



Developing an Observational Database for Spalding's
catchfly (*Silene spaldingii*)

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ON THE COVER: Spalding's catchfly (*Silene spaldingii*), observed at a new sub-occurrence on an unnamed basalt ridge 4 miles SE of Swanson Lakes, in Lincoln County, Washington, 4 August 2018.

Photographs by: Walter Fertig

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Introduction

Silene spaldingii (Spalding's catchfly) is a tall, perennial herb in the carnation family (Caryophyllaceae) that is restricted to remnant Palouse prairie and channeled scabland sites in southern British Columbia, eastern Washington, northeastern Oregon, west-central Idaho, and western Montana (US Fish and Wildlife Service 2007). It is listed as Threatened under the US Endangered Species Act due to extensive habitat loss and degradation from human development, grazing, competition with invasive weeds, changes in fire frequency, and exposure to herbicides (US Fish and Wildlife Service 2001).

Rangewide, *Silene spaldingii* is known from over 100 occurrences, nearly two thirds of which contain fewer than 100 individuals. For recovery purposes, these occurrences have been clustered into larger Key Conservation Areas (KCAs) that are scattered across five different physiographic regions. To meet recovery objectives (and be eligible for delisting), 27 KCAs, each with at least 500 plants, need to have stable to increasing population trends for at least 20 years and management plans in place to protect and improve habitat conditions (US Fish and Wildlife Service 2007). In Washington, there are presently 48 extant and four historical or extirpated occurrences of *S. spaldingii* within 11 established or proposed KCAs (Fertig 2018). These occurrences often consist of numerous smaller sub-occurrences (referred to as "source features" in NatureServe's Biotics database) that are separated by less than 1 km of suitable habitat and thus function biologically as single populations.

Washington occurrences of *Silene spaldingii* are found on lands managed by the Bureau of Land Management (BLM), US Forest Service (USFS), US Fish and Wildlife Service (USFWS), US Air Force, Washington Department of Natural Resources, Washington Department of Fish and Wildlife, Washington State Parks and Recreation Commission, Washington State University, and private individuals. Long-term monitoring and surveys have been conducted at 35 occurrences in Washington using a variety of methods and recorded in several different GIS databases, including GeoBOB (BLM) and NRIS (USFS). All of these data have been aggregated into Element Occurrence Records (EORs) in the Biotics database of the Washington Natural Heritage Program (WNHP). In the process of creating and revising EORs, fine-grained spatial and event-specific data from GeoBOB and NRIS tend to be aggregated into coarser scale records that do an excellent job of capturing state-wide and regional patterns in the distribution and abundance of *S. spaldingii*. These fine-grained records, however, can be extremely valuable for identifying specific sites for establishing monitoring or demographic plots, or for tracking changes in abundance, which is vital for meeting recovery objectives.

In 2017 WNHP initiated a project to develop a GIS observation database to synthesize and standardize the collection and organization of *S. spaldingii* sub-occurrence data. With input from partners in BLM, USFWS, and USFS, we have developed an observation database in ESRI's ArcGIS. The following report summarizes the development and application of our database for Washington records of *S. spaldingii*. This database was built such that it will be applicable to *S. spaldingii* occurrences elsewhere in its range and to other biological elements (plant and animal species or ecological communities) with large and complex information sets.

Methods

We developed an ESRI geodatabase, version 10.5.1, and created blank fields for various population, habitat, location, and management attributes relevant to *Silene spaldingii* conservation. The database was then populated with *S. spaldingii* records from NRIS, GeoBOB, and Biotics (US BLM 2017 and 2018, USFS 2018, WNHP 2018). When available, we transferred population-specific data from comments fields in the original databases via field mapping and by entering data by hand. Sites were delineated by hand to cluster observations that were within < 0.25 km and along the same ridge or valley feature.

Appendix A includes metadata that explains the structure of the database and the various data entry fields in greater detail.

Results and Discussion

Based on data from the GeoBOB, NRIS, and Biotics datasets, there are 4723 separate observation records of *Silene spaldingii* in Washington (Figure 1). We have aggregated these into 500 site records, which contain one to several individual observations from the same approximate geographic location. In turn, these sites can be clustered into 52 element occurrences, based on standardized rules developed by NatureServe (i.e., sites within 1 km are considered part of the same element occurrence, unless separated by a barrier that would restrict gene flow). Presently, the 48 extant and four historical element occurrences of *S. spaldingii* in Washington are combined into 11 KCAs that are the primary focus of recovery efforts.

