



Natural Resource Program Center

Business Architecture

Reference Service Road Map Functional

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Point of Contact: Brent Frakes

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1 Introduction

1.1 Background

The Reference Service is the NPS Natural Resource Program Center's application for managing references to documents, datasets, media, and collections relevant to managing the National Parks' natural resources. The Reference Service replaces the core functionalities of the NPS Data Store and NatureBib; therefore, the scope of the Reference Service is the management of citations and metadata about reports, datasets, GIS vector coverages, and shapefiles, GIS grids, hardcopy and digital maps, ANCS+ collections, permits, vouchers, field notes, etc. The Reference Service will be designed to be interoperable with other NPS systems external to IRMA, ensuring that it does not duplicate other IT investments.

This Functional Roadmap describes the long-term vision of the Reference Service, **with an emphasis on the general how and why**. It addresses the business logic, workflow, and general functionality that users will ultimately realize when the system is completed. When necessary, this document explains why decisions were made (i.e., pros and cons of any controversial decision) and provides detail that will have major repercussions for the overall business logic and/or functionality.

The reader of this document should note the following. First, this document does not differentiate between the graphical user interface (GUI) and the underlying service, which is GUI independent. It also does not distinguish between the Reference Service and other [IRMA framework services](#) which it may leverage. For instance, the NPS Unit information is handled by the Unit Service, even though this document does not explicitly mention that. Finally, this document does not address the data migration issues related to the legacy applications; while important, it should not drive the design of this system.

This Functional Roadmap will guide the prioritization of Reference Service versions. With each version and iteration, this document will be refined and improved. Figure 1 provides the framework for the modification to this document. Following each iteration, User feedback will inform the overall Project Scope which then informs the priorities for the next iteration.

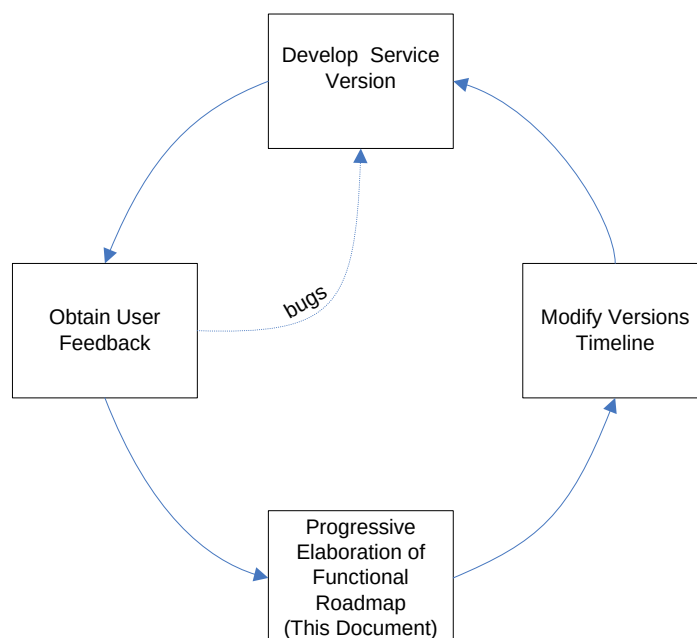


Figure 1. Progressive Elaboration of Functional Roadmap

This document is organized as follows. Each chapter defines important value added functionality for managing references to meet the specific business needs of NPS natural resources staff. Within each chapter, the first section summarizes the functionality, much like an executive summary. Following the

Summary is a more detailed discussion of the functionality. The detailed section addresses any functional requirements identified through the stakeholder interviews conducted in the fall of 2008. During these interviews, a preliminary set of stakeholders were asked a series of open questions regarding what functionality they did and did not like in the legacy applications. Furthermore, they were asked to think outside of the current functionality and describe what the future application could do to help them perform their work tasks more efficiently. Users were asked to describe what they would like and not worry about how that would be implemented or whether it was technically feasible.

The prevailing stakeholder requirements expressed in all the meetings were:

- Easily and effectively ensure high quality information
- Provide accessibility and functionality to all NPS Users and ultimately the public

These requirements are repeating themes throughout this document and form the foundation for the design of this system.

Finally, it is important for the reviewer of this document to note that this Roadmap will never be complete. For instance, many of the Appendices are currently incomplete and/or undergoing considerable review. While this lack of finality may frustrate some readers, it outweighs the risk of not communicating the current vision of the Reference Service.

1.2 Clarification of Terminology

The following terms are either referred to repeatedly or not defined in the document:

Business Logic – The rules for how business objects interact with one another.

Holding Location - A description of the location where the Information Resource, which is described by the Reference, resides. A Holding Location can be in the File Service, on a local computer system, on the internet or intranet, in another national system, or as an analog copy in an office or library. See Section 7. A Holding Location is **not** the actual Information Resource.

Information Resource - Any object that contains natural resources information. It can be digital or analog information. General examples include documents, datasets, multimedia, web resources, or collections.

Reference – A database record that, using core attributes, describes an Information Resource. When reference is capitalized, it pertains to a Reference in the Reference Service.

Role - A set of connected behaviors, rights and obligations that a particular User may inherit or voluntarily accept. See Section 2.2.1.

Stakeholders – Groups of users who would interact with the system in a similar way with similar use cases. These groups of Users (1) have an influence in the design of the Reference Service, and (2) are affected by the completed Service. Stakeholders include Data Managers, Resource Specialists, Regional and Park GIS Specialists, Park Interpreters, Regional and Park Scientists, NRPC Division staff, etc. Ideally, a Stakeholder should be a primary User of the Reference Service.

Taxonomy - Any taxonomy maintained by the Taxonomy Service. Unless otherwise specified, this generally refers exclusively to the biological taxonomy. See Section 6.

Unit - A Unit is any entity within the National Park System of interest to NPS Natural Resources. Units are referenced by a unique 4 to 10 alpha character code. Examples of units include parks, monuments, preserves, rivers, trails, heritage areas, cemeteries, battlefields, wilderness areas, offices, programs, park subunits and divisions, etc. All NPS programs will have their own unique Unit Code.

User – Any person or entity who uses the Reference Service.

Workflow – A common sequence of operations/steps to accomplish a given task.

2 System-Level User Roles and Record-Specific Assignments

2.1 Summary

- A User will be part of one or more system-level roles:
 - Guest
 - Collaborator
 - NPS
 - UPOC
 - Administrator
- Users may be assigned zero or more record-specific roles:
 - Reference Owner
 - Reference Viewer
 - Holding Location Owner

2.2 Detail

Much of the Reference Service's business logic and workflow relies on system-level roles and record-specific assignments. Therefore, the first section of this document is dedicated to these concepts.

Stakeholder interviews identified the following requirements for user management:

- All roles and rights must be clearly defined
- Handle abuses of the system
- Accommodate different User rights, including viewing and editing privileges

The foundation for handling these requirements is detailed in the following sections.

2.2.1 System-Level User Roles

The Reference Service recognizes five system-level roles. Roles are a set of connected behaviors, rights and obligations that a particular User may inherit or voluntarily accept in relation to owning, managing, stewarding, administering and/or viewing References. Which Role a particular User inherits often depends on whether they have been authenticated and, if so, whether they are an NPS employee.

Authentication is the means by which a User identifies and verifies who they are. Users authenticate automatically to the Reference Service by having already logged on to an NPS computer (i.e., no need to provide an additional username and password). When not using an NPS computer, authentication will require providing a username and password, which, if the User is associated with the NPS, will be the same as the active directory login.

2.2.1.1 Guest

The Guest role is given to any User who has not been authenticated. The general public would be given this role. Additionally, any User who abuses Reference Service policies will be given this role.

2.2.1.2 Collaborator

The Collaborator Role is given to Users who, based on authentication, have been given special permission to access the Reference Service, but are not employed by the NPS. Non-NPS employees can be a research collaborator, working for another federal agency, or someone having some other need to be registered with the Reference Service.

2.2.1.3 NPS

The NPS Role is given to Users who are permanently, temporarily, or seasonally employed by the NPS. NPS employment can include working at a park, network, or other NPS office or can include NPS contractors and Partners. Any User who has an active directory account will be part of this role.

2.2.1.4 Unit Point of Contact (UPOC)

Every Unit within the NPS - whether it is a park, network, regional office, or the national office - will designate one or more Unit POC(s). This shared role can be given to any NPS employee, regardless of whether they reside at the Unit. For instance, the Data Manager for the Rocky Mountain Network could share the UPOC role with park staff at one of the Network's respective parks. More information regarding the UPOC Role is handled in Section 5.2.2. Likewise, larger Units may designate multiple Users to be UPOCs. Although it will be up to each Unit to define the criteria for selection, the Reference Service will provide recommendations and offer clear guidance to the UPOCs.

The UPOC can delegate the role to other Users. Delegation has the benefit of splitting up the workload, allowing UPOCs to handle specific areas of expertise, and cover for the UPOC if they are on annual leave. Ultimately, it will be up to each Unit and UPOC to determine to whom and when they delegate their role.

2.2.1.5 Administrator

A very small subset of NPS employees will be part of the Administrator role. This role has all available rights and permissions associated with the Reference Service.

2.2.1.6 Summary of System-Level Roles

Permissions associated with each role are summarized in Table 1. Permissions are inherited when moving down the table from Guest to Administrator. For example, the Collaborator Role has all of the Guest permissions plus additional permissions. Likewise, the NPS role inherits the Collaborator and Guest Role permissions.

Except in rare cases, Users will only have only one system-level User role. One notable exception is when a User is the UPOC for more than one Unit. Additionally, an Administrator may also serve as a UPOC, although this case is expected to be rare.

Primary Role	Inherited Role Permissions	Requires Authentication?	Requires NPS Employment?	Designated by Unit?	Added by Administrator?
Guest					
Collaborator	Guest	Yes			
NPS	Guest Collaborator	Yes	Yes		
UPOC	Guest Collaborator NPS	Yes	Yes	Yes	
Administrator	Guest Collaborator NPS	Yes	Yes		Yes

	All UPOCs				
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Table 1. Summary of System-Level Roles

2.2.2 Record-Specific User Assignments

Record-specific assignments are those that apply to a single record in the Reference Service. Any User can have zero or more record-specific assignments in addition to the system-level roles. All record-specific assignments require authentication, but do not require NPS-employment or designation by a Unit or Administrator. The record-specific assignments provide specific permissions to Users, independent of their roles.

The following sections detail the most important record-specific assignments for editing and viewing information. Other record-specific assignments are handled in their respective sections.

2.2.2.1 Reference Owner Assignment

When a User creates a Reference, the User inherits the Reference Owner assignment for that Reference and *has complete authority and responsibility* for its attribution and stewardship (content, quality, currency, etc.). For example, the Reference Owner is responsible to ensure the Reference and associated Information Resources are attributed correctly for sensitivity, proprietary ranking and quality.

The Reference Owner can lock or unlock a Reference, approve and undo edits, and delegate this assignment to other Users of the Collaborator Role or above. Reference Owners can also assign the Reference Viewer assignment to other Users of the Collaborator or above Role.

For each Reference, the Reference Owner must designate at least one delegate as Reference Owner. Should the Owner leave the NPS or permanently lose system level rights, having at least one other Reference Owner ensures records are not orphaned (i.e., without an Owner). Reference Owner delegates can be added and removed at any time as long as there is always at least one Reference Owner and one delegate Reference Owner.

Because the Reference Owner assignment does not depend on a Unit affiliation, if a Reference Owner changes positions within the NPS, they will still maintain ownership of their respective References. In many cases, however, it will be advantageous to transfer the Reference Owner assignment to the staff replacing them in their previous position.

Section 3 provides more detail more about Reference management.

2.2.2.2 Reference Viewer Assignment

The Reference Viewer assignment, which is granted by the Reference Owner, provides a User with special permission to view a Reference. This assignment is important when the Reference would otherwise not be visible to a User with a system-level Role (e.g., Collaborator). For example, the Reference Owner could assign Reference Viewer permission to a USGS employee of the Collaborator Role to view a Reference and/or Information Resource that contains sensitive information regarding the location of wells.

Section 3.2.3 provides more detail regarding the viewing of References.

2.2.2.3 Holding Location Owner Assignment

The Holding Location Owner is a User who creates a Holding Location for a specific Reference. The Holding Location Owner has complete authority and responsibility for stewardship of the Holding Information (e.g., content, quality, currency, etc.). The Holding Location Owner can lock or unlock a Holding Location, approve and undo edits, and delegate this assignment to other Users of the Collaborator or above Role.

Section 7 describes more about the management of Holding Locations.

2.2.3 Summary of Key System-Level Roles and Record-Specific Role Permissions

Table 2 provides a summary of the key permissions associated with these system-level roles and record-specific assignments. Important to the interpretation of the table is that permissions are additive. In other words, if a User has at least the Collaborator Role and the Reference Viewer assignment for a particular restricted Reference, the Collaborator (or other) role may not afford them the right to view the Reference, but their Viewer assignment will.

System Level Permission	Guest Role (See 2.2.1.1)	Collaborator Role (See 2.2.1.2)	NPS Role (See 2.2.1.3)	UPOC Role (See 2.2.1.4)	Administrator Role (See 2.2.1.5)	Reference Owner Assignment (See 2.2.2.1)	Reference Viewer Assignment (See 2.2.2.2)	Holding Location Owner Assignment (See 2.2.2.3)
View All Public References, Holding Locations, and/or Digital Files (See 3.2.3.1.1, 7.2.3.1, 7.2.4.1)	Yes	Yes	Yes	Yes	Yes	No	No	No
View All Select References, Holding Locations, and/or Digital Files (See 3.2.3.1.2, 7.2.3.27.2.4.2)	No	Yes	Yes	Yes	Yes	No	No	No
Create a Reference (See 3.2.2.1)	No	Yes	Yes	Yes	Yes	No	No	No
Suggest Changes to References (See 3.2.4.1)	No	Yes	Yes	Yes	Yes	No	No	No
View All Internal References, Holding Locations, and/or Digital Files (See 3.2.3.1.3, 7.2.3.3, 7.2.4.3)	No	No	Yes	Yes	Yes	No	No	No
View All Restricted References, Holding Locations, and/or Digital Files (See 3.2.3.1.4, 7.2.3.4, 7.2.4.4)	No	No	No	Yes, if linked to their Unit	Yes	No	No	No
Approve/Reject Reference-Unit Link (See 5.2.2)	No	No	No	Yes	Yes	No	No	No
View Single Reference (See 3.2.3.1.4)	No	No	No	Yes, if linked to their Unit	Yes	Yes	Yes	Yes
View Single Holding Location (See 7.2.3.5)	No	No	No	Yes, if linked to their Unit	Yes	Yes	Yes	Yes
View Single Digital File (See 7.2.4.5)	No	No	No	Yes, if linked to their Unit	Yes	Yes	Yes	Yes
Edit Single Reference (See 3.2.4)	No	No	No	No	Yes	Yes	No	No
Edit Single Holding Location (Section)	No	No	No	No	Yes	No	No	Yes
View Reference Change History (See 12.2.3)	No	No	No	No	Yes	Yes	No	No

Table 2. Granted Permissions for Key System Level Roles and Record-Specific Assignments

These permissions will be addressed in more detail in the forthcoming sections.

3 Reference Management

3.1 Summary

- There are three levels of Reference attribution. All References share a small core set of attributes, which are fundamental to discovery and basic interpretation. All References are further attributed by the format of the information source (e.g., journal article, photograph, or dataset). References are optionally attributed by the information content (e.g., fire)
- Any User with the Collaborator role or above can create a Reference and is assigned the Reference Owner.
- Any User with the Collaborator role or above can suggest changes to a Reference, although the workflow varies depending on whether the Reference is locked or unlocked by the Reference Owner
- The ability of any User to view a Reference depends on its specific attributes and/or whether the User has the appropriate record-specific role.
- Extensive quality assurance and control measures will be used to ensure quality information.

3.2 Detail

Reference management is the primary function of the Reference Service. This section discusses Reference attributes along with the primitive functionality of creating, editing, viewing and deleting References. Because the number of stakeholder comments regarding reference management was so large, summaries of stakeholder requirements are split among the sections.

3.2.1 Reference Attributes

Stakeholder interviews highlight a number of legitimate, yet sometimes conflicting, requirements regarding the attribution of References:

- Minimize the number of required fields, yet still capture key information and make a Reference discoverable.
- Meet all applicable laws for attribution (e.g., FGDC requirements for geospatial datasets).
- Balance internal NPS business needs and the public's right to view the appropriate References.
- Accommodate all types of information.
- Minimize the number of workforms and attribution necessary to make information discoverable.
- Accommodate specialized programmatic needs for attributes to facilitate searching and discovery.
- Need ability to resolve disputes among Users of the system

To address these as best as possible, there will be three levels of attribution any Reference may have: Core, Type-Specific, and Content-Specific. Note that definitions and enumerations for the Core and Type specific attributes are found in Section 15.

3.2.1.1 Core Attributes

All References, whether a book, photograph, or dataset, will have a core set of attributes. Core Attributes are those that are fundamental to description, searching/discovery, prevention of duplicate entries, and the initial interpretation of a Reference's value to the end User following a search. Core Attributes will have the most extensive quality assurance and control measures, particularly for the control of duplicates. Core Attributes are generally required, although some may be completed with an "Unknown" or comparable value. If the required core attributes are not completed, a Reference may not move beyond a "Draft" lifecycle state and, consequently, will only be visible to the Reference Owner (Section 2.2.2.1). Once all core attributes are completed, a Reference can optionally be activated by the Reference Owner and, therefore, be more broadly discoverable.

Some notable examples of core attributes that address stakeholder needs include:

- Title, Date of Issue, Author – These three attributes (what, when and who) generally uniquely identify any reference.
- Spatial Geometry – Almost any information resource applies to some spatial location, whether it is a sampling point, park unit, bounding box, state, country or the entire world.
- Proprietary Ranking – Whether the Information Resource contains copyright/licensed information.
- Sensitivity Ranking – Whether the Information Resource contains sensitive information (e.g., T&E locations).
- Quality Ranking – Whether the Information Resource has quality information.
- Subject Category – A controlled list of subjects categories tailored to the needs of natural resources

The number of core attributes managed by the Reference Service will rarely, if ever, change; any change must be approved programmatically (i.e., via controlled change management). Definitions for all core attributes are found in Section 15.1.

