lizards. The tracks also provided evidence that the structure of the fleshy part of the foot was much like that of large mammals of today. In addition, at least one set of carnivore tracks is found overlapping and inside of a sauropod trackway, suggesting a predatory interaction.

Significance:

The series of tracks displayed at Dinosaur Valley are the only known source of distinct and full-grown sauropod footprints and are among the first clearly defined sauropod trackways known in North America. These tracks provided evidence relating to locomotion and foot structure for these large dinosaurs.

Ownership: State

Designation: October 1968

Evaluation: Franklin G. Smith, National Park Service, 1968

Natural Landmark Brief

March 2006

Appendix F. Sample Landmark Boundary Map