Over 73% of the observations of *S. spaldingii* are from Lincoln County, Washington (Table 1). About 86% of the observations come from BLM lands (Table 2). The large number of BLM observations comes in part from the 20-plus years of monitoring conducted by BLM biologists and the high proportion of *S. spaldingii* occurrences on BLM property. The relatively low percentage of observations on US Forest Service lands may be an artifact of observation-level data being aggregated into larger records in the USFS NRIS database and the shorter period of time in which these populations have been known and monitored.

This database was designed to meet multiple information needs of the project's stakeholders. This database will be useful for relocating known locations of *S. spaldingii* for future monitoring and the basic data fields are easy to incorporate into existing monitoring protocols and data recording systems to facilitate data sharing. The basic system can readily be adapted to accommodate data from other states with *S. spaldingii* occurrences as well as other elements of biological diversity (plant and animal species or plant communities). It could also be modified to help record absence data, which currently is rarely collected or archived. Fine-grained presence and absence data would greatly improve the ability of researchers to model the potential distribution of *S. spaldingii* across its range.

The WNHP intends to continue to maintain and enhance this database as funding is available. Future enhancements include adding domain tables, constraints, and triggers to better control data integrity; moving the database to a cloud format, enabling approved entities outside of WNHP to enter and retrieve data; and creating a mobile device entry form that could then be used to populate the database. However, as built, the database will improve the ability to meet the recovery objectives for *S. spaldingii* in Washington state.