3.2.1.2 Type-Specific Attributes

Depending on the type of the Information Resource (e.g., book chapter, journal article, dataset, picture, etc.), a Reference will also have more attributes that are type-specific. The purposes of the type-specific attributes are threefold. First, they more precisely describe a Reference. For instance, a journal article has attributes (e.g., volume, issue, and page range) that are common to all journal articles but do not apply to most or all other formats like digital photos. Second, the type defines how the Reference should be viewed. For example, the presentation of a journal article Reference should be different from a map Reference, both in the order of fields and the field names. Third, the reference type defines how some References may be related to others. For instance, a book chapter can be part of a book, but a book chapter can never be part of a picture (See Chapter 4 for more discussion). Finally, types help inform discovery since Users are often interested in one or more types of References (e.g., all written materials, etc).

Similar to the core attributes, type-specific attributes will have quality assurance and enforced business rules, although not as stringent as with the core. Furthermore, more of the attributes will be optional.

Most References are likely to be of one type, although there may be a few, albeit rare, cases where a Reference can be associated with more than one type. For instance, an unpublished report may contain an appendix with a complete database. Assigning the Reference to both the unpublished report and database ensures that the Reference is documented and discoverable in two different ways.

As with the core attributes, type-specific attributes will only periodically change via controlled change management. Section 15.1.19 describes the list of proposed reference types, while section 15.2 presents the type-specific attributes.

3.2.1.3 Content Specific Attributes and Extensions

Content-specific attributes are the Reference Service's controlled means of managing additional attributes based on the content of the Information Resource. For example, a report and dataset may both have content related to a vegetation inventory. A formal grouping of content-specific attributes is known as an extension. A Reference may have zero or more extensions.

There are two possible ways that content-specific attributes and extensions will be managed. First, it is most likely that other high-level services will build off of the functionality of the Reference Service and offer user community-specific attribution and functionality. These high-level services could be developed by any group participating in SOA collaboration. For instance, a new "GIS Metadata Service" could offer the ability to fully document datasets following FGDC guidelines. Because this "GIS Metadata Service" leverages the core functionality of the Reference Service, all GIS data would still be discoverable in the Reference Service. A second option is for the Reference Service to offer this functionality internally, for selected content types. For example, a Fire Program-specific extension could be designed to capture attributes that better describe fire products.

3.2.1.4 Using Forms For Viewing and Editing

To aid the User in creating and viewing References, the Reference Service will maintain a set of forms that, depending on the Reference Type, will allow viewing/editing of relevant attributes. For instance, the relevant fields for viewing a reference type of journal article would have fields for Date, Authors, Title, Journal, Volume, Issue, and Page Range. For a photograph, the relevant fields might include Title, Date, and Photographer.

In the case where a reference has more than one type, it would be possible to view the attributes for each type separately or together.

3.2.1.5 Mandates for Attribution

To accommodate various needs and not develop an overly complex system, the Reference Service will neither enforce all of FGDC requirements for attribution nor provide a relational database framework for managing the entire suite of FGDC metadata attributes and extensions.

Nevertheless, legal requirements can still be accommodated. First, as already discussed in Section 3.2.1.3, the Reference Service can support higher-level services that are fully compliant with various requirements, including FGDC. Second, if someone uses desktop software to create a metadata record, which is encapsulated in a file (e.g., xml) that has attributes not managed by the Service, the Reference Service will archive the original file and return the original file as needed (See Section 10.2.6 for more details on importing). Thus, information is never lost. Furthermore, depending on the Reference type (e.g., geospatial dataset, report, newspaper article, etc.), References discoverable by the public will be required to meet minimum standards for attribution. Finally, should the Users determine that a complete FGDC Extension is necessary and agree on the required and optional attributes, the Reference Service can be extended to provide that functionality (See Section 3.2.1.3).

3.2.2 Creating a Reference

Stakeholder interviews defined a set of general requirements related to the creation of References:

- Simplify, streamline, and clarify creation process.
- Facilitate entry and use by all NPS Users.
- Spread workload/responsibility to avoid bottlenecks.
- Control for quality, duplicates, and content scope.
- Accommodate time constraints of User.
- Accommodate varying definitions of "useful" information.
- Balance flexibility with standardization.

- Minimize system timeout information loss.
- Accommodate all types of information.

3.2.2.1 Who Can Create

Any User with the Collaborator role or above (Section 2.2.1) can create a Reference. Allowing a broad user community to create References ensures that the system will be fully used by removing any subjective and bureaucratic barriers involved in determining who is qualified or competent to create References. When the User creates the Reference, they are assigned the Reference Owner (Section 2.2.2.1).

The only requirement for creating a Reference is that the User must take a short online training course and test. The training will highlight the key functionality of the system, orient the User to further help, and emphasize the need to (1) maintain quality information and (2) protect sensitive information. The test will confirm a basic understanding of the Service and its policies and require each User to accept responsibility for any Reference they create.

Granting any Collaborator the right to create a Reference assumes that all Users will observe NPS and Reference Service rules and guidance. There is indeed a risk inherent in this assumption. Some Users may add inappropriate References or not adequately evaluate the information for sensitivity, copyright, or quality. However, the legacy solution to minimizing such risks through strict enforcement of logins and permissions has proven to be counterproductive. To minimize this risk of compromising quality, the Reference Service offers functionality in the following areas: quality assurance (Section 3.2.5), Reference editing (Section 3.2.4), duplicate Reference management (Section 4), notification (Section 13), and system-level roles and record-specific assignments (Section 2).

3.2.2.2 When

Any User with the Collaborator role or above can create a Reference at any time. A Reference can be created even before it meets the minimum attribution requirements (See Section 3.2.1), ensuring that a User who does not have enough time to complete a Reference can get started and finish later. When a Reference is created, it automatically is given a 'Draft' lifecycle state until final verification by the Reference's Owner (See Section 15.1.14). The verification process includes automated checking for duplicates, spelling errors, omission of required fields, and enforcement of other business logic rules. Following a verification process and assuming that minimum requirements are met, the Reference Owner can optionally change the Reference status to 'Active', where it is discoverable by others (See Section 3.2.2). Further quality assurance and control of the Reference is discussed in Section 3.2.5.

A Reference can also be created and completed before the Information Resource is complete. In this scenario, a placeholder is created to let other Users know that a product is in development. However, since the Reference Service does not accommodate the sharing of draft documents for the purpose of commenting and editing, only in rare instances should draft Information Resources (i.e., the draft version of the digital file) be made available via the Reference Service.

3.2.3 Viewing

Interviews with stakeholders identified the following general requirements regarding the viewing of References:

- Public Accessibility - Generally default to allowing everyone, including the public, to view References.
- Different User Permissions - Different Users should have different viewing permissions. Clearly and easily define and control who can view a Reference.
- Satisfy Legal Requirements - Recognize important legal requirements for viewing References.

- User Friendly - Customizable views. View most important information first.

3.2.3.1 System-Level Permissions Viewing Reference

To help clarify who can view a Reference, it is critical to define classes of References that meet specific and agreed-upon criteria. The following sections define each of these classes.

3.2.3.1.1 Public References

References that meet all of the following criteria are defined as Public References:

- The Reference's Lifecycle State is 'Active' (Section 15.1.14).
- The Reference does not contain any sensitive information, whether operationally and/or legally sensitive (Section 15.1.12)
- The Reference is not a duplicate of another reference (Section 4.2.1.1)
- The Reference is not proprietary or contains proprietary information with permission to distribute to the public (Section 15.1.15)
- The quality of information in the Information Resource is 'Good' or 'High' (Section 15.1.12)
- The Reference has at least one 'Accepted' link to a NPS Unit (Section 5).

Any Guest User will automatically will be able to view all Public References.

3.2.3.1.2 Select References

References defined as Select meet all of the following criteria:

- The Reference lifecycle state is 'Active' or 'InReview' (Section 15.1.14.)
- The Reference does not contain any sensitive information, whether operationally and/or legally sensitive (Section 15.1.12)
- The Reference is not proprietary (Section 15.1.15).

Any User with the Collaborator role or above will be able to view all Select References.

3.2.3.1.3 Internal References

References defined as Internal meet all of the following criteria:

- The Reference Lifecycle State is 'Active' or 'Legacy' or 'InReview' (Section 15.1.14).
- The Reference does not contain legally sensitive information, but may contain operationally sensitive information (Section 15.1.12)
- The Reference may be distributed internally (i.e., 'Copyrighted, Distribute Internally' - Section 15.1.15).

Any User of the NPS Role will be able to view Internal References.

3.2.3.1.4 Restricted References

References defined as Restricted meet any of the following criteria:

- The Reference contains legally sensitive information (Section 15.1.12)
- The Reference contains proprietary information with no permission to distribute internally (Section 15.1.15)
- The Reference is in a 'Draft', 'QC_Approved', 'Inactive' or 'Quarantined' Lifecycle State (Section 15.1.14).

Only Users of the Administrator Role automatically will be able to view all Restricted References. UPOCs have permission to view all Restricted References linked to their respective Unit.

3.2.3.2 Record-Specific Viewing Assignments

Beyond the system-level user roles and viewing permissions, affiliation with other NPS Units does not afford a User any extra permission to view References, particularly those that are Restricted. In these specific cases, permission to view or edit a Reference is User-specific and is likely to transcend Unit affiliations. For instance, if a Reference contains sensitive information about the location of minerals, the geologist and resource specialists at a park unit may be the only two staff required to have viewing permission. The Reference Owner may also need to give viewing permission to a geologist employed by the USGS, with whom he/she is collaborating. Therefore, the Reference Owner may selectively assign Reference Viewer to one or more Users with the Collaborator role or above.

On rare occasions a User may attempt to create a Reference for one that is already present but not automatically visible to that User (e.g., Restricted). If this occurs, both the Reference Owner and User will be notified that the User is attempting to create a duplicate reference. Both parties will need to determine whether:

- The User should be assigned the Reference Viewer/Owner
- The User should link their Holding Location to the Reference
- The User or Reference Owner has information they shouldn't and should take appropriate action (e.g., send the copy of the Information Resource to the Reference Owner).

In addition to the Reference Owner and Viewer, the following assignments have permission to view a specific Reference:

- Holding Location Owner - The Holding Location Owner has a copy of the Information Resource; preventing them from viewing the Reference is nonsensical and should already be addressed by the process mentioned above.
- UPOC, if the Reference is linked to their respective Unit – In addition to being a trusted individual, they will need to view the Reference (and information Resource) to determine whether they approve the link to their Unit.

Cases not accommodated by these general rules and scenarios likely reveal other security issues which are well beyond what the Reference Service can reasonably handle.

3.2.3.3 Viewing Permissions Summary

In summary, the above criteria function as automated filters with the goal of transparently, seamlessly and effortlessly providing information to the appropriate Users. These filters combined with the ability to override default permissions via the Reference Viewer assignment meets the Stakeholder requirements for (1) public accessibility, (2) customizing for different viewing permissions, and (3) satisfying legal requirements. Public Accessibility is addressed by the fact that, unless a Reference is filtered, it will be visible to the public; the Reference Owner does not have to make an explicit and extra effort to release a Reference to the public. Viewing permissions depend on a number of criteria, which should ensure the appropriate User Roles can see References without the Reference Owner having to explicitly define permissions. Finally, legal requirements, particularly those related to providing high quality, non-sensitive, and non-proprietary information to the public, are addressed by all of the criteria.

3.2.3.4 View Options

Based on the stakeholder requirement to customize views of References, the Reference Service will offer intuitive screens for viewing References, regardless of the Information Resource. The User will be able to:

- Optionally view certain fields/attributes.
- View most important attributes first.
- Optionally not view sensitive or proprietary References, even if the User has permission.
- Customize views of References.

3.2.4 Editing a Reference

Many of the Stakeholder comments regarding the editing of References overlap those for creating. For instance, Users need a simple process with useful tools for editing and controlling for quality. There are, however, certain requirements which are specific to editing:

- Track all changes to a Reference through time.
- Enable editing and updating of poor and out-of-date records.
- Share the editing burden and avoid bottlenecks.
- Easily identify and fix poor records.
- Respect ownership rights regarding record editing

3.2.4.1 Who May Suggest Changes and Edit

In general, if a Reference is visible to a User (See Section 3.2.3) and the User is at least a Collaborator, the User may suggest a change to any attribute of that Reference, even if the User is not the Reference Owner (Section 2.2.2.1). This has the advantage of enabling References to be improved regularly and immediately as mistakes - typos, misspellings, grammar, etc. - are discovered by others. In addition, it distributes the burden of updating and improving References through time.

However, to ensure that Reference Owners maintain control over the editing process, they can either lock or unlock a Reference, which affects the editing process. For locked References, a Collaborator (or above) (i.e., non-Owner) may suggest a change by directly editing the Reference. The Reference Service then notifies the Owner that another User has made a suggested change to the Reference. During the gap between the notification and the Owner response, the locked version of the Reference remains the official version visible to all other Users. When the Owner responds to the notification, the Owner will be able to see which fields were edited and simultaneously view the original and modified information. If the Owner accepts the suggested changes, the revised Reference is then visible to other Users. If the changes are denied, the Reference remains as it is, the User is notified that suggested changes were rejected, and the suggested changes are archived by the Reference Service.

With unlocked References, a non-Owner can suggest changes which are immediately visible to other Users. Following editing, the Reference Owner is notified of the change and has the opportunity to either accept or deny such changes. Should the owner deny a change, the Reference reverts back to its prior condition.

There are a few exceptions to the editing process that do not depend on a reference being locked/unlocked. Any suggested change to a Reference's (1) Lifecycle State (i.e., changing from Active to Inactive), (2) Sensitivity Ranking, (3) Proprietary Ranking, and/or (4) Quality Ranking causes the Reference to become Restricted, rendering the Reference invisible to all except a few select Users (The User making the suggested change can still view the Reference, however, even if not assigned a Reference Viewer). Changes to any of these fields implies that the Reference is blatantly misleading, egregiously incorrect (i.e., beyond simple misspellings, cleanup, and editing), or, more seriously, has

been incorrectly evaluated for sensitivity, copyright, and/or quality. Only following review and resolution will the Reference again be visible to the appropriate User Roles.

There are pros and cons to having such a stringent policy. On the one hand, this could be abused and there is a chance some records will be invisible at any one time. On the other, this ensures that there is a very conservative process for preventing any disclosure of information that could harm the NPS's reputation and/or its natural resources.

3.2.4.2 When

The Reference Owner can make changes to the Reference as needed.

Suggesting changes to a Reference can also occur at any time. However, to prevent Users from making suggestions to References currently being edited, Users are warned about suggesting modifications to an attribute that has suggestions pending Owner review.

3.2.4.3 Arbitration

The Reference Service does not intend to be a top-down, formally-monitored, and controlled service (i.e., there will **not** be any Reference Police). In extremely rare instances, however, Users may not be able to resolve disputes and will need to rely on the guidance of individuals who specialize in various topical areas, including T&E species, FOIA, legal and policy requirements for information quality, unit-specific policies, taxonomy, etc.

In cases where a non-Owner and Owner disagree on changes to a Reference, the NRPC will provide guidance for arbitration, including recommended experts in particular topical areas (e.g., FOIA), to provide assistance. The ability to refer to system-level experts ensures that legal requirements, NPS policies, and Unit mandates ultimately prevail in how information is managed and accessed.

3.2.4.4 Tracking Changes

There are a few important items to know about any change to a Reference:

- Who made the change?
- When did they make the change?
- What was the change?
- Why did they make the change?

The first three items are addressed more thoroughly in Section 12. To track why changes were made, the Reference Owner will always be prompted to comment as to why the change is being made (See Section 11).

3.2.5 Quality Assurance and Control

More than any other requirement, Stakeholders repeatedly emphasized the need to enforce quality assurance and control measures to guarantee that other Users, and particularly the public, have access to useful information. Quality assurance is ensuring that good information is entered into the system. Quality control is the process of confirming information is accurate following its entry into the system. The Reference Service will rely on automating both techniques, although it will place more emphasis on assurance than on control.

Some of the ways that quality will be enforced is through providing:

- Unambiguous field definitions and purposes.

- Clear lifecycle definitions (e.g. 'Draft', 'Active', 'Inactive') that determine who is able to discover and view References.
- Standardized picklists (when appropriate).
- Batch editing.
- Automated and immediate (i.e., before the Reference is active) checking for duplicate References.
- Spell checking.
- Clear directions for data entry.
- Training and testing modules, guidance documents, and help screens.
- Templates/defaults.
- Assigning new and/or imported References to a "Draft" lifecycle state. Draft Reference must pass an automated quality control process before they can become 'Active'.
- Reference relationships that minimize duplicate data entry and accommodate both duplicates (Section 4.2.1.1) and versioning (Section 4.2.1.3).
- Peer-review of the References and the Information Resources (See Sections 3.2.4 and 5 and 13).
- Arbitration (Section 3.2.4.3).

The Reference Service will have extensive batch editing capability (e.g., modifying one or more attributes for a set of References). Batch editing is available only for the Reference Owners.

3.2.6 Searching

This is covered in depth in Section 8.

3.2.7 Deleting

In most cases, stakeholders identified the desire to delete a Reference as a means for maintaining quality, especially when attempting to resolve and manage duplicates. Additionally, stakeholder groups articulated the following needs regarding deleting References:

- Ensure that external links to deleted References don't lead to dead-ends or system errors
- Prevent and resolve other broken links (e.g., an NPSpecies record that points to a deleted report)

References are never permanently purged from the Reference Service; thus, "deleting" a Reference results only in its lifecycle state changing from 'Active' to 'Inactive' (See also Section 15.1.14). When the Reference Owner first attempts to set a Reference to "Inactive", he/she will be notified of any related References that will be affected by such an action – e.g., Reference Relationships (Section 4), Holding Locations (Section 7), Unit-Links (Section 5).

If the Reference Owner continues with deleting the Reference, despite the broken links, other affected Users (e.g., another User who owns a Reference linked to the inactive one) are notified of the change in a Reference's status and have one of three options: (1) protest the change and request the Reference remain 'Active', (2) accept the change and modify any links accordingly; (3) ignore the change.

When a Reference is set to Inactive, it is only discoverable and viewable by the Owner and other Users with special viewing permission. However, anyone attempting to follow a link to an inactive Reference will not receive an error. The User will be informed that the Reference was set to inactive and, if the

Reference was a duplicate, will be directed to the appropriate Reference. The Reference Owner will also be notified that someone was trying to access the inactive Reference and will always have the option of re-activating the Reference. If the Reference Owner sets a Reference to 'Inactive' and that Reference has never previously been 'Active', it will automatically be purged (i.e., removed completely) from the Reference Service.

4 Reference Links

4.1 Summary

References and/or their related Information Resources can formally be related to each other in one or more ways:

- Is Duplicate Of – A Reference is a duplicate of another Accepted Reference.
- Is Bundled With - A Reference and its associated Information Resource are part of the same project.
- Supersedes - A newer version of an Information Resource, along with its associated Reference, replaces an older version
- Is Product Of – An Information Resource is derived from another Information Resource.
- Is Physically With - An Information Resource resides with, yet is generally independent of, another.
- Is Surrogate For - A Surrogate Reference functions as a replacement for another Reference, should a User have restricted access
- Is Part Of - One Information Source is part of another and the description, discovery, and interpretation of that Reference depends entirely on the other Reference(s).

4.2 Detail

Few References (i.e., Information Resources) are created entirely independent of others. For instance, updated versions of a dataset that reflect new information may be added as needed. In other cases, datasets and reports from the same project must travel together for proper interpretation and use.

Stakeholder interviews identified a number of cases which can be effectively accommodated by Reference Links. The following are listed in order of frequency; the first two cases, in particular, were discussed in almost every meeting:

- Bundling Project Deliverables – documents, datasets, maps and permits must travel together, sometimes organized hierarchically. References about each item may need to be discovered individually or as a group.
- Resolving Duplicate References – While having two identical References is misleading and confusing, being forced to permanently delete one of the two References is neither easy nor effective. System must automatically find and enable duplicate correction.
- Versioning – Some Information Resources, particularly datasets, have repeating maintenance life cycles. Preservation of the older information has merit for particular studies.
- Substitute one Reference for another depending on the User's permissions

Additionally, Reference Links may also address one of the most common user requirements: quality control. Reference Links potentially prevent duplicate entry of information that may be inconsistently entered and ultimately be more difficult to resolve.

Beyond the general requirements for having Reference Links, stakeholders were not explicit in the functional requirements regarding the creation, editing, viewing or deleting of such links. Thus, the remaining sections are not necessarily derived from specific stakeholder suggestions.

4.2.1 Link Types

The Reference Service recognizes a number of links that a Reference may have. As much as possible, the links are unidirectional, and complement the user workflow for creating and linking. In some cases, the links explicitly pertain to the References; while in other cases refer to the associated Information Resources. Finally, these links are not always mutually exclusive so it is feasible that some References may have one or more of the following associations.

4.2.1.1 Is Duplicate of

'Is Duplicate Of' designates that a Reference (not the Information Resource) is a duplicate of another *Accepted* Reference. An Accepted Reference, which requires agreement among all vested Owners, is the Reference that is considered official. The Owner of the Accepted Reference has the option of harvesting the information from the duplicate records and also adding the other Reference Owners as delegates. When assigning the Reference as a duplicate, its lifecycle state changes to 'Inactive'.

There may be cases where the Owners of potential duplicate References may not agree on the *Accepted* Reference, either because they do not have enough information or are unwilling to yield Ownership. In these cases, duplicates will Reference each other as *Unaccepted* References

In general, duplicate References are not discoverable in searches (See Section 8.2.1), foremost because they are 'Inactive'. Requests for the inactive duplicates will be directed to the appropriate Reference.

4.2.1.2 Is Bundled With

The 'Is Bundled With' relationship is used when a Reference and its associated Information Resource are part of the same project. References (and optionally any attached files) are by default, grouped together on download, although the user always has the choice of retrieving only the individual References and/or files.

Bundling requires creating a project reference type to which all other References link. Additionally, only appropriate references types can be bundled with a project. For instance, it is valid to bundle a report and dataset with a project but invalid to bundle a book series with a project.

Other types of informal and subjective bundling not related to a formal project are handled through Reference Collections (See Section 9)

4.2.1.3 Supersedes

This relationship is used to indicate that a newer version of an Information Resource, along with its associated Reference, replaces an older version. Superseded References are still visible to all users but also indicate that a newer version exists. For example, when viewing a park's 1970 boundary, the Reference Service would also inform the User of other available versions and that the latest version is from 2008.

The 'Supersedes' relationship is not intended to be used when replacing incorrect or inappropriate References and/or the Information Resource itself. These cases are handled more directly through editing of the Reference (See Section 3.2.4) or replacing the digital file (See Section 7.2.5).

4.2.1.4 Is a Product Of

Some Information Resources are derived from other Information Resources managed by the Reference Service. A case in point is a Vegetation Map, whose creation depended on the use of remotely sensed imagery, the park boundary, a roads layer, and a digital elevation model. Likewise, 'Is a Product Of' can indicate that the generation of a report relies on one or more other References.

4.2.1.5 Is Physically With

The “Is Physically With” relationship among References handles cases when an Information Resource resides with, yet is generally independent of, another. For instance, a report may have a map in the back cover. The report and map have separate authors, titles and perhaps publication dates, and therefore each require their own Reference for proper attribution. Because the map is part of the report, however, it would be difficult to find the map without locating the document.

4.2.1.6 Is Surrogate For

A Surrogate Reference functions as a replacement for another Reference, should a User not have the appropriate role for viewing/downloading. This relationship provides Reference Owners the flexibility to control User access. For instance, two References are bundled as part of a project: (1) a Reference about a report, (2) a Reference containing sensitive information about a dataset (e.g., the Reference's abstract contains T&E location information). The Owner of the Reference for the dataset designates that an alternate Reference (which is purged of the sensitive information in the abstract) “Is the Surrogate For” the sensitive Reference.

A User attempting to view and/or download all of the References in the bundle will see different items, depending on their viewing permissions (See Section 3.2.3.1). A User of the Role with permission to see the Reference will see the one containing the abstract with T&E location information. A User of a Role without permission would first be informed they do not have permission to view the sensitive document and only will be able to download and view the Reference and/or Information Resource purged of the T&E location information.

4.2.1.7 Collection

This informal relationship has a very different logic for creating, viewing, editing, and searching. Therefore, it is described separately in Section 9.

4.2.1.8 Is Part of

The last relationship is one that most users will not need to be concerned with, but will certainly realize the flexibility in having this type of relationship. It allows the Reference Service to be much more efficient in creating new records, minimize the need to add redundant information, prevent duplicates, and provide considerable flexibility in searching.

“Is Part Of” indicates that one Information Resource, and its associated Reference, is part of another and the description, discovery, and interpretation depends entirely on others. For instance, the Reference for a book chapter is part of a Reference for the edited book which may be part of the Reference for a book series. Likewise, conference proceeding articles are all part of the same conference proceeding.

Generally, Users will not need to know that a Reference is composed of two or three related References. For instance, when viewing a book chapter reference, which shows information from the book chapter and related book, the user interface will integrate the two References and display them in a single coherent view. Likewise, when creating a Reference, a User will be able to add all of the information in one form and the Reference Service will automatically take care of how the record is split. Finally, when uploading a record, for example via an xml file, the Reference Service will automatically handle the relationship logic.

Not all References will be part of another. For instance, there are many stand-alone reports, maps, datasets, and books. Of course, all book chapters are part of a book and all journal articles are part of a journal.

4.2.2 Creating

The workflow for creating a Reference Link is generally the same as for editing a Reference (See Section 3.2.4). Namely, any User with the Collaborator role or above can suggest that two References are linked, but it is at the discretion of the Reference Owner, for the source Reference only, to reject or accept this relationship. For clarification, the source Reference is the Reference which points to another. For example, in the case where a book chapter 'Is Part Of' a book, the book chapter is the source and the book is the destination. Likewise, if Reference A 'Is a Duplicate Of' Reference B, Reference A is the source reference.

Depending on whether a Reference is locked or unlocked, the workflow for approval will differ.

The Reference Owner can create one or more relationships at any time, even while the Reference's status is draft. However, approval of the Reference Relationships by other affected Owner(s) does not occur until the Reference is active.

4.2.3 Viewing

Whenever a User views a Reference, the system will accommodate the various relationships that exist. For instance, how the "Is Part of" relationship is viewed depends on whether the User is looking up or down a relationship hierarchy. For instance, if a User is looking at a book chapter, which is part of a book that is part of a series, the book chapter will appear as a single and complete Reference (with a single link to the book and series). Alternatively, a User viewing a book series can look down one level of the hierarchy and see links to the related books.

4.2.4 Editing

The workflow for editing a Reference Link is the same as for creating (See Section 4.2.2).

4.2.5 Searching

Users may not search explicitly for a Reference Link.

4.2.6 Downloading References and/or Digital Files

The Reference Links will sometimes affect how a User chooses to download References and/or the related Information Resources (if they exist). There are two cases in point. First, References bundled together will, by default, be downloadable together. Likewise, when exporting a list of References, the Reference Service will automatically resolve the "Is Part Of" link and provide complete References that Users are familiar with.

4.2.7 Deleting

Deleting a Reference Link follows the same workflow as creating (Section 4.2.2).

5 Reference-Unit Relationships

5.1 Summary

- Any User with a role of Collaborator or above can create a Reference-Unit link
- Every NPS Unit has a Point of Contact (UPOC) who may approve or deny a Reference linked to their respective Unit
- A Reference should only be linked to a Unit if the Information Resource explicitly contains information about that Unit

5.2 Detail

Linking a Reference to a NPS Unit (See definition in Section 1.2) is perhaps one of the most important benefits of the NRPC supporting an enterprise system for managing References. Unfortunately, why and when a Reference is linked to a Unit has been inconsistent and poorly defined among applications and Users.

In discussing stakeholder requirements for Reference-Unit linkages, the following themes emerged:

- Clearly define why and when a Reference is linked to a Unit
- Enable a Reference to be linked to multiple Units
- A steward, or set of stewards, needs to evaluate and approve information that pertains to their Unit. Reviewing References and information sources depends on their area of expertise and how parks intend to manage their information.
- Facilitate searching for all information about a Unit
- The requirement that all References link to at least one Unit may not always be appropriate and/or informative

The following sections attempt to address these requirements.

5.2.1 Criteria for Linking a Reference to a Unit

When linking a Reference to a Unit, the Information Resource must explicitly refer to the Unit. Cases that warrant linking a Reference to a Unit include:

- Description/discussion of the Unit in the Information Resource
- Data/information collected at the Unit or is explicitly about the Unit
- A shapefile or database containing a record of information specific to the Unit
- A satellite image has pixels that overlap the Unit

Some common cases where linking a Reference to a Unit is not necessarily warranted or appropriate include:

- Mention of the Unit in the “List of References”, “Bibliography”, or “Acknowledgements” section of a document or report
- A reference about a report or dataset whose generation was created through the funding or support of a Unit
- A quote made by someone working at a Unit, but not in reference to that Unit (e.g., a periodical refers to Bob’s knowledge of LIBI and Bob happens to work at ROMO)
- A general reference document (e.g., Soils of North America) that is used by the Unit for management purposes

- A report that is housed on a shelf located in the Unit
- The extent of a shapefile overlaps the park but the shapefile does not have any information specific to the park. Note that spatial relevance is handled through the spatial attribution of a Reference (Section 3.2.1.1) and spatial queries (Section 8.2.2.2).
- The bounding box for the satellite image overlaps the Unit, but the satellite image does not have pixels overlapping or representative of the park Unit (e.g., diagonal images and cloud cover).

5.2.2 Approval of the Link by the Unit Point of Contact (UPOC)

The UPOC has the authority to review and approve/deny any Reference links to their respective Unit (See Section 5.2.1). It is up to the UPOC, and likely the Unit, to decide how much time and resources they devote to the review process. At one extreme, some UPOCs may automatically approve all References linked to their Unit and devote negligible time to this duty. Others may automatically approve most and devote time to reviewing a select few. Still other UPOCs may consult an expert to determine whether a Reference is appropriately linked. Finally, at the opposite extreme, some may thoroughly review each Reference and associated Information Resource.

Approval of a link should be guided by the following requirements:

- The Information Resource explicitly refers to the Unit, as best as the UPOC can reasonably ascertain.
- The Information Resource and/or Reference contain(s) information that is correct and neither misleading nor misrepresentative, as best as the UPOC can reasonably ascertain.

Section 18 provides more detail on the Reference-Unit link details.

5.2.3 Creating

Any User with a role of Collaborator or above can create a link, whether or not they are the Reference Owner or the UPOC. However, both the Reference Owner and UPOC must approve the link.

A Reference linked to more than one Unit will require separate approval from each UPOC. However, UPOC approval does not affect approvals by other UPOCs. For instance, a Reference linked to both FLFO and GRSA will require approval by two UPOCs. The UPOC for GRSA may approve this link while the UPOC for FLFO, after reviewing the Reference and Information Resource, determines the Reference and associated Information Resource are not about FLFO and rejects the link.

The Reference Owner can create one or more Reference-Unit links, even while the Reference's status is draft. However, approval of the Reference-Unit link by the UPOC does not occur until the Reference is Active.

5.2.4 Editing

The workflow for editing a Reference-Unit link is the same as creating (See Section 5.2.3).

5.2.5 Viewing

The Guest Role may view References that have at least one UPOC-approved links to a Unit (See Section 3.2.3.1). Preventing all non-Collaborator Users or above from seeing unapproved and/or unlinked References enables the NPS to manage all types of information (e.g., general documents),

but ensures that the public only sees information explicit to the NPS. For instance, the public is not likely to be impressed about finding a reference describing the birds of North America, but would certainly be interested in a book about the Birds of Glacier NP.

In cases where a Reference has an approved link for one Unit and a rejected link for another, the Reference can still be discoverable, but not as having information specific to the Unit with an rejected link.

5.2.6 Searching for References with Unit Links

When a User is searching for a Reference and specifies a Unit(s) in the search criteria, they are searching for those References which contain accepted and appropriate information about that Unit.

Searching by Unit is *neither* an explicit spatial search *nor* a search for what the Unit physically possesses. These two types of searches are handled in Sections 7 (Holdings) and 8 (Searching) respectively. In cases where someone is searching for references produced by a Unit, they would search via the author/producer of the Information Resource.

5.2.7 Deleting

The workflow for deleting follows the creating workflow for a Reference-Unit link (See Section 5.2.3).

6 Reference-Taxa Relationships

6.1 Summary

- Any Reference can be related to one or more biological Taxa, sometimes in the context of an NPS Unit.
- Reference-Unit-Taxon links from the Reference Service will not affect NPSpecies. If a Reference is linked to a taxon via a NPS Unit, it will be up to the NPSpecies Point of Contact to manage the relevance of that link within NPSpecies.

6.2 Detail

Fundamental to park management is an understanding of the biological taxa that are relevant to the parks. Tracking biological taxa is a challenge because names change, there are different local names for the same taxon, and where a taxon fits within a taxonomic system changes. Providing the means to manage this information would greatly expand the relevance of the Reference Service to the National Park Service.

Stakeholder interviews identified the following needs regarding Reference-Taxon relationships:

- Warn a User that their Reference is linked to a T&E Species to ensure they give the Reference the appropriate sensitivity ranking
- Prevent a Reference from being deleted if linked to NPSpecies
- Link species observed in data file to make them discoverable
- Accommodate all species of management concern, whether or not they are in the park
- Enable taxonomic searching (e.g., hierarchical, synonyms, scientific and common names)
- Clearly link with NPSpecies

In consideration of the scope and functionality of the Reference Service, some of these needs will be addressed while others will not.

6.2.1 Creating

There are two ways a User with the Collaborator role or above can link a Reference to a taxon. First, any Reference can be related to one or more taxa independent of an NPS Unit. For instance, a textbook on amphibians can be related to the taxon *Amphibia*. This relationship has the benefit of enabling taxonomic searching (Section 8.2.2.4). A second option is to link a Reference to a taxon via an NPS Unit. For a Reference to be linked to the Unit, it must contain information about the occurrence of that taxon within that Unit. The Reference Service allows a Reference to be linked to one or more Units, each with their own unique taxonomic classification records. For instance, a biological inventory at two park units may have found different species at each.

The workflow for creating a Reference-Taxon or Reference-Unit-Taxon link is similar to editing a Reference (Section 3.2.4).

If a User creates a link to a taxon that is classified as threatened and/or endangered, the User will be notified that it is a species of concern. This warning is useful because if the Reference and/or Information Resource contain location specific information about that particular species, the User will likely want to confirm that the sensitivity evaluation is correct.

Although the Reference Service will never provide the means to know the exact location of species, it does provide the ability to assign spatial attributes to a Reference via bounding coordinates (Section 3.2.1.1).

6.2.2 Editing

The workflow for editing a link is similar to editing a Reference (See Section 3.2.4).

6.2.3 Viewing

Viewing of a Reference and its taxon links is similar to viewing a Reference (Section 3.2.3).

6.2.4 Searching

A User can search for taxa related to a Reference. Further detail on searching is covered in Section 8.2.2.4.

6.2.5 Deleting

The workflow for deleting a taxon link is similar to editing a Reference (Section 3.2.4).

6.2.6 Linking with NPSpecies

Within the IRMA framework, the Reference Service is entirely decoupled from the new NPSpecies Application (i.e., not the legacy application) and any business logic within the Reference Service therefore does not depend on NPSpecies. If a Reference is linked to a taxon via an NPS Unit, it will be up to the NPSpecies Point of Contact to determine whether the information is valid evidence for NPSpecies. Should they decide the information is important, they will manage it separately within NPSpecies.

7 Holding Locations

7.1 Summary

- Any User of the Collaborator role or above can create a Holding Location
- When a Holding Location is created, the User is assigned the Holding Location Owner
- Any Collaborator can suggest changes to a Holding Location's attributes, although the workflow depends on whether the Holding is locked or unlocked by the Holding Location Owner.
- Holding Locations can refer to Information Resources managed internally or externally to the Reference Service and the NPS
- The ability of a User to view a Holding Location's attributes is determined by system level roles and record-specific assignments.
- The ability of a User to acquire (i.e., download) and view a digital holding is controlled by system-level roles and record-specific assignments.