Acknowledgements

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Tables and Figures

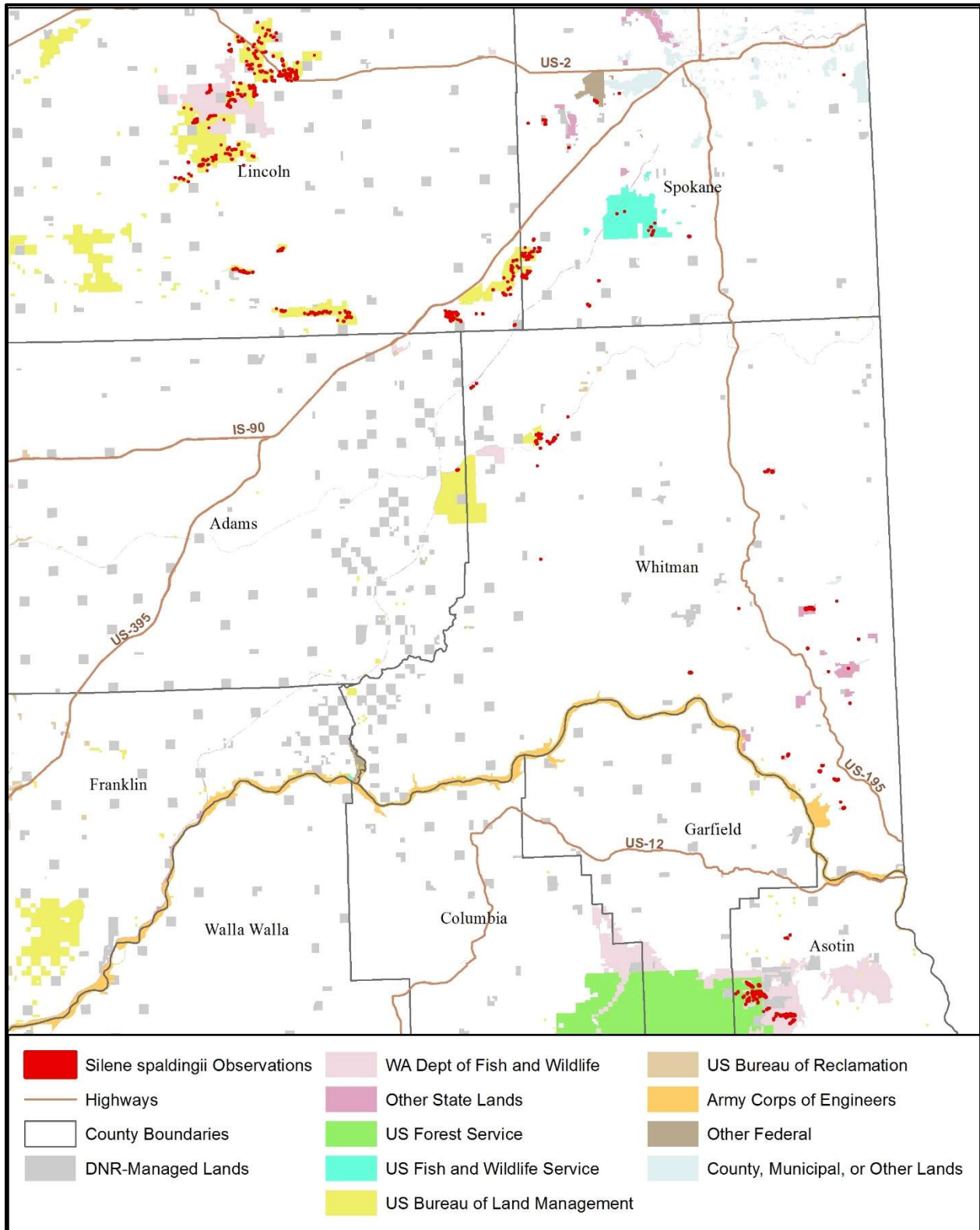


Figure 1. *Silene spaldingii* observations in Washington; data are current as of December 27, 2018.

Table 1. Number of *S. spaldingii* observations by Washington county.

Number of Observations	County
105	Adams
186	Asotin
3452	Lincoln
472	Spokane
508	Whitman

Table 2. Number of *S. spaldingii* observations in Washington state by land owner.

Number of Observations*	Owner
226	Private
4070	US Bureau of Land Management
155	US Dept of Defense
34	US Fish and Wildlife Service
56	US Forest Service
110	WA Dept of Fish and Wildlife
49	WA Dept of Natural Resources
5	WA State Parks and Recreation Commission
18	State University

* A small number of observations are double-counted since they cross multiple ownerships.

Literature Cited

- Fertig, W. 2018. Status of federally listed plant taxa in Washington state, 2017. Natural Heritage Report 2018-02. Washington Natural Heritage Program, Olympia, WA. 75 pp.
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- US Fish and Wildlife Service. 2001. Endangered and threatened wildlife and plants; final rule to list *Silene spaldingii* (Spalding's catchfly) as threatened. Federal Register 66(196):51598-51606.
- US Fish and Wildlife Service. 2007. Recovery plan for *Silene spaldingii* (Spalding's catchfly). US Fish and Wildlife Service, Portland, OR. xiii + 187 pp.
- US Forest Service. 2018. NRIS database snapshot. US Forest Service, Portland, OR.
- Washington Natural Heritage Program. 2018. Biotics database. Washington Natural Heritage Program, Olympia, WA.

Appendix A. Metadata for WNHP *Silene spaldingii* Observation Database

This ESRI file geodatabase contains observation-level information about rare plants in Washington.

The file geodatabase is native to ArcGIS 10.5.1.

The Observation feature class has overlapping polygons, one for each observation event. Observation polygons are contained within a Site feature class polygon. A site is an area that has been surveyed in the past and may be again in the future. The Managed Area feature class represents administrative units that contain sites and observations.

The Introduced Source Features feature class are single part polygons, while the Introduced Occurrences may be multipart polygons containing/overlapping the Introduced Source Features. The Introduced Occurrences and Introduced Source Features are meant to be used in conjunction with the Element Occurrences from WNHP, which can be found here: https://data-wadnr.opendata.arcgis.com/datasets?group_ids=266f0b3bdc014f5ab2a96ad4ea358a28 . The WNHP Source Features are available upon request. The Introduced Occurrences are new occurrences established by humans through the outplanting of seeds or plugs and designed to expand the number of populations of a species to improve its conservation status. Introduced occurrences are not currently included in the WNHP Biotics database.

Null values in tables denote unknown/no information available.

Contacts

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Feature Class Field Descriptions

OBSERVATIONS FEATURE CLASS:

OBSERVATION_ID: Unique identifier for each observation event. Required.

SITE_ID: Identifier for each site. Required. M:1 relationship with SITE_ID from the Site feature class.

SCI_NAME: Scientific name of the element being observed. Required.

MONITOR_DATE: Date of the observation

MONITOR_YEAR: Year the element was observed

NUMBER_PLANTS: Number of plants observed or estimated at the time of the observation event. The number zero indicates no plants were found whereas null values indicate no information was available.

PLANT_COUNT_UNITS: Units of the plant count. Not constrained to the values listed below.

PLANTS

STEMS

GENETS

RAMETS

FLOWERS

FRUITS

PLANT_EST_MAX: The estimated maximum number of plants in the observation at the time of observation.

PLANT_EST_MIN: The estimated minimum number of plants in the observation at the time of observation.

PLANT_COUNT_METHOD: Method of the plant count. Not constrained to the values listed below.