7.2 Detail

A Holding Location refers to the location of an Information Resource that is described by a Reference. Holding Locations can describe Information Resources held internal to the Reference Service (via the File Service), external to the Reference Service (e.g., NPS Voyager, NPS Focus), or external to the NPS (e.g., Library of Congress, geospatial nodes, museums, etc.). The Holding Location provides the ability to locate digital files – sometimes by downloading a digital file – and/or hardcopy resource.

Stakeholder interviews identified the following requirements for Holding Locations and the associated files:

- Must accommodate extremely large files; Ability to take something down or repost
- Be able to download files in different formats (e.g., MS Word or PDF)
- Accommodate copyrighted information – many important items from journals
- Maintain different levels of user accessibility to files – independent of the Reference
- Enable easy posting of digital documents to ensure they are archived and preserved.
- Accommodate both hardcopy and digital Information Resources.

The following sections address many of these requirements.

7.2.1 Attributes

For the same Information Resource, there are some attributes that will differ among their respective Holdings Locations. Examples include:

- Whether the information resource is analog/hardcopy or digital
- The physical quality of the digital or hardcopy/analog file (e.g., missing, torn, fuzzy, or faded pages)

Further details for the Holding Location attributes is found in Section 16.

7.2.2 Creating

Any User of the Collaborator role or above can create a Holding Location once they have taken a short training course and test specific to creating and managing Holding Locations. When a Holding Location is created, the User is assigned the Holding Owner for a specific Holding Location record and can assign this to other Collaborator Users as needed. The management of a Holding Location's attributes is independent of managing the Reference. If a Reference Owner disagrees with the attribution of Holding Location, their method of resolution is handled through the editing process (Section 7.2.5). The same applies if the Holding Location Owner disagrees with the attribution of a Reference.

The Reference Service will provide flexibility for creating and managing Holding Locations. A digital file can be uploaded from a User's desktop to automatically create a digital Holding Location within the Reference Service (via the File Service), without restriction on the file size. It will be possible to upload multiple files in batch, either with a related Reference, or to initiate the development of new References. In some cases, the batch upload of digital files may be in the context of uploading a project bundle (i.e., 'Is Bundled With').

Finally, someone can point to a file in another system. With some systems, it will be possible to both create a Reference and Holding Location. For instance, if a digital file exists in NPS Focus and/or Focus has information on the file location, the Reference Service will harvest the information and create both a Reference and Holding Location.

All Holding Locations must refer to a single Reference, but a Reference can have zero or more Holding Locations. Furthermore, each Holding Location can have one or more digital and/or analog, files/documents. In some cases, a large report may be divided into sections (e.g., separating a report from the related appendices). In other cases, there may be multiple digital copies that provide complementary information. For instance, one digitized copy of a legacy report is complete, but the pages are stained and the text is fuzzy; a second copy is clear but is missing pages. In other cases, the appendix may be in a separate PDF from the report. Finally, the same resource might exist in three separate Units as multiple failover copies, or on 13 office shelves.

The Holding Location Owner can choose to either lock or unlock the Holding Location, which affects the workflow for editing in the same manner as the Reference (See also Section 3.2.4).'

7.2.3 Viewing a Holding Location's Attributes

The ability of a User to see the information about a Holding Location is defined by their Role and the attribution of both the Reference and Holding Location.

7.2.3.1 Public Holding Location

A Holding Location is defined as Public if all of the criteria are met:

- The Reference is defined as a Public Reference (See Section 3.2.3)
- The Information Resource is a digital file managed by the Reference Service (via the File Service)
- The physical condition of the digital file is at least "good" (Section 16.1.4)
- Releasing information about the Holding Location does not pose a Physical Security Risk (Section 16.1.5)

Any Guest User will automatically will be able to view all Public Holding Location.

7.2.3.2 Select Holding Location

A Holding Location is defined as Select if all of the criteria are met:

- The Reference is defined as a Select Reference (See Section 3.2.3)
- Releasing information about the Holding Location does not pose a Security Risk (Section 16.1.5)

Any User of the Collaborator Role can view any Select Holding Location.

7.2.3.3 Internal Holding Location

A Holding Location is defined as Internal if all of the criteria are met:

- The Reference is defined as an Internal Reference (See Section 3.2.3)
- Releasing information about the Holding Location does not pose a Security Risk (Section 16.1.5)

Any User of the NPS Role can view an Internal Holding Location.

7.2.3.4 Restricted Holding Location

A Holding Location is defined as Restricted if at least one of the following criteria are met:

- The Reference is defined as a Restricted Reference (See Section 3.2.3)
- Releasing information about the Holding Location poses a Security Risk (Section 16.1.5)

Any User of the Administrator Role can automatically view a Restricted Holding Location.

7.2.3.5 Record-Specific Viewing Assignments

In addition to the Holding Location Owner, the following assignments have permission to view a specific Holding Location:

- Reference Owner
- Reference Viewer
- UPOC, if the Reference is linked to their respective Unit.

7.2.4 Viewing and Downloading Digital Files

Viewing and/or downloading a digital file is different than viewing a Holding Location, since many Holding Locations can refer to copies of Information Resources held on bookshelves and on local computers. Therefore, all files that can be downloaded are those that are managed by the Reference Service (via the File Service).

For files not available for download, the Reference Service will provide the User with the option of requesting the file via Notification (See Section 13).

In cases where the file is extremely large or system performance is degraded in a way that downloading a file will take an unreasonable amount of time, the Reference Service will place the file on a secure FTP site. Once posted to the FTP site as an encrypted and compressed archive file (e.g., zip), the User will be notified of the FTP posting via a link (See also Notification - Section 13).

7.2.4.1 Public

A File is defined as Public if all of the following conditions are met:

- The Reference is a Public Reference (See Section 3.2.3)
- The Holding Location is Public Holding Location (Section 7.2.3):
- The Information Resource may contain proprietary information, but there is full permission to distribute for any type of use (Section 15.1.10).
- The Information Resource does not contain any type of sensitive information (Section 15.1.12)

Any Guest User will automatically will be able to view all Public Files.

7.2.4.2 Select

A File is defined as Select if all of the following criteria are met:

- The Reference is a Select Reference (See Section 3.2.3)
- The Holding Location is a Select Holding Location (Section 7.2.3):
- The Information Resource does not contain any type of sensitive information (Section 15.1.12)

Any User of the Collaborator Role may download a Public File.

7.2.4.3 Internal

A File is defined as Internal if all of the following conditions are met:

- The Reference is a Internal Reference (See Section 3.2.3)
- The Holding Location is a Internal Holding Location (Section 7.2.3):
- The Information Resource may contain proprietary information, but there is permission to distribute internally (Section 15.1.10), and
- The Information Resource does not contain legally sensitive information (Section 15.1.12)

Any User of the NPS Role may download an Internal File.

7.2.4.4 Restricted

A File is defined as Restricted if at least one of the following criteria are met:

- The Reference is a Restricted Reference (See Section 3.2.3)
- The Holding Location is a Restricted Holding Location (Section 7.2.3):
- The Information Resource contains proprietary information with no permission to distribute internally (Section 15.1.10), and
- The Information Resource contains sensitive information (Section 15.1.12)

Any User of the Administrator or Arbitrator role may download an Internal File.

7.2.4.5 Record-Specific Permissions

Any User may also view and/or download a digital file if they are assigned:

- Reference Owner
- Reference Viewer

- Holding Location Owner
- UPOC for a Unit that the Reference is linked to

7.2.5 Editing

Any User with the ability to view a Holding's attributes can suggest changes. The workflow is patterned after editing a Reference (See Section 3.2.4); however, the Holding Owner, not the Reference Owner, must approve any changes to the attributions of the Holding.

7.2.6 Searching

The Reference Service will offer the functionality to search explicitly for References that have Holding Location information and/or digital files.

7.2.7 Deleting a Holding Location Attributes

A Holding can be set to 'Inactive' (i.e., deleted) at any time. Setting the Holding Location to 'Inactive' follows a similar workflow as for a Reference (See Section 3.2.7).

7.2.8 Deleting a Digital File

Only the Holding Owner User can delete a digital file managed by the Reference Service.

8 Search/Query References

8.1 Summary

- A variety of search options, ranging from simple to advanced; Layouts will be available to meet different User needs
- Any User of the Collaborator role or above can save and share queries
- Saved queries can be customized for parameterization and notification

8.2 Detail

Efficient discovery of References is critical to ensuring that Users continue to utilize the Reference Service following creation of a Reference.

Stakeholder interviews identified a variety of requirements regarding searching:

- Fast, intelligent, and simple search algorithms (like Google) - Easily locate official and high quality programmatic information (e.g., from the I&M inventories) and sort search results by their relevance;
- Full text searching - Minimize the reliance on inconsistent keywords and make full use of Reference attribution and text within a digital Holdings
- Customizable searching and sorting - Sort results in different ways
- Search explicitly within a particular Reference attribute, including by Ownership, spatial attributes, taxonomy, etc.
- Refine Searches - Combine saved searches for a subset; Search only within a user-defined subset of References
- Save and share searches with others
- Download list of References found through search
- Preview file before download

To accommodate these requirements, the Reference service will offer a few different types of searches that range from simple, advanced, and custom. Additionally, there are a number of different search result views that function independently of the search.

8.2.1 Simple Search

A simple search for References is likely to be one of the most common functions used in the Reference Service. Searching will enable one to answer such questions as:

- What data is available on Pine Beetle for ROMO?
- What other parks have information on Pine Beetle?
- What is the current inventory of documents and datasets for my park?
- What References are contained by my Unit (i.e., fall within)?

As much as possible, the search logic is automatically optimized behind the scenes. For example, when searching for a text string, the Reference Service will automatically search over many fields and results will automatically be sorted based on priority.

Simple searches are tailored to the basic user and offer the fewest number of choices that are most frequently used. A User can choose to select up to four search options: (1) Reference Type Groups; (2) NPS Unit; (3) Text Phrase; and (4) Spatial Area.

Figure 2 provides an example of what a simple search might look like.

The screenshot shows a web-based search interface titled "Reference Search". In the top right corner, there are two icons: a yellow warning triangle and a blue question mark. The interface is divided into several sections:

- Search Type:** A dropdown menu set to "Simple".
- Define Search Criteria:**
 - Reference Type Group:** A dropdown menu set to "Documents".
 - Subject:** A dropdown menu set to "Biological Integrity".
 - Any Field Contains:** A text input field containing the word "deer".
- Select Units:**
 - Select By:** A dropdown menu set to "Park".
 - Find in list:** A text input field containing the word "sand".
 - Available Units (Left List):** A list box containing "Great Sand Dunes National Monument (GRSA)" and "Sand Creek Massacre (SAND)".
 - Selected Units to Search (Right List):** A list box containing "Rocky Mountain National Park (ROMO)" and "Rocky Mountain Network (ROMN)".
 - Navigation Buttons:** Between the two lists are four buttons: ">>", ">", "<", and "<<".
- Checkboxes:**
 - Include all component units:** A checked checkbox.
 - Only References about the Unit:** A checked checkbox.
- Buttons:** At the bottom right, there are two buttons: "Reset" and "Search".

Figure 2. Example Simple Search Screen

8.2.1.1 Reference Type Groups

Users wishing to discover information may not know, or even care, about the subtle differences between Reference types (e.g., journal article or published report – See Section 3.2.1.2). Instead, most Users are likely to be more interested in basic information categories. Examples of such categories include:

- Synthesized/written information – All types of documents that can be read that often synthesize and summarize information. This includes journal articles, books, book chapters, conference proceedings, reports, maps, etc.
- Datasets – All types of raw data/information, regardless of whether it is a geospatial layer or a tabular dataset. This includes remotely-sensed information, shapefiles, maps, access databases, pictures, sound clips, etc.
- Multimedia – Photos or other types of non-traditional media (e.g., interpretive movies). This includes pictures, maps, movies, sound clips, etc.
- Collections – Groups of documents, datasets, and/or multimedia that are not individually described. Examples include an ANCS+ collection (aka ICMS), map collection at a park, photo collection, etc. Note that this collection is not the same thing as a Reference Collection (Section 9).
- Correspondence – Emails, notes, memos, and letters containing pertinent information.
- Series – NPS Baseline Inventory Series (e.g., "12 Baseline Inventories", including Vegetation Maps, Geologic Maps, etc.), NRPC Technical Report Series, etc.

Thus, when a user selects a particular group, a number of Reference types are automatically searched without the User needing to know the subtle differences.

In some cases, a specific Reference type may appear in multiple groups. For instance, a picture is part of the dataset and multimedia groups. Depending on the User, a picture may be: (1) a dataset because it contains raw information; or (2) a picture because it can also be viewed for its aesthetic qualities.

8.2.1.2 NPS Unit

Searching by NPS Unit returns References that (1) contain information explicit to the Unit, and (2) are approved by the UPOC (See Section 5.2.1).

The User can optionally search for related units. For example, a User could select one network and optionally search all related parks within that Network. Likewise, a User could search a Unit and all of its legacy names and codes.

8.2.1.3 Phrase

Users can type in any phrase without needing to specify which field to search. The Reference Service automatically searches the most relevant fields, including title, abstract, and the text of the Information Resource (when possible).

8.2.1.4 Spatial Area

Because spatial coordinates are required attributes for all References, a User can leverage this functionality by specifying whether they are interested in information that is also relevant to a Unit. Spatial searches can return relevant information even though they are not explicitly linked to a Unit. For instance, if the area of interest is ROMO, a spatial search might yield a book discussing the “Birds of Colorado.” The book is relevant to ROMO since it contains information about birds that ROMO is likely to have, but the book may not explicitly mention ROMO.

8.2.1.5 Information Categories

Many basic Users may be interested in some suggested information themes (air, water, geology, soils, etc.). These information categories are outlined in detail in Section 15.4.

8.2.2 Advanced Search

Advanced search offers the most flexibility to the User, but is more complex and is likely to be used more often by power Users. Advanced searches have the option of searching explicitly by one or more attributes.

Advanced searches will enable Users to answer such questions as:

- What References do I Own?
- What publications are there for “brown bear” or related scientific name (i.e., *Ursus*)?
- What References have been added since last week?

Figure 3 provides mock-up of an advanced search (with some advanced features still missing).

Reference Search



Search Type: Advanced

Define Search Criteria

Select Reference Types

Report
Journal Article
Map
Photo
Book
Book Chapter

Generic Dataset

Specify Search Strings

Search Strings: Title Begins With elk OR
Any Field Contains moose AND

Select Subjects

Biological Integrity
(select)

Select Units

Select By: Park
Find in list: sand

Great Sand Dunes National Monument (GRSA)
Sand Creek Massacre (SAND)

>>
>
<
<<

Selected Units to Search (Default is All Units):
Rocky Mountain National Park (ROMO)
Rocky Mountain Network (ROMN)

Include all component units: ☒ Only References about the Unit ☒

Select Bounding Area

North
45
West 120 110 West
35
North

Define Using a Park Boundary
Define Using a Map

Select My Reference

I Own OR
I Am Assigned to View OR

Reset Search

34

Figure 3. Example Advanced Search Screen

The following sections describe some of the added advanced search capability.

8.2.2.1 Reference Attributes

In the advanced search, almost all Reference Attributes are searchable. The following operators will be supported for each data type:

- Text - contains, equals, begins with
- Date – equals, is less than, is greater than
- Numbers – equals, is less than, is greater than

8.2.2.2 Spatial Coordinates

The Reference Service will provide options for specifying a spatial location:

- Typing in the latitude/longitude coordinates
- Sketching out an area on a pop-up map
- Selecting one or more NPS Units from a picklist

Additionally, the advanced search enables the User to specify spatial search operators:

- ***“Is Contained By”*** - A Reference is found completely within an area of interest (e.g., A Reference referring to a watershed within a Park Unit)
- ***“Is The Same As”*** – A Reference’s boundary is equal to an area of interest. (e.g., A Reference with bounding coordinates equal to the Unit of interest.
- ***“Contains”*** - A Reference contains the area of interest (e.g., “Birds of Colorado” have bounding coordinates that contain Rocky Mountain National Park).
- ***“Is Within a Defined Distance Of”*** – Bounding coordinates of Reference are within a defined distance of the area of interest (e.g., All References within 20 miles of a Unit)
- ***“Intersects”*** - Bounding coordinates partially or completely overlap the area of interest

8.2.2.3 Holding Locations Attributes

A Holding Location search enables a user to search References by a Holding Location attribute.

8.2.2.4 Taxonomy

A taxonomy search enables a user to search for References with a specified taxonomy. Searching by taxonomy can return References that (1) refer to the specific name type (e.g., scientific or common name) (2) refer to a taxonomy’s synonyms and/or (3) are at a certain placement within the taxonomic hierarchy. For instance the user can search for “Bald Eagle” and get records for *Haliaeetus leucocephalus* or search for “Canis” and get all the References linked to that Genus and below, or “mammal”.

8.2.2.5 Reference Collection

A Reference Collection search uses a personal reference collection (See Section 9) as the subset of references to search.

8.2.3 Custom Searches / Saved Queries

8.2.3.1 Creating a Saved Query

During or following a simple or advanced search, any User of the Collaborator role or above can opt to save their search criteria. One or more saved searches are then permanently available to the User for future use. Saved searches, unless delegated, are only visible to the User who created them.

Saving queries will allow a user to accomplish the following:

- Create a library catalog for a park, network or office
- Maintain a web page with the most recent publication for a particular unit and taxa
- Search only within a particular subset of References

There are three types of saved queries: select, parameterized, and notification.

8.2.3.1.1 Select Query

Select queries return a list of References meeting the criteria defined in the search. These are the default searches that most Users are familiar with.

8.2.3.1.2 Parameterized Query

Saved searches can be parameterized. Parameterized queries are useful in cases where a User has a class of queries that are almost identical, except for a subtle change in one parameter. For example, a User may have multiple queries named "List maps for ROMO, List Maps for GRKO..., etc." These queries can be efficiently combined into one parameterized query named "List maps *by Unit Code*" where the Unit Code is parameterized. Each time this query is run, the User is prompted to enter a Unit Code.

8.2.3.1.3 Notification Query

Finally, a search can be saved as a notification query. Notification queries alert the User when additions or changes to References meet certain criteria. Many Users, whether for personal or professional interests, will want to know when References are added or changed. In general, notification queries may have a limited set of attributes to query by and will not accommodate queries involving more complex search logic.

Notification queries can be neither delegated nor parameterized

8.2.3.2 Sharing a Saved Query

There are a number of different ways to share a query. One option is for the Query Owner to delegate rights to a specific User or group. The User is notified of the share and can either accept or deny the delegation. If accepted, the shared query is visible and functional to the User and can be renamed locally to suit the User's preference.

Additionally, a query can be shared via a link in an email or web page to any User. This type of sharing does not require the Query Owner to delegate to another User.

In all cases, the set of returned References depends on the User's role and record-specific assignments (See Section 2).

8.2.3.3 Editing a Saved Query

At any time a Collaborator can edit his/her own saved search. If the User wishes to modify someone else's shared search, the User must create a personal copy of the query and modify it accordingly where the two queries would then function independently.

8.2.3.4 Deleting a Saved Query

At any time a Collaborator can delete his/her own saved query. If a User wishes to delete a query that they have delegated, the other delegates will be notified of the delete and have the option of creating their own personal copy of that query.

8.2.4 Search Results Layouts

Search results layouts and formatting are independent of the search. As with searching, there are a variety of different layouts to accommodate the simple and advanced Users.

8.2.4.1 Simple View

The simple layout emphasizes readability. It provides all information in the same basic format and is printer friendly

8.2.4.2 Advanced View

The advanced view provides all available information. The User will have more flexibility in how to view the information.

One example of an advanced view is to aggregate searches. Aggregate summaries provide Reference statistics (Sum, count, maximum, minimum, etc.) while "Return List" list provides a list of References meeting the query requirements.

8.2.4.3 Custom Views

The Reference Service will provide different viewing options which can be saved for later use.

9 Reference Collections

9.1 Summary

- A Reference Collection is an informal, subjective, and static grouping of References
- Any User of the Collaborator role or above can create, edit, share, and search within a Reference Collection

9.2 Detail

The Reference Service will offer Reference Collections which are informal, subjective, and static groupings of References. Reference Collections are a powerful tool that allows groups of Users to collaborate in developing an informal collection of References related to particular topics and interests:

- Steve's List of Favorite Publications for ROMO
- A list of references for a report
- The entire virtual and physical library collection for a unit, including files present at the unit, files not physically held at the unit, files about the unit, and files of interest to the unit
- List of geospatial layers related to soils
- Important fire-related publications for the intermountain region and associated parks.
- A "Virtual Library" that includes all Unit Holdings (Section 6.1), Linked Units (Section 5) or any other references determined to be important.

Reference Collections complement the functionality of saved queries (Section 8.2.3) which offer a dynamic list of References meeting specified criteria.

Interviews with stakeholder identified a set of requirements related to the ability to share personal collections of information:

- Organize and save collection References by personal or programmatic interest and needs
- Search by user-defined collections
- Share collections with others, ideally as one link

9.2.1 Creating

Any User with a role of Collaborator or above can create a Reference Collection. When created, the User is assigned the Collection Owner, which can be delegated to other Users that at least have the Collaborator role.

9.2.2 Sharing

A Reference Collection Owner can share Collection with another User by assigning them Collection Viewer. When shared, the User can either accept or deny the share. When accepted, the Collection is visible to the User (i.e., that User inherits the Collection Viewer Role) and can be renamed to accommodate personal preferences and avoid duplicate or unclear Collection names.

9.2.3 Editing

Only the Collection Owner can add or remove References from a Reference Collection. If a Collection Viewer wishes to modify a Reference Collection, they will need to make a copy of the Reference Collection.

9.2.4 Viewing

The only Users capable of viewing a Reference Collection are those with the Collection Owner or Collection Viewer assignment.

9.2.5 Searching Within

Searching within a Reference Collection is available through the advanced search (see Section 8.2.2)

9.2.6 Deleting

Any Collection Owner can delete the entire Reference Collection. When deleted, Collection Viewers will be notified of the delete and will have the option of creating their own personal Reference Collection.

Deleting a Collection purges the collection - not the References - from the Reference Service.

10 Import and Export References

10.1 Summary

- The References Service will strive to be interoperable with other interchange standards, particularly via the sharing of common core attributes
- Any Collaborator can import desktop references as delimited text, XML, exif, or a file
- Any Collaborator can import and manage references from other supported NPS (e.g. Focus, TIC, ANCS+, and Voyager) and non-NPS (e.g. Library of Congress) systems. Imports from other applications are managed as a Holding Location.
- All imported References are given “Draft” status until they can be reconciled for integrity and duplication.
- References can be exported to desktop as delimited text, spreadsheets, and discrete XML files

10.2 Detail

Importing and exporting References was common to almost all stakeholder interview discussions. Requirements include a variety of needs:

- Import from and export to local applications including [EndNote](#), [ProCite](#), [NPS Metadata Tools and Editor](#), Metadata Catalog, NatureBib Desktop, and [ESRI's ArcCatalog](#); which function well for local editing and formatting,
- Prevent duplicate References
- Import from other NPS applications (ANCS+/ICMS, PMIS, Focus, RPRS, etc.) and external applications (e.g., Library of Congress) but minimize redundancy among applications
- Easily batch upload References managed locally
- Save import templates for re-use
- Observe copyright issues when importing references from proprietary reference services

These requirements pose some of the most serious challenges to the Reference Service. Enabling the importing and exporting of records introduces the risk of creating duplicate records. Yet, the ability to upload References generated and managed locally will also have the greatest payoff for widespread use.

Nevertheless, Users should be aware that importing and exporting will never be completely automated and will still require User intervention. For instance, few, if any, 3rd party software applications can manage all of the attributes managed by the Reference Service (e.g., taxa links, geospatial attributes, etc.), which limits the ability to completely preserve all attributes when References are cycled to and from the desktop.

10.2.1 System Interoperability

Where feasible and appropriate, the References Service will strive to be interoperable with other interchange standards, including NPS Citation Standards, the NPS Metadata Profile, the [National Environmental Information Exchange Network](#), [Z39.50](#) (See also the [GeoProfile Z39.50](#)), [ISO 19139](#), [International Standard Bibliographic Description \(ISBD\)](#), the [Federal Geographic Data Committee's \(FGDC\)](#) set of content standards and profiles (e.g., biological, remote sensing, etc.).

Because the foundation for interoperability is the sharing of common core attributes (Section 3.2.1.1) among all standards, it does not force the Reference Service to adhere to any one specific standard.

10.2.2 Importing From Local/Personal Computer

In many cases, Users may find local creation and editing of References to be more efficient. Third party desktop applications – e.g., [EndNote](#), [ProCite](#), [NPS Metadata Tools and Editor](#), and [ESRI's ArcCatalog](#) - are easy to use and have tools that facilitate the local management of References. When using a camera to generate photographs, [exif](#) creation is entirely independent of the Reference Service or any other desktop application.

While importing and exporting is vital, the NRPC does not plan to devote development time to accommodating numerous import and export formats. For instance, there are different versions of Endnote and ProCite and each user can potentially have their own data schema. However, the NRPC will develop guidance on how to use EndNote that ensures importing is as straightforward as possible.

Therefore, the Reference Service plans to initially accommodate three import formats with the recognition that may be added as the stakeholders confirm the need:

- **Delimited Text** - The delimited text format ensures that all users of ProCite and Endnote can export their libraries. Likewise, this format accommodates any other tabular database containing References. When a user imports a delimited text file, they must map each column to an attribute within the Reference Service. This mapping can be saved as a mapping template for reuse.
- **XML** - The FGDC North American Profile and ISO 19139-compliant XML metadata format (which is currently in development) permit a User to use ArcCatalog or any other metadata editing tool to create a Reference locally. Because the desktop applications are devoted entirely to the creation and maintenance of geographic metadata, there are many attributes that will not be managed as core (with all of the quality assurance and business rules) by the Reference Service. Many of these attributes are not intended for data discovery, but are used for the thorough interpretation of the Reference's Information Resource. The Reference Service, when it imports an XML record, will harvest the core (Section 3.2.1.1) and type-specific (Section 3.2.1.2) attributes that it manages internally. To harvest other attributes, the User will need to specify a defined content extension (e.g., biological, fire, etc; Section 3.2.1.3). If the Reference Service determines that other attributes, which are not part of a defined extension, are also present, it will save the XML record and use it as a template should an export to XML be requested at a later date.
- **Exif** - The Exif format allows one to create a Reference directly from a photograph and automatically harvest such information as date, time, and geospatial points.

All imported References are given draft status until they can be reconciled for integrity and duplication.

10.2.3 Importing from Other NPS and Non-NPS Systems

The Reference Service, when necessary, can import and manage References from other supported NPS (e.g., Focus, TIC, ANCS+, and Voyager) and non-NPS (e.g. Library of Congress, Western Archeological Conservation Center) systems. On import the information from the external system is used to auto-populate a new Reference; the link to the external system is then maintained through the creation of a Holding Location (See Section 7.2.2). Once the information is imported, the Reference Owner can modify the Reference attributes.

At a higher level, importing from other systems does create redundancy. It is hoped that ultimately, this type of import will be less necessary as systems offer their information as web services.

10.2.4 Exporting to Desktop

Some applications, such as EndNote and ProCite, have advanced formatting to accommodate a variety of reference styles. Thus, Users will want to export References to accommodate their own formatting needs. In other cases, Users may wish to update metadata records using ArcCatalog.

Any User can export a list of References. This list can be generated via a query (See Section 8) or Reference Collection (See Section 9). Options for exporting include:

- Delimited text
- Spreadsheets
- Individual XML files for each Reference

These formats can be imported easily and consistently into the most frequently used applications for managing References locally.

It is important to note that depending on the application receiving the exported list or files from the Reference Service, many attributes (e.g., geospatial) are not likely to be preserved. Thus, attempting to do a regular two-way synchronization may not be feasible.

10.2.5 Exporting to Other NPS and Non-NPS Systems

The Reference Service will make all References available to other NPS and Collaborating external applications. It will be up to those systems to determine how they integrate the information into their business logic.

10.2.6 Retaining Information Not Managed Directly By the Reference Service

There are likely to be many instances where References created locally may have attributes not common to the Reference Service. A case in point is a XML metadata record created using ArcCatalog, NPS Metadata Tools and Editor, or some other metadata creation/editing tool. Therefore, the Reference Service will always preserve the original record if the Service determines that extra information is present.

Should a User request to view or export the XML record, any edits done on the Reference record in the database will overwrite (or be merged with) the original xml file.

11 User Comments and Discussion Threads

11.1 Summary

- Any User with a role of Collaborator or above can create a comment about a Reference and inherit the Comment Owner role for the comment.
- Private Comments are visible only to the Comment Owner
- Public Comments are visible to all Users

11.2 Detail

Users may have the need to annotate References in a way that does not fit into the normal schema of attribution. In some cases, User with a role of Collaborators or above may wish to annotate for their own personal use, including an annotated bibliography. In other cases, it may be important to document discussions among Users regarding the editing of a Reference.

Stakeholder requirements related to user comments and discussion threads include the following:

- Provide a public forum to discuss issues/concerns related to a Reference, particular to the quality of information
- Provide a means for annotating a Reference for personal/park-specific use

11.2.1 Creating

At any time, a User with a role of Collaborator or above can create a comment about a Reference and is assigned the Comment Owner. Commenting is extremely flexible and can be attached to the entire Reference or a specific attribute of the Reference. Additionally, any time a User edits a Reference (See Section 4.2.4), the User is prompted to optionally comment as to why a change was made.

When a Comment is created, the default status is "Private". The Comment Owner has the option of changing the status to "Select", which affects how it is viewed (Section 11.2.4).

Comments do not have a delegate assignment.

11.2.2 Editing

Comments can be edited by the Comment Owner at any time.

11.2.3 Linking Comments as Discussion Threads

Select comments can be followed up (i.e., linked) with further Select comments by other Users, thus creating discussion threads.

11.2.4 Viewing

Private comments are visible only to the Comment Owner who created the comment. Select comments are visible to all User with a role of Collaborator or above.

11.2.5 Deleting

Comments can be deleted by the Comment Owner at any time as long as they are not part of a discussion thread. Comments are permanently purged from the Reference Service.

11.2.6 Inappropriate Comments

Users posting inappropriate public comments may lose permissions (Section 2.2.3) as determined an Administrator.

12 Change History Management

12.1 Summary

- All changes to a Reference are automatically and perpetually archived
- Only the Reference Owner can undo a change to a Reference
- Only the Reference Owner(s) are allowed to see the change history for a Reference

12.2 Detail

Knowing how, when, and why a Reference's attributes changed is a valuable part of assessing and maintaining quality.

Stakeholder interviews identified the following requirements regarding change history management:

- Track all changes, including who made the changes and why
- Be able to undo the changes
- Be able to view full history of changes

12.2.1 Tracking

Any time a change is made to a Reference attribute, or any other attribute (e.g., Holding, Reference-Unit link, etc.), the Reference Service automatically tracks the change, including:

- Who made the change
- The modified attribute(s)
- When the change was made
- Comments as to why the change was made (optional; See also Section 11.2.1)

12.2.2 Undoing

Only the Reference Owner can undo a change to a Reference. The Reference Owner is free to undo any change (e.g., one that was done a year ago) because the change will automatically replace the current attribute. Thus, the Reference Service will not attempt to reconcile differences and it is up to the Reference Owner to manually integrate older versions with newer. Undoing a change is logged as part of the change history.

12.2.3 Viewing

In addition to the Reference Owner(s), only the Administrator may view the change history of a Reference. Viewing changes is restricted because logged changes may contain sensitive, proprietary, and/or misleading information.

12.2.4 Editing and Deleting

Change history can neither be edited nor deleted from the system. Change history will be preserved through the life of the system.

12.2.5 Change History Management for Other Types of Information

The change history associated with Holding Locations, Saved Searches, and Reference Collections will not be managed by the Reference Service.

Changes to the Information Resource will also not be managed. Management of incomplete Information Resource is beyond the scope of what the Reference Service is intended to accommodate. If a new Version of the Information Resource is created, a new Reference should also be created.

13 Notification

13.1 Summary

- Users with a role of Collaborator or above can opt for notification
- Notification can be via Email and/or NRPC Portal Messages
- Users are automatically notified of events and changes deemed important to the management of the Reference Service
- Users may optionally be notified of other changes to the Reference Service
- Users may optionally join a notification group

13.2 Detail

Notification ensures that the appropriate Users know about important changes within the Reference Service.

Stakeholder interviews identified the following requirements:

- Notification of additions or changes to a Reference's attributes and who made the change
- When a Reference and/or the associated attached file is viewed or downloaded by another User
- Establish own criteria for notification (like travel websites)
- Utilize various and effective methods of notification, including email or other
- Notify a group when something is posted or modified

These requirements are addressed in the following sections.

13.2.1 Methods of Notification

Any User with the Collaborator Role or above can opt for notification. The current methods for notification include:

- Email – one or more valid email addresses
- Portal Messages – Notification when logged into the [NRPC Portal](#)

Users can opt for one or both of these to be the preferred method for notification. Additionally, Users can opt to be notified in batch at regular intervals instead of getting a continuous stream of emails.

13.2.2 Automatic Notification Triggers

Automatic notifications are for those events and changes deemed important to the management of the Reference Service.

A User is automatically notified via the preferred notification method when:

- A change is made to a Reference or Holding Location they Own
- A Reference is linked to a Unit for which they are the Point of Contact
- A Select comment is posted against a Reference or Holding Location they own
- A suggested change is accepted/denied by the Reference Owner

A User is automatically notified via all notification methods when:

- A change is made to the Reference regarding its status, sensitivity, quality, and/or proprietary ranking
- The User abuses Reference Service policies
- The User has not responded to an automated notification within a reasonable time period

13.2.3 Optional Notification Triggers

For events and changes that are not considered vital to the management of the Reference Service, Users can opt to be notified. Examples of such notifications include:

- A Holding Location they own is viewed and/or bookmarked
- A Reference they own is viewed and/or bookmarked
- A custom notification query they own returns positive results (e.g., a new Reference containing the phrase “grizzly bears” is posted)

13.2.4 Custom Notifications

A User can establish one or more customized notifications using the notification query option (Section 8.2.3.1.3).

13.2.5 Notification Groups

In some cases, a User may wish to ensure that other Users are aware of Reference changes or additions. The Reference Owner can establish a Notification Group and invite Users to join the Notification Group. When the User adds or modifies a Reference, they can opt to notify the group of any changes.

14 Accessing the Reference Service via SOAP Messages

14.1 Summary

- All functionality of the Reference Service can be accessed external to the web portal using SOAP messages

14.2 Detail

Following best practices, the Reference Service operates within a three-tier architecture ([Wikipedia, 2009](#)):

- Presentation Tier - Presentation tier displays information related to such services as browsing merchandise, purchasing, and shopping cart contents. It communicates with other tiers by outputting results to the browser/client tier and all other tiers in the network.
- Application Tier ([Business Logic](#)/Logic Tier) - Controls an application's functionality by performing detailed processing.
- Data Tier - Here information is stored and retrieved in a relational database system (e.g., SQL-Server). This tier keeps data neutral and independent from application servers or business logic.

Each tier operates independently of the other which not only provides more flexibility since each tier can be maintained separately, but also provides more freedom to the end User in how they interact with the system. Most Users will access the functionality of the Reference Service via the NRPC Portal; indeed, much of this document has not differentiated the presentation tier (i.e., web page) from the underlying functionality (i.e., application tier). However, a User is capable of interfacing directly with the application tier to fully bypass the GUI.

Access to the application tier is possible via Simple Object Access Protocol (SOAP) messaging, which is a common standard for exchanging information in the implementation of Web Services. It relies on Extensible Markup Language (XML) as its message format (See also [Wikipedia, 2009](#)).

Enabling SOAP messaging ensures that Users can realize the power of the Reference Service independent of the Portal and tailor the functionality for their own needs. Example uses include:

- Maintain a dynamic list of References for a park, network, or research learning center web page
- Develop custom applications for the management of References (via the Reference Service), including the creation, editing and deletion.
- Share spreadsheets with information pulled dynamically from the Reference Service

Each SOAP message has a basic structure that includes a command followed by a set of parameters. For instance, the message to create a Reference titled "Birds of ROMO" might look something like this:

```
<CreateReference>
  <Title>Birds of ROMO</Title>
  <Publisher>NPS</Publisher>
</CreateReference>
```

Other examples of commands that can be implemented via SOAP messaging include:

- <EditReference>
- <DeleteReference>
- <AddReferenceOwner>
- <CreateReferenceUnitLink>
- <DeleteReferenceUnitLink>
- <FetchReferenceList>
- <FetchReference>

15 Appendix A – Reference Details

Note – This Appendix is undergoing considerable revisions.

This Appendix provides more details on References, including core and optional attributes as well as the required and expected attributes for each Reference Type.

Because much of this chapter relies on defining attributes, it is important to first define what an informative and useful definition should be:

- Be concise, objective and unambiguous
- Be based on professional standards and/or precedents
- Remain invariant and not require continued re-evaluation of its meaning and applicability
- When necessary, include examples of *What is* and *What is Not*
- Be completely divorced from any workflow associated with it (e.g., who can view a reference)

15.1 Core Attributes (Required)

15.1.1 Bounding Box East

Definition - The easternmost extent of the Information Resource footprint expressed in decimal fractions degrees of longitude. Whole degrees of longitude are represented by a three-digit decimal number ranging from 0 through 180. Longitudes east of the prime meridian are specified by a plus sign (+), or by the absence of a minus sign (-). A point on the prime meridian is assigned to the Eastern Hemisphere while a point on the 180th meridian is assigned to the Western Hemisphere.

Type – Float; Default of 0

Enumerations - None

15.1.2 Bounding Box North

Definition – The northernmost extent of the Information Resource footprint expressed in decimal fractions degrees of latitude. Whole degrees are represented by a two-digit decimal number ranging from 0 through 90. Latitudes north of the equator are specified by a plus sign (+), or by the absence of a minus sign (-), preceding the two digits designating degrees. Latitudes south of the Equator are designated by a minus sign (-) preceding the two digits designating degrees. A point on the Equator is assigned to the Northern Hemisphere.

Type – Float; Default of 0

Enumerations - None

15.1.3 Bounding Box South

See Bounding Box North (Section 15.1.2)

15.1.4 Bounding Box West

See Bounding Box East (Section 15.1.1).

15.1.5 Code

Definition – Code uniquely identifying a Reference. All NatureBib IDs are preserved, while all DataStore Metadata ID's have 1,000,000 added (e.g., DataStore ID of 123 is now 1000123). Any Reference created in the Reference Service will begin at 3000000.

Data Type - Integer

Enumerations - None

15.1.6 Contact

Definition – Any person or entity. Contacts are generally static and likely not to change on a regular basis, if ever.

Data Type - String

Enumerations (at least one is required)

- Author – Person directly and primarily involved in creation of the Information Resource
- Contributor – Assisted in the creation of the Information Resource
- Corporate Author – Entity/organization directly and primarily involved in creation of the Information Resource; no person was mentioned by name
- Editor - Coordinated compilation and review of the Information Resource
- Lead – Project lead
- Originator - the name of an organization or individual that originally developed the Information Resource
- Publisher -
- Recipient - Recipient of an Information Resource
- Steward – The party responsible for the maintenance of the Information Resource. Authoritative Data Source

15.1.7 Content Description

Definition – A very concise description/characterization of the information/data contained by the Information Resource. The Content Description should not be a replicate of the Abstract or Table of Contents.

Data Type - String

Enumerations - None

15.1.8 Date of Issue

Definition - Date of formal issuance (e.g., publication) of the Information Resource. Date of Issue can be represented as just the year, year-month or year-month-day.

Data Type – Date; Value of 'Unknown' is permitted.

Enumerations - None

15.1.9 Display Citation

Definition – An auto-populated aggregate field based on the reference type. The display Reference is comparable to how references would appear at the end of a research paper using a formatting style (See Section 15.3)

Data Type - String

Enumerations - None

15.1.10 Globally Unique ID

Definition - Globally unique identifier for use by other non-IRMA systems

Data Type - GUID

Enumerations - None

15.1.11 Information Resource Proprietary Rank

Definition – This rank indicate whether a the Information Resource contains information that is copyrighted, has other legal restrictions, paid for access from a third party, and/or the data has recently been collected by a non-NPS Principle Investigator who plans to publish their results in a professional journal. Examples of when an Information Resource may contain proprietary information:

- Data was purchased from a private vendor (e.g., Ikonos Satellite Imagery)
- The article was downloaded from a bibliographic service
- There is any mention of copyright ©
- The information was collected as part of a contract

Data Type - String

Enumerations

- Unknown – Proprietary status cannot be determined. Assumed to be “Copyrighted, Do Not Distribute” until resolved.
- Legacy – The information came from a legacy application where the definitions for Proprietary Information were either different or did not exist.
- Copyrighted, Do Not Distribute – Known to contain copyrighted information but with no permission to distribute
- Copyrighted, Distribute Internally – Known to contain copyrighted information. Permission secured to distribute internally within NPS.
- Copyrighted, Distribute for Non-Commercial Use – Known to contain copyrighted information. Public distribution allowed for non-commercial use.
- Copyrighted, Distribution Permitted- Known to contain copyrighted information. Permission secured to distribute to the public and use for commercial purposes.
- Non-Proprietary - No copyrights or other ownership issues.

15.1.12 Information Resource Sensitivity

Definition - The Information Resource describes the specific location of a key natural resource and/or provides information not appropriate for the public. There are two general types of sensitivity.

Operationally Sensitive Information Resources are those that are important to the internal business operations of the NPS, but not appropriate to external audiences. Examples include: locations of social trails, planned construction sites, planned boundary acquisitions, in-holding information, etc.

Legally Sensitive Information Resources contain location-specific information that would create an unreasonable risk of harm, theft, or destruction of a natural or cultural resource or object, including individual organic or inorganic specimens or risk to the health and/or safety of park personnel or the public. Location specific information is defined as a descriptive, graphical or electronic portrayal of a

place in such detail that knowledge of the place would permit a person to find the specific place, no matter where it is in the park. For an Information Resource to qualify as having legally sensitive information, all of the following criteria must be met:

- **Internal Resource** - The Information Resource contains information about a resource internal to the NPS.
- **Location-Specific** – There are GPS coordinates indicating the exact location of the resource. It is important to note that only disclosing that a resource is present at a park unit is not considered to be location-specific. Likewise, generalized location data (e.g., cutting off the last digits in UTM coordinates) is also not considered to be location-specific.
- **Not Already Publicly Available** - Information that already is publicly available is not legally sensitive. For instance, the return of condors to the Grand Canyon has been well documented by the press.
- **Resource Type** – The Information Resource contains information pertains to archeological, cave, commercially valuable, cultural, endangered, Indian sacred sites, minerals, security, paleontological, threatened, and/or well resources.

Data Type - Boolean

Enumerations (Zero or More of the Following):

- Archeological (Legal) –Park-specific, location-specific, and non-public information about material remains of past human life or activities which are of archaeological interest (Archaeological Resource Protection Act, 16 U.S.C. § 470hh)
- Caves (Legal) - Park-specific, location-specific, and non-public information about any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge (including any cave resource therein, but not including any vug, mine, tunnel, aqueduct, or other manmade excavation) and which is large enough to permit an individual to enter, whether or not the entrance is naturally formed or manmade. Such term shall include any natural pit, sinkhole, or other feature which is an extension of the entrance (The Federal Cave Resources Protection Act of 1988 [16 U.S.C. 4301 - 4309]).
- Commercially Valuable (Legal) – Park-specific, location-specific, and non-public information about a resource that has potential for being traded or sold in legal or illegal markets such that unauthorized removal of the resources from a park is likely to occur despite the potential of civil or criminal penalties.
- Cultural (Legal) – Park-specific, location-specific, and non-public information about cultural resources having importance for archeology, history, ethnography, literature, and/or art that are at risk of theft or damage to their physical and/or nonphysical integrity.
- Endangered (Legal) - Park-specific, location-specific, and non-public information about a species or population that has been formally designated as endangered or proposed for such a designation by the US Fish and Wildlife Service, National Marine Fisheries Service or other appropriate state agency (Source)
- Indian Sacred Sites (Legal)- Park-specific, location-specific, and non-public information about any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian

religion has informed the agency of the existence of such a site (Executive Order No. 13007).

- Minerals (Legal) – Park-specific, location-specific, and non-public information about naturally occurring, usually inorganic, discretely bounded crystalline substance with characteristic physical and chemical properties that are due to its atomic arrangement. While a mineral object usually has a characteristic crystal form, it may exhibit a non-crystalline form, such as occurs in opal or obsidian. A mineral object also includes organic substances such as oil and coal, and may contain substances in the category of natural aggregates of materials.
- Security (Legal) – Park-specific, location-specific, and non-public information about information of concern to local or national security. Examples include buried utilities and dam locations.
- Operations - Important to the internal business operations of the NPS
- Paleontological (Legal) - Park-specific, location-specific, and non-public information about any discretely bounded organic remains of a plant or animal, trace of a plant or animal, imprint of a plant or animal, or cast of a plant or animal that has been preserved by natural processes within a geologic context, together with geologic and paleontological data associated with the object.
- Threatened (Legal) – Park-specific, location-specific, and non-public information about a species or population that has been formally designated as threatened or proposed for such a designation by the US Fish and Wildlife Service, National Marine Fisheries Service or other appropriate state agency (Source).
- Unknown – The Information Resource has not been evaluated as to whether it contains sensitive information. It is assumed that the Information Resource does not contain legally sensitive information, but may contain operationally sensitive information, until otherwise specified.
- Wells (Legal) - Park-specific, location-specific, and non-public information about geological and geophysical information and data concerning wells used for the purpose of withdrawing or injecting water, oil or natural gas

Legal Sensitivity is informed by a number of different laws, Director's Order and/or Executive Orders, including:

- National Parks Omnibus Management Act of 1998, Section 207
- Archaeological Resource Protection Act, 16 U.S.C. § 470hh
- The Federal Cave Resources Protection Act of 1988, 16 U.S.C. 4301 – 4309
- Executive Order No. 13007
- Freedom of Information Act, 5 U.S.C. § 552
- Director's Order #66 (RM-66B)

15.1.13 Information Resource Quality Rank

Definition – Describes the quality of information provided by the Information Resource. Items to consider in an assessment of quality include:

- Documentation of and adherence to protocols
- Qualifications of observers or data collectors

- Consistency of observers or data collectors (e.g., high staff turnover that could result in variability?)
- Protocols and/or equipment used (e.g., current vs. outdated methods, quality and performance of equipment)
- Volume of data collected and duration of study
- Accuracy, consistency and completeness of data collection and data entry
- Documentation and precision of location data
- Level of synthesis or interpretation of raw data

If a quality assessment is made, the opinion should be substantiated with a comment.

Data Type - String

Enumerations (One of the following):

- High – The Information Resource is not known to be missing or contain misleading information AND adequate documentation on its generation is present. Generally, peer-reviewed materials (e.g., from published journal articles or rigorous monitoring programs) fall into this category.
- Medium – The Information Resource is missing some information, but not information that is essential to the correct interpretation. There may have been some internal review of the Information Resource, but not a formal peer-review.
- Low – The Information Resource is missing some information. Documentation on its generation is limited. Correct interpretation is still possible by someone with an advanced knowledge of the topic.
- Poor – The Information Resource is missing key information or has misleading information that makes effective and correct interpretation extremely difficult. Examples include datasets with little or no documentation.
- Legacy – The information came from a legacy application where the definitions for Quality were either different or did not exist.
- Unknown – The quality of the Information Resource is unknown and/or unevaluated. Assumed to be Poor until resolved.

15.1.14 Reference Lifecycle State

Definition - A sequence of defined stages over the full duration of a Reference, ranging from its creation to deletion.

Data Type - String

Enumerations (One of the following):

- Legacy – The Reference was imported from a legacy application and has not been reviewed as to whether it (1) meets the quality standards and (2) uses the same definitions, of the Reference Service
- Draft – The Reference was created in the Reference Service but has not been checked for quality and/or is missing required information.
- QC_Accepted – The Reference has passed an automated quality control process and is eligible to be set to “Active”
- Active – The Reference is active

- In Review – The Reference, which was once active, has been edited and will require another automated QC before it can become active once again.
- Quarantined – Another user suggested or made an edit to the Sensitivity, Proprietary and/or Quality attributes of the Reference and/or Information Resource
- Inactive – There Reference has been set to an inactive.

The following figure defines acceptable lifecycle state transitions:

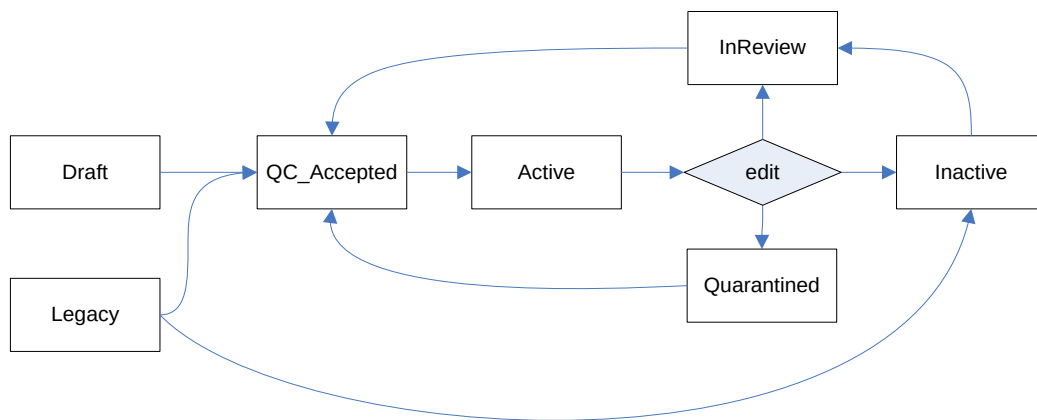


Figure 4. Valid Lifecycle State Transitions for a Reference

15.1.15 Reference Proprietary Rank

Definition – This rank indicates whether a Reference contains information that is copyrighted, has other legal restrictions, paid for access from a third party, and/or the data has recently been collected by a non-NPS Principle Investigator who plans to publish their results in a professional journal. Examples of when a Reference may contain proprietary information:

- The Abstract for a copyrighted journal article is copied verbatim into the Reference.
- The entire Reference is copied verbatim from another copyrighted service

Note: While the Reference Service will support legacy References attributed as being proprietary, this will not be supported in the future since it hinders information discovery.

Data Type - String

Enumerations (One of the Following):

- Unknown – Proprietary status cannot be determined. Assumed to be “Copyrighted, Do Not Distribute” until resolved.
- Copyrighted, Do Not Distribute – Known to contain copyrighted information but with no permission to distribute
- Copyrighted, Distribute Internally – Known to contain copyrighted information. Permission secured to distribute internally within NPS.

- Copyrighted, Distribute for Non-Commercial Use – Known to contain copyrighted information. Public distribution allowed for non-commercial use.
- Copyrighted, Distribution Permitted- Known to contain copyrighted information. Permission secured to distribute to the public and use for commercial purposes.
- Non-Proprietary. No copyrights.

15.1.16 Reference Sensitivity

Definition – The Reference itself contains the information (See above)

Note: While the Reference Service will support legacy References attributed as being sensitive, this will not be supported in the future since it hinders information discovery.

15.1.17 Subject Category

Definition – One or more categories that generally describe the content of the information resource. Each Reference must have at least one subject category (See Section 15.4).

Type – String

Enumerations – See Section 15.4.

15.1.18 Title

Definition - A name given to the Information Resource. If the Information Resource does not have a name, a descriptive name should be provided and enclosed in brackets (e.g., [Letter to the Superintendent Regarding Water Quality]). [Unknown] is acceptable, although discouraged.

Data Type - String

Enumerations - None

15.1.19 Types

Definition – The type of Information resource that the Reference refers to. References are divided into types because the attributes necessary to describe them vary. Subtypes are used to further modify the specific Reference type and most often, although not always, differentiate between formats (e.g., analog and digital) or lifecycle states (e.g., draft, proof etc.).

Data Type - String

Enumerations (one primary and zero or more secondary):

- Aerial Photograph
- Book - A set or collection of written, printed, illustrated, or blank sheets, made of paper, parchment, or other material, usually fastened together by a hinge at one side.
 - Electronic - A book originally produced in electronic format
- Book Chapter - One of the main divisions of a book. Chapters are generally numbered or titled.
- Brochure
- Conference Proceeding - Collection of academic papers that are published in the context of an academic conference. They are usually distributed as printed books (or

sometimes CDs) either before the conference opens or after the conference has closed. Proceedings contain the contributions made by researchers at the conference. They are the written record of the work that is presented to fellow researchers.

- Conference Proceeding Paper – A single paper published within a Conference Proceeding.
- Docket – Summary of legal documents
 - Appropriative
 - Federal Reserved
 - Ownership
 - Riparian
- Educational Handout
- Email - A digital message from one person to one or more other persons. An Email consists of two components, the message header, and the message body, which is the email's content.
- Field Notes -
- Generic Collection - An aggregation of resources whose individual components are not described separately. Examples include a box of photos, a folder of maps, etc.
- Generic Correspondence - Non-concurrent, remote communication between people
- Generic Dataset - A collection of data. Data is presented in tabular form, where each column represents a particular variable, either as text string or geography (i.e., points, lines and polygons), and each row corresponds to a given member of the data set in question.
- Generic Document – Any original or official paper that conveys information
- Generic Image – A picture captured by an optical device, including cameras, mirrors, lenses, telescopes, microscopes. Images that are orthorectified (processing to geometrically correct it so that the scale of the photograph is uniform and it can be measured as a map) would be treated as a dataset.
 - Hardcopy– A reproduction suitable for direct use by a person without the aid of a computer.
 - Digital - An electronic reproduction which requires the aid of a computer to view.
- Generic Periodical - A published work that appears as a new edition on a regular schedule
- Journal – A periodical
 - EJournal
 - Hardcopy
- Journal Article - An article from a peer-reviewed periodical relating to a particular academic discipline.
 - Pre-Print
 - Proof
 - Electronic
- Letter – A written message from one person to another
- Map - A visual representation of an area highlighting relationships between objects, regions, and themes

- Hardcopy - A paper reproduction suitable for direct use by a person without the aid of a computer.
 - Digital – An electronic reproduction which requires the aid of a computer to use.
- Movie – A collection of still images, that when viewed in series, show motion.
 - Hardcopy - A film reproduction suitable for direct use by a person with the aid of film projector.
 - Digital - An electronic reproduction which requires the aid of a computer to view.
- Newspaper - A periodical publication containing news, information, and advertising
- Newspaper Article
- Podcast - A series of digital computer files, usually either digital audio or video, that is released periodically and made available for download by means of web syndication.
- Plan – Any type of planning document, including monitoring or management plans.
- Presentation – Used for the purpose of showing and explaining the content of a topic to an audience or learner. Most often this is a set of slides that rely on simple text statements and graphics.
- Project - A planned endeavor, usually with a specific goal and accomplished in several steps or stages that produces a variety of end-products.
- Protocol - A rule, guideline, or document which guides how an activity should be performed.
- Raster Dataset - Storage format for managing the location of geospatial information as grids and their associated attribute information.
- Relational Database - A database containing more than one table, with the tables sharing data.
- Report – A piece of information describing an event which given or presented to someone
 - Draft – A report which never was completed
 - Unpublished – A report that is not published by an entity whose primary business is to publish.
 - Published – A report that is published by an entity whose primary business is to publish.
- Satellite Image –
- Series - A succession of volumes or issues published with related subjects or authors, similar format, and/or continuous numbering
- Standard - A rule or set of rules or requirements which are widely agreed upon
- Standard Operating Procedure - Detailed written instructions to achieve uniformity of the performance of a specific function
- Survey - A series of questions used to gather information
- Table - A database containing a single table or group of discrete tables.
- Thesis - A written essay submitted for completion of a university degree.
 - Masters
 - Doctoral
- Vector Dataset- Storage format for managing the location of geospatial information (points, lines and polygons) and their associated attribute information.
- Web Page -

- Web Service -

Other Information

To streamline the searching and management of the Reference Types, they can be generalized into one or more Reference Type Groups.

Reference Type Group	Reference Type
Images	Aerial Photograph Generic Image Map Movie Podcasts Presentation Satellite Image
Datasets	Aerial Photograph Generic Dataset Generic Image Map Raster Dataset Relational Database Satellite Image Survey Table Vector Dataset Web Service
Documents	Book Book Chapter Brochure Conference Proceeding Conference Proceeding Paper Docket Educational Handout Email Generic Correspondence Generic Document Letter Newspaper Article Journal Article Map Plan Protocol Report Standard Standard Operating Procedure Thesis
Collections	Generic Collection Conference Proceeding Docket Project
Web Resources	Podcast Web Page Web Service

Table 3. Reference Type Groups and Associated Reference Types

When a Reference is assigned more than one Reference Type, there are only certain combinations which are valid. The following table presents valid combinations of primary and secondary Reference Types:

Primary Reference Type	Valid Secondary Reference Type
Report	Dataset

Report	Map
Report	Photograph
Docket	Map

Table 4. Valid Primary and Secondary Reference Type Combinations

15.2 Type-Specific and Optional Attributes

15.2.1 Abstract

Definition – The abstract copied directly from the Information Resource or a more thorough account of the content of the Information Resource.

Data Type - String

Enumerations - None

15.2.2 Content Begin Date

Definition – Starting date the content refers to. In many cases, the information contained within the Information Resource is earlier than the date the Information Resource was published. For example, a report published in 2006 describes fieldwork conducted in July, 2005; the Content Begin Date would be July, 2005. If the Content Begin and End Dates are the same, then only the Content Begin Date need only be completed.

Data Type - Date

Enumerations - None

15.2.3 Content End Date

Definition - Ending date the content refers to. In many cases, the information contained within the Information Resource is earlier than the date the Information Resource was published. For example, a report published in 2006 describes fieldwork conducted in July, 2005; the Content End Date would be July, 2005.

Data Type - Date

Enumerations - none

15.2.4 Coordinate System

Definition - the reference frame or system from which linear or angular quantities are measured and assigned to the position that a point occupies

Data Type - String

Enumerations - None

15.2.5 Date Range

Definition – Any miscellaneous range of dates that further describes the Information Resource, such as the meeting dates for a conference.

Data Type - String

Enumerations - None

15.2.6 Datum

Definition – The standard position or level that the projection measurements are taken from

Data Type - String

Enumerations - None

15.2.7 Edition

Definition -

Data Type

Enumerations

15.2.8 Issue

Definition – A single publication of a periodical.

Data Type - String

Enumerations

15.2.9 Keyword

Definition – A word or phrase that describes the information resource in a way which is not already articulated using one or more other attributes (e.g., category, title, abstract, reference-taxon link, reference collection, etc).

Data Type - String

Enumerations

15.2.10 Location

Definition – Description of the geographic locations characterized by the Information Resource.

Data Type - String

Enumerations

15.2.11 Meeting Place

Definition – A geographic location that is not described by the Information Resource, but is important to its creation, publication and/or organization.

Data Type

Enumerations

15.2.12 Miscellaneous Code

Definition - Any type of code that has been used to identify the information resource

Data Type - String

Enumerations

15.2.13 Notes

Definition – Other general notes about the Information Resource

Data Type - String

Enumerations

15.2.14 Page Range

Definition: Beginning and ending page numbers. If the information source is one page, the page range will be a single number.

Data Type- String

Enumerations

15.2.15 Place Published

Definition – The location an Information Resource was published

Data Type - String

Enumerations

15.2.16 Projection

Definition - The method used to representing the surface of a sphere to a plane.

Data Type - String

Enumerations

15.2.17 Purpose

Definition – Intent for the creation of the Information Resource

Data Type - String

Enumerations

15.2.18 Resolution

Definition - Resolution of the Information Resource

Data Type

Enumerations

15.2.19 Size

Definition – The physical or digital size of the Information Resource.

Data Type - String

Enumerations

15.2.20 Size Units

Definition – The units of measure used for describe the physical size of the Information Resource.

Data Type - String

Enumerations

15.2.21 Table of Contents

Definition – A listing of the topics covered in the Information Resource as arranged by chapter and/or section.

Data Type - String

Enumerations

15.2.22 Update Frequency

Definition - The anticipated frequency with which changes, additions and/or releases are made

Data Type - String

Enumerations

15.2.23 Version

Definition - A particular revision described by a number, code and/or date. Changes in version implies substantive changes in content rather than differences in format. For books, this is synonymous with edition.

Data Type - String

Enumerations

15.2.24 Volume

Definition - A series of issues of a periodical

Data Type - String

Enumerations

15.3 Required and Expected Reference Type Attributes

The following sections define the expected for a specific Reference Type. The core attributes are also required and only included below if the definition differs significantly. They include:

- Reference Code;
- Display Citation;
- Title;
- Content Description;

- Date of Issue;
- Reference Type; and
- Bounding Box (north, south, east and west)

Because the Reference Service uses a small number of fields to cover a wide range of Reference Types, some of the attributes are overloaded and will have different definitions depending on the Reference Type. For instance, in the context of a Book, Page Range means the number of pages. However, in the context of a Journal Article, Page Range is the actual page range.

The following codes are used:

- R – Required. The Reference Lifecycle State may not be set to 'Active' until completed.
- E – Expected. The Reference can be set to an 'Active' lifecycle state but may not be considered to be adequately attributed for some user groups (e.g., general public).
- O – Optional. This field is applicable to the Reference Type although may optionally be completed

In addition to the attributes, the formatting for the display citation along with some examples are also provided.

15.3.1 Aerial Photograph

15.3.2 Book

15.3.2.1 Attributes

- Author (R/O) – Author of the book. A book must have either an author or an editor.
- Editor (R/O) –Editor of the book. A book must have either an author or an editor.
- Location (E) – Place/location the book was published
- Page Range (E) – Number of pages in the book
- Series (O) – See Series. Book series number/code.
- Volume (O) – Book volume
- Miscellaneous Code (O) – Other identifying book code.

15.3.2.2 Display Citation

Author, year, book title, publisher, place published

Contact.Authors,DateOfIssue,Title,Contact.Publisher, Location

Examples:

- Burnett, G. W. and M. K. Botz. 1974. Montana water quality bibliography. Montana Dept. of Health & Environmental Sciences, Helena, MT.
- Frye, T. C. 1934. Ferns of the northwest. Metropolitan Press, Portland, OR.

15.3.3 Book Chapter

15.3.3.1 Attributes

- Book (R) – (See Book).
- Author (R) – Individual(s) and/or entities who wrote the book chapter.
- Page Range (E) – Page range of the book chapter within the book.
- Generic Code (O) – Chapter number

15.3.3.2 Display Citation

chapter author, year, chapter title, [Pages] page range, [in] book author, book title, publisher, place published)

Contact.Author, DateOfIssue, Title, PageRange, BookAuthor/Editors(s), BookTitle, Contact.Publisher, Location.

Examples

- Bock, J. H. 1989. Ecology and evolution in the Great Plains. Pages 551-577 *in* J. H. Bock and Y. B. Linnart. The Evolutionary ecology of plants. WestView Press, Boulder, CO.
- Lichtwardt, R. W. and S. T. Moss. 1978. Systematics and evolution of the trichomycetes. Pages 30-31 *in* K. L. McArthur. 1977 Annual Research Summary, Glacier National Park. Glacier National Park, West Glacier, MT.

15.3.4 Brochure

15.3.5 Conference Proceeding

15.3.5.1 Attributes

- Publisher (R) – Entity responsible for the creation of the Conference Proceeding
- Page Range (E) – Total number of pages in the conference proceeding
- Location (E) – Location of the Conference
- Date Range (E) – Date(s) of the conference
- Editors (O) – Editors of the Conference Proceeding
- Miscellaneous Code (O) – Any code that was used to identify the conference proceeding
- Series (O) – (See Series).

15.3.5.2 Display Citation

year, proceedings title, place of meeting, publisher, place of publication, date of meeting

DateOfIssue, Title, MeetingLocation, Contact.Publisher, Location, DateRange

Comment: again, place of meeting should be changed to be next to date of meeting when we have a chance to re-code this.

Examples:

- 1993. Crown of the Continent Ecoregion Workshop. Kalispell, MT, Flathead Basin Commission, unpublished, Kalispell, MT, September 12-15, 1993.
- 1989. Tamarisk Control in Southwestern United States. University of Arizona, Tucson, University of Arizona Press, Tucson September 2-3, 1987
- 1997. Making protection work : Proceedings of the ninth conference on research and resource management in park and on public lands : The George Wright Society Biennial Conference. Albuquerque, NM, The George Wright Society, Hancock MI March 17-21, 1997

15.3.6 Conference Proceeding Paper

15.3.6.1 Attributes

Conference Proceeding (R) – See Conference Proceeding.

Authors (R) – Authors of the conference proceeding paper

Page Range (E) – The page range the paper occupies within the Conference proceeding.

Abstract (O)

15.3.6.2 Display Citation

Paper author, year, paper title, proceedings title, place of meeting, publisher, place of publication, date of meeting: page range)

Comment: When we re-code these citation strings, it might make more sense to put place of meeting next to date of meeting (this is what other styles usually do, like CBE).

15.3.6.3 Examples:

Greer, K. R. 1972. Grizzly Bear Mortality and Studies in Montana. Bears - Their Biology and Management: Papers and Proceedings of the Second International Conference on Bear Research and Management. Calgary, Alberta, Canada, International Union for Conservation of Nature and Natural Resources, Morges, Switzerland, 6-9 November 1970: 53-66.

Howe, R. E. and K. R. Greer. 1964. Winter weights of northern Yellowstone elk, 1961-62. Transactions of the North American wildlife and natural resources conference, 29th. Wildlife Management Institute, Washington, DC, March 9, 10, and 11, 1964: 237-248.

Martinka, C. J. and K. C. Kendall. 1986. Grizzly bear habitat research in Glacier National Park, Montana. Grizzly Bear Habitat Symposium, Missoula, MT. USDA, Forest Service, Intermountain Research Station, Ogden, UT, April 30-May 2, 1985: 19-23.

Foxx, T. S. and L. D. Potter. 1984. Fire Ecology at Bandelier National Monument. La Mesa Fire Symposium. Los Alamos National Laboratory, Los Alamos, NM, US Government Printing Office, Washington, DC October 6 & 7, 1981.

15.3.7 Correspondence

15.3.7.1 Attributes

- Subtype (R) – Indicates what type of correspondence it is.
- Author(s) (R) – The person(s) who prepared the correspondence

- Recipient(s) (R) – The person(s) who the correspondence was prepared for
- Number of Pages (O) – Total number of pages of the correspondence.

15.3.7.2 Display Citation

- **Letter** (letter author, date, [Letter to] recipient. [Letter]
- **Memorandum** (memo author, date, [Memorandum to] recipient, memo title, [Memorandum]
- **Email** (email author, date, [Email to] recipient, Email title, [Email]
- Kuailani, F. 1988. Letter to Superintendent, Pu'uuhonua o Honaunau NHP et al. Letter.
- Acting Assistant Field Supervisor, Mojave/Great Basin Deserts. 2005. Memorandum to Compliance Specialist, National Park Service and Death Valley National Park. Request for species list for Death Valley National Park, Bonnie Claire and Ubehebe Roads Project. Memorandum.
- Adler, L. 2004. Email to T. Croissant and M. Essington. visiting Death Valley. Email.

15.3.8 Docket

15.3.8.1 Attributes

-

15.3.9 Educational Handout

15.3.10 Email

15.3.11 Generic Collection

15.3.12 Generic Dataset

15.3.12.1 Attributes

- Use Constraints (R)
- Contributors/Authors (R/O) – Either an author/contributor or publisher/producer must be identified
- Publisher/Producer (R/O) - Either an author/contributor or publisher/producer must be identified
- Content Begin Date (E)
- Content End Date (E)
- Generic Code (O)
- Version (O)
- UpdateFrequency (O)
- SubType (O)
- Series (O) – See Series

15.3.12.2 Display Citation

- **Data set** (author, year, title, [Dataset], URL)
- Buskirk, S. n.d. Steve Buskirk's field notes, 1973 - 1977. Dataset.
- National Park Service, Alaska Regional Office. 1984. Subsistence papers (collection of subsistence papers and regulations). Dataset.
- Peyton, L. J. n.d. Bird songs of Alaska. Dataset.
- Smith, B. 1999. Invertebrates within American Samoa coral reef ecosystem. Dataset (<http://www.nodc.noaa.gov/archive/arc0001/9900054/>).

15.3.13 Generic Document**15.3.13.1 Attributes**

- SubType (O)

15.3.13.2 Display Citation**15.3.14 Generic Image****15.3.14.1 Attributes**

- Author (R) – aka Photographer
- Content Begin Date (E) – The date the photograph was taken.
- Publisher (O)
- Use Constraints (O)
- Generic Code (O)

15.3.14.2 Display Citation**15.3.15 Generic Periodical****15.3.15.1 Attributes**

- Publisher (R)
- SubType (R)

15.3.15.2 Display Citation**15.3.16 Issue/Volume**

- Volume (R)
- Issue (E)
- Title (O)

15.3.17 Journal**15.3.18 Journal Article****15.3.18.1 Attributes**

- Issue/Volume (R) – See Issue/Volume
- Author (R)
- Page Range (E)
- Abstract (O)

15.3.18.2 Display Citation

article author, year, article title, journal title, **volume**: page range)

Comments: Notice the journal issue is not included. The journal title is expressed just like it is in the data (i.e. if it is abbreviated, then that is the way it is expressed). If there are more than 10 authors, 'and others' is added after the tenth author.

Harrington, F. H. and L. D. Mech. 1982. An Analysis Of Howling Response Parameters Useful For Wolf Pack Censusing. J Wildl Manage **46**:686-693.

Moment, G. B. 1968. Bears: the need for a new sanity in wildlife conservation. BioScience **18**:1105-1108.

Kayen, R. E., M. E. Torresan, S. V. Dadisman, D. A. Clague, D. E. Drake, C. E. Gutmacher, M. A. Hampton, M. S. Marlow, J. G. Moore, W. R. Normark and others. 1990. GLORIA side-scan sonar imagery of the Hawaiian Islands exclusive economic zone [abs.]. Eos, Transact

15.3.19 Letter**15.3.20 Map****15.3.20.1 Attributes**

- Use Constraints (R) – “None” or “Unknown” is allowed
- Content Begin Date (R) – “Unknown” is allowed
- Content End Date (R) - “Unknown” is allowed
- Subtype (R)
- Contributors/Author (R/O) – Either a contributor/author or a publisher must be identified
- Publisher (R/O) – Either a contributor/author or a publisher must be identified
- Version (O)
- Miscellaneous Code (O)

- Map Size (O)
- Scale (O)
- Scale Units (O)

15.3.20.2 Display Citation

author, year, title, [Map]. publisher, place published, issue ID, URL)

Achuff, P., R. L. Mcneil, C. Coleman, C. Wallis, C. Wershler, and R. Riddell. n.d. Ecological land classification maps of Waterton Lakes National Park, Alberta. Map.

Boardman, L., W. L. McIntosh, and I. M. Morgan. 1969. Geologic map index of Montana. Map. USGS, Washington, DC.

USDI. n.d. Tutuila American Samoa. Map. (http://doc.asg.as/Maps/tut_nps.jpg).

Flanigan, V. J., C. Long, D. Rohret and P. Moir. 1986. Apparent resistivity map of the rift systems of Kilauea and Mauna Loa Volcanoes, island of Hawaii, Hawaii. Map. MF1845-B.

Comment: The following example shows how whatever was entered in the URL field in NatureBib is displayed, even though it has more info than just the URL.

Carruth, R. L., USGS and Commonwealth Utilities Corporation, CNMI. 2003. Ground-water resources of Saipan, Commonwealth of the Northern Mariana Islands. Map. United States Geological Survey, Reston, VA (<http://Address as of 03/16/04: http://water.usgs.gov/pubs/wri/wri034178/pdf/wrir03-4178.pdf>; current access available via PURL.).

15.3.21 Movie

15.3.21.1 Attributes

- Content Begin Date (E)
- Content End Date (E)
- Use Constraints (O)
- Miscellaneous Code (O)

15.3.21.2 Display Citation**15.3.22 Newspaper****15.3.23 Newspaper Article****15.3.24 Podcast****15.3.25 Plan****15.3.26 Presentation****15.3.27 Project****15.3.27.1 Attributes**

- Lead (E)
- Content Begin Date (E) – Date the project started
- Content End Date (E) – Date the project closed/finished
- Contributors (O) – Other people involved in the project

15.3.27.2 Display Citation**15.3.28 Protocol****15.3.29 Raster Dataset****15.3.30 Relational Database****15.3.31 Report****15.3.31.1 Attributes**

- Author (R)
- Page Range (E) – Number of pages in the report
- Editor (O)
- Publisher (O)
- Miscellaneous Code (O)
- Abstract (O)
- Series (O) – See Series

15.3.31.2 Display Citation

Unpublished Report - author, year, report title, URL

Else, P. V. 2007. Literature reviewed during development of PACN Landscape Dynamics Protocol. (http://www1.nature.nps.gov/im/units/pacn/monitoring/vs_landscape.cfm).

Craighead, F. C. 1951. A biological and economic evaluation of coyote predation.

Glacier National Park. 1995. Mountain Goat And Human Use Patterns At Oberlin Bend, Logan Pass.

Rice, P. and C. Toney. 1997. Susceptibility of northern region habitat types to invasion by five noxious weed species-first approximations. *Annals of the American Geophysical Union*. **71**:1580.

Published report (author, year, report title, publisher, place published, report ID, URL)

Sheehan, S. W., G. L. Ennis, and R. L. Hallam. 1980. A Water quality study of the Flathead River Basin in British Columbia prior to proposed coal mining. Environment Canada, Inland Waters Directorate, Vancouver, BC.

US Fish and Wildlife Service. 1993. 1991 and 1992 annual reports of the Montana Interagency Wolf Working Group. United States Government Printing Office, Washington, DC.

Beckwith, M. A. 2002. Selected trace-element and synthetic-organic compound data for streambed sediment from the Clark Fork-Pend Oreille and Spokane River basins, Montana, Idaho, and Washington, 1998. US Geologic Survey, Helena, MT. Open-File Report 02-336. (<http://water.usgs.gov/nawqa>).

Raulerson, L. and A. F. Rinehart. 1989. Vegetation of American Memorial Park, Saipan, Mariana Islands. Cooperative National Park Resources Studies Unit, University of Hawaii at Manoa, Honolulu, HI. CPSU Technical report 70 (<http://www.botany.hawaii.edu/faculty/duffy/techrep.htm>).

15.3.32 Satellite Image

15.3.33 Series

15.3.33.1 Attributes

- Publisher (R)

15.3.33.2 Display Citation

15.3.34 Standard

15.3.34.1 Attributes

- SubType (R)
- Author (R) – Author of the standard
- Publisher (O) – Publisher of the standard

- Abstract (O)
- Series (O) – See Series

15.3.34.2 Display Citation**15.3.35 Standard Operating Procedure****15.3.36 Survey****15.3.37 Table****15.3.38 Thesis****15.3.38.1 Attributes**

- Author (R) – Single author of the thesis
- Publisher (E) – University where the thesis was completed
- SubType (E)
- Location (E)
- Page Range (E) – Number of pages in dissertation
- Abstract (O)

15.3.38.2 Display Citation

- **Thesis** (author, year, title, [Thesis or Dissertation], university name, place published)
- Lunan, J. S. 1972. Phytosociology and fuel description of Pinus ponderosa communities in Glacier National Park. Thesis. University of Montana, Missoula Thesis.
- Mace, R. D. 1984. Identification and evaluation of grizzly bear habitat in the Bob Marshall Wilderness Area, Montana. Thesis. University of Montana, Missoula Thesis.
- Marsh, J. 1972. Man, landscape and recreation in Glacier National Park, British Columbia, 1880 to present. Dissertation. University of Calgary (Canada) Dissertation.

15.3.39 Vector Dataset**15.3.40 Web Page****15.3.41 Web Service****15.4 Subject Categories**

Subject categories are a fixed set of hierarchically organized subjects. Users can associate a Reference with one or more subject categories. They can optionally choose a category at any level. For example, a User can associate Reference to “Air and Climate” or could be more specific and associate it with “Ozone.”

To meet the needs of natural resources and others, the creation of these hierarchical categories is guided by the following rules, in order of priority:

- Categories are mutually exclusive
- The number of category levels is limited to three
- For each category, there should not be less than 2 and never more than 10 subcategories
- There should be at least one appropriate category per Reference
- Categories match the [NPS Ecological Monitoring Framework](#)

Level 1 Category	Level 2 Category	Level 3 Category	Comments
Air and Climate	Air Quality	Ozone	
		Wet and Dry Deposition	
		Visibility and Particulate Matter	
		Air Contaminants	
	Weather and Climate	Weather and Climate	
Geology and Soils	Geomorphology	Windblown Features and Processes	
		Glacial Features and Processes	
		Hillslope Features and Processes	
		Coastal/Oceanographic Features and Processes	
		Marine Features and Processes	
		Stream/River Channel Characteristics	
		Lake Features and Processes	
	Subsurface Geologic Processes	Geothermal Features and Processes	
		Cave/Karst Features and Processes	
		Volcanic Features and Processes	
		Seismic Activity	
	Soil Quality	Soil Function and Dynamics	
	Paleontology	Paleontology	
Water	Hydrology	Groundwater Dynamics	
		Surface Water Dynamics	
		Marine Hydrology	
	Water Quality	Water Chemistry	
		Nutrient Dynamics	
		Toxics	
		Microorganisms	
		Aquatic Macroinvertebrates and Algae	
Biological Integrity	Invasive Species	Invasive/Exotic Plants	
		Invasive/Exotic Animals	
	Infestations and Disease	Insect Pests	
		Plant Diseases	
		Animal Diseases	

Level 1 Category	Level 2 Category	Level 3 Category	Comments
	Focal Species or Communities	Marine Communities	Includes coral communities
		Intertidal Communities	
		Estuarine Communities	
		Wetland Communities	Marshes, swamps, bogs
		Riparian Communities	
		Freshwater Communities	Standing water (inland ponds and lakes) and flowing water (rivers and streams); emphasis on aquatic biota
		Sparsely Vegetated Communities	
		Cave Communities	Cave flora and fauna. Physical and chemical features and processes should go under Caves/Karst Features and Processes
		Desert Communities	
		Grassland/Herbaceous Communities	Includes tundra and alpine meadows, lichens, fungi
		Shrubland Communities	
		Forest/Woodland Communities	
		Marine Invertebrates	
		Freshwater Invertebrates	
		Terrestrial Invertebrates	
		Fishes	
		Amphibians and Reptiles	
		Birds	
		Mammals	
		Vegetation Complex (use sparingly)	Catch-all category to be used in rare cases where no other community type can be used.
		Terrestrial Complex (use sparingly)	Catch-all category to be used in rare cases where no other category can be used.
	At-risk Biota	T&E Species and Communities	
Human Use	Point Source Human Effects	Point Source Human Effects	
	Non-point Source Human Effects	Non-point Source Human Effects	
	Consumptive Use	Consumptive Use	
	Visitor and Recreation Use	Visitor Use	
	Cultural	Cultural Landscapes	
		Archeology	
		Ethnology	
		History	
Landscapes (Ecosystem Pattern and Processes)	Fire and Fuel Dynamics	Fire and Fuel Dynamics	
	Landscape Dynamics	Land Cover and Use	Includes landscape pattern, fragmentation
	Extreme Disturbance Events	Extreme Disturbance Events	Records of floods, windthrow, ice storms, hurricanes, etc., which might also be placed in Climate category.
	Soundscape	Soundscape	
	Viewscape	Viewshed	
		Dark Night Sky	

Level 1 Category	Level 2 Category	Level 3 Category	Comments
	Nutrient Dynamics	Nutrient Dynamics	
	Energy Flow	Primary Production	
Technical	Remote Sensing		
	??		

16 Appendix B - Holding Details

Note – This Appendix is undergoing considerable revisions.

16.1 Core Holding Location Attributes (Required)

16.1.1 Description

Definition – General description of the holding.

Data Type - String

Enumerations – None

16.1.2 Lifecycle State

Definition – Describes the lifecycle state of the Holding Location

Data Type - String

Enumerations

- Draft – A holding location has been created
- Active – The holding location is adequately attributed
- Inactive – The holding location is no longer active and/or has been removed

16.1.3 Name

Definition – Holding-specific name or title.

Data Type - String

Enumerations – None

16.1.4 Physical Condition Rank

Definition – Describes the physical condition of a specific holding. The physical condition may vary among holdings.

Data Type - String

Enumerations (One of the Following):

- Unknown – The physical condition of the information resource holding has not been evaluated.
- Poor – Information resource holding is in poor physical quality and is missing multiple pages, difficult to read, fuzzy, and/or severely faded.
- Fair
- Good
- Excellent – Information Resource shows no sign of wear. All pages are known to be present.

16.1.5 Physical Security Risk

Definition – Indicates reasons why the release of a holding location may pose a security risk to the information resource. Each holding location can have one or more of the following enumerations.

Data Type -

Enumerations – (Zero or More)

- Internal Copy – This is an internal copy that is not intended for public use.
- Rare – This is a rare copy of information resource. Examples include one-of-a-kind.
- Commercially Valuable – Has some physical quality that makes it suitable for theft.
- High Lending Cost – There would be an inordinate cost in lending this out (e.g., photocopy or shipping costs)

16.1.6 Type

Definition – The type of holding location.

Data Type - String

Enumerations (One of the Following):

- Physical – The Information Resource is held physically at an NPS Unit. The Information Resource may be hardcopy or digital.
- DigitalFile – The Information Resource is a digital file managed by the Reference Service (via the File Service)
- ExternalResource – The Information Resource resides external to the NPS and may be hardcopy or digital.

16.2 Optional Holding Location Attributes

16.2.1 Unit Code

Definition – NPS Unit where the Information Resource is physically located

Data Type - String

Enumerations – NPS Units in the Unit Service

16.2.2 External System

Definition – Name of any external system that is used to describe the holding of the Information Resource. Common examples include ANCS+, TIC, NPS Focus, or a Park Library System.

Data Type - String

Enumerations (One of the following or User can specify their one)

- ANCS+ (also known as Interior Collections Management System – ICMS)
- TIC
- Focus

16.2.3 External System Code

Definition – Code used by the External System to uniquely identify the Holding.

Data Type - String

Enumerations – None

16.2.4 Storage Format

Definition – Format of the Information Resource Holding.

Data Type - String

Enumerations (One of the Following)

- Hardcopy
- Digital

16.2.5 Location

Definition – Code used by the External System to uniquely identify the Holding.

Data Type - String

Enumerations – None

16.2.6 URL

Definition –

Data Type - String

Enumerations – None

16.2.7 Date Last Accessed

Definition – The date the holding location was last confirmed to still have the Information Resource.

Data Type - Date

Enumerations – None

17 Appendix C - Reference Links

Note – This chapter is undergoing considerable revisions.

17.1 Required Attributes

17.1.1 Reference Link Lifecycle State

Definition – The status of the Reference Link.

Data Type - String

Enumerations (One of the Following):

- Active
- Inactive

17.2 Valid Links by Reference Type

Link Type	Source Reference Type	Destination Reference Type
IsPartOf	Book	Series
IsPartOf	Book Chapter	Book
IsPartOf	Report	Series
IsPartOf	Journal Article	Issue/Volume
IsPartOf	Issue/volume	Periodical
IsPartOf	Conference Proceeding	Series
IsPartOf	Conference Proceeding Article	Conference Proceeding
IsPartOf	Map	Series
IsPartOf	Generic Dataset	Series
IsPartOf	Standard	Series
IsBundledWith	Book	Project
IsBundledWith	Book Chapter	Project
IsBundledWith	Report	Project
IsBundledWith	Map	Project
IsBundledWith	Generic Dataset	Project
IsBundledWith	Conference Proceeding Article	Project

17.3 IsPartOf Link

17.3.1 Orphan Records

If a Reference is the destination of an “IsPartOf” relationship with another Reference with a lifecycleState of “Active”, the user will not be able set the lifecycle state to Inactive.

18 Appendix D – Reference-Unit Link Details

Note – This chapter is undergoing considerable revisions.

18.1 Reference-Unit Link Attributes

18.1.1 Reference Owner Reference-Unit-Link Lifecycle State

Definition - A sequence of defined stages over the full duration of a Reference-Unit link specific to the Reference Owner.

Data Type - String

Enumerations (One of the Following):

- Legacy – The Reference-Unit was imported from a legacy application and has not been reviewed as to whether it uses the same definitions, of the Reference Service.
- Active – The Reference Owner has linked a Reference to a Unit.
- Inactive – There Reference Owner has unlinked to Reference from the Unit.

The following figure defines acceptable lifecycle state transitions:

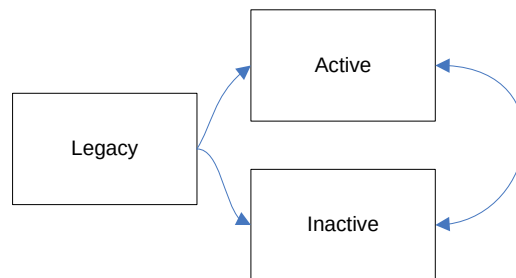


Figure 5. Valid Lifecycle State Transitions for a Reference Owner Reference-Unit Link

18.1.2 UPOC Reference-Unit- Link Lifecycle State

Definition - A sequence of defined stages over the full duration of a Reference-Unit link specific to the UPOC.

Data Type - String

Enumerations (One of the Following):

- Legacy – The Reference was imported from a legacy application and has not been reviewed as to whether it uses the same definitions of the Reference Service
- Pending– The UPOC has not reviewed a Reference-Unit link.
- Approved – The Reference Unit link was is approved by the UPOC.
- Rejected – The Reference link is not approved by the UPOC.

The following figure defines acceptable lifecycle state transitions:

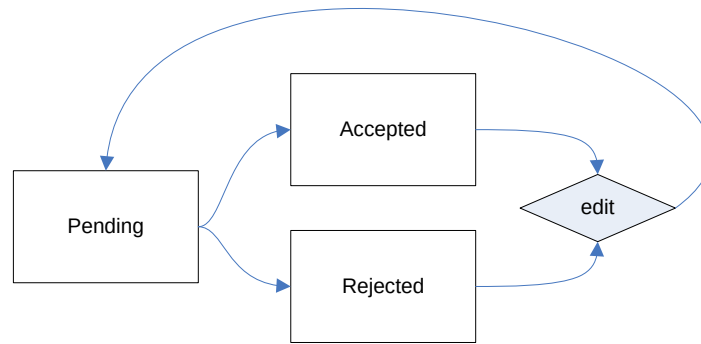


Figure 6. Valid Lifecycle State Transitions for a UPOC Reference-Unit-Link

19 Reference-Taxa Link Details

Note – This chapter is undergoing considerable revisions.

19.1 Required Attributes

19.1.1 ReferenceTaxaLifecycleState

Definition - A sequence of defined stages over the full duration of a Reference-Taxa link.

Data Type - String

Enumerations (One of the Following):

- Active – The Reference has an active link to a taxa
- Inactive– The Reference had an active link which has now been set to inactive because of some determination that the link was wrong and/or inappropriate.

The following figure defines acceptable lifecycle state transitions:

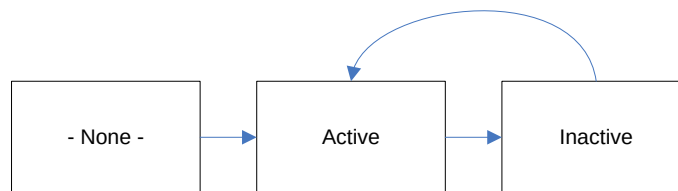


Figure 7. Valid Lifecycle State Transitions for a ReferenceTaxaLifecycleState

20 Appendix C –Use Cases

Note – This chapter is undergoing considerable revisions.

Searching

- Search References Through ArcGIS
- Search for References that are FGDC compliant
- Share a Saved Query
- Generate a report of All Technical Documents Produced by the Natural Resource Technical Report Series
- Search for All Protocols related to Water Quality
- Inventory all References (for documents, datasets and other) for a park Unit

Reference Management

- Contest a Reference
- Share Ownership of Reference
- Create a Reference
- View a Reference
- Edit a Reference
- Delete Reference

Reference Relationships

- Bundle Items as part of a project
- Reconcile Duplicate References
- Create a Reference-Reference Relationship
- Edit a Reference-Reference Relationship
- Delete a Reference-Reference Relationship
- View Reference-Reference Link

Reference-Unit Links

- Contest a Reference-Unit Link
- View a Reference-Unit Link
- Link a Reference to a Unit
- Unlink a Reference from a Unit
- Reference-Taxonomy Links
- Contest a Reference-Taxonomy Link
- NBII Metadata Profile Extension – importing process to cross-reference with taxonomic groupings
- Export to NBII Profile Extension
- Link a Reference to a Taxon
- View Reference -Tax Link
- Unlink a Reference from a Taxon

Holding Locations

- Replace an older version of a file
- Contest a Holding
- Share Holding Stewardship Role
- Primitive Use Cases
- Create a Holding
- Edit a Holding
- Delete a Holding
- View a Holding

Reference Collections

- Collection Crosswalks
- View all References for a Reference Collection
- Extract Metadata (etc.)
- Share Reference Collections
- Merge Bookmarks to Create a New Reference Collection
- Primitive Use Cases
- Create a Reference Collection
- View a Reference Collection
- Edit a Reference Collection
- Delete Reference Collection

Import and Export References

- Introduction
- High Level Use Cases
- Batch Import 50 photographs
- Reconcile Imported References
- Automatically Populate Nature Resource Technical Report Series Publications
- Automatically Populate with NPS Protocol Information
- Import References
- Export References
- Create Import Template
- View Import Template
- Delete Import Template

User Comments and Discussion Threads

- Create a Discussion Thread
- Respond to a Discussion Thread
- Create User Comment
- Edit a User Comment
- View a User Comment
- Delete a User Comment

Change History Management

- Introduction
- High Level Use Cases
- View Change History
- Undo Changes
- Redo Changes
- Primitive Use Cases
- Create Change History Record
- View Change History Record
- Undo Change

System Level User Management

- Manage User Rights
- Manage UPOCs
- Add User
- Edit User
- View User
- Add UPOC
- Edit UPOC
- View UPOC
- Delete UPOC
- Add Arbitrator
- Notification
- Track when another user at a park adds a new record
- Notify User