CENSUS

ESTIMATE

MONITOR PLOT

DATA_SOURCE: Data source of the original observation. Include dataset name and date in a YYYYMMDD format.

OBSERVATION_COMMENT: Comments relevant to that observation

SURVEYOR: People conducting the observation

REPRO_COUNT: Count of reproductive plants

VEGETATIVE_MATURE_COUNT: Count of mature but not reproducing plants

SEEDLING_COUNT: Count of non-mature plants

DEAD_COUNT: Count of dead plants

OBSERVATION_PHOTO_PATH: Path to the folder of photos that were taken during the time of observation. Use UNC paths.

ID_DOCUMENTATION: Any documentation used to ID the plant

MAPPED_BY: Name of the person that added the observation to table. Required.

MAPPED_DATE: Date the observation was added to table. Required.

FEDERAL_ID: Unique ID in original data source for the observation. BLM's GeoBOB; FLSITE_CN; USFS's NRIS: SPATIAL_ID.

SITES FEATURE CLASS:

SITE_ID: Unique identifier for each area containing at least one observation. Required.

SITE_NM: Name of a site. Not necessarily unique.

SITE_MANAGER_CONTACT: Contact person for the site

SITE_MANAGER_PHONE: Contact person's phone number. Format: 1234567890

SITE_MANAGER_ADDRESS: Contact person's mailing or physical address.

SITE_PROTECTION_LEVEL: Description of the site's level of protection.

PLANT_RECOVERY_ZN: Any recovery units associated with that population of the species.

SITE_COMMENTS: Comments about the site.

SITE_ACRES: GIS acres of the site polygon.

SITE_CONTACT_INFO_UPDATED: Date of the last time the contact information was updated.

MAPPED_BY: Name of the person that added the site to table. Required.

MAPPED_DATE: Date the site was added to table. Required.

SITE_PHOTO_PATH: Path to the folder of photos that were taken during the time of observation. Use UNC paths.

SITE_NAME_SYNONYM: Site names can change over time and old names can be stored here. If a site has more than one name, others can be stored here.

MANAGED_AREA_ID: Unique identifier for a managed area, defined by the site polygon's centroid since a site can cross managed areas. M:1 relationship with the managed areas feature class. Whitman County records without managed areas have a MANAGED_AREA_ID = -1.

SITE HABITAT TABLE:

M:1 relationship with the site feature class.

SITE_ID: Unique identifier for each area containing at least one observation. Required.

HABITAT_DATE: Date the habitat was observed

HABITAT_YEAR: Year the habitat was observed
WOODY_COVER_PCT: Woody cover percent
NATIVE_COVER_PCT: Native cover percent
EXOTIC_COVER_PCT: Exotic cover percent
EXOTIC_SPP_CONCERN: Exotic species of concern
NATIVE_FORB_PCT: Native forbes percent
NATIVE_GRASS_PCT: Native grass percent
OTHER_TESP_PRESENCE: Other TESP species present
SURVEYOR: Surveyor name
SURVEY_TYPE: Habitat survey type
HABITAT_COMMENTS: Habitat comments
HABITAT_PHOTO_PATH : Path to the folder of photos that were taken at the time of observation. Use UNC paths.
SOILS: Soil types
GEOLOGY: Geology of the area
TOPOGRAPHIC_POSITION_DESC: Topographic position description

MANAGED AREA FEATURE CLASS:

Note that there are not private parcels from Whitman County as they don't have parcels in a GIS format. This could be added in the future if they start using GIS to track parcels.

MANAGED_AREA_ID: Unique identifier for a managed area
MANAGED_AREA_NM: Managed area name. Not necessarily unique.
MANAGED_AREA_OWNER: Land owner of the managed area
MANAGED_AREA_OWNER_CONTACT: Contact person for the managed area
MANAGED_AREA_OWNER_PHONE: Contact person's phone number. Format: 1234567890
MANAGED_AREA_OWNER_ADDRESS: Contact person's mailing or physical address.
MANAGED_AREA_PROTECTION_LEVEL: Description of the managed area's level of protection.
MANAGED_AREA_COMMENTS: Comments about the managed area
MANAGED_AREA_ACRES: GIS acres of the managed area polygon.
MANAGED_AREA_CONTACT_INFO_UPDATED: Date of the last time the contact information was updated.

MANAGED_AREA_NAME_SYNONYM: Managed area names can change over time and old names can be stored here. If a managed area has more than one name, others can be stored here.

MAPPED_BY: Name of the person that added the site to table. Required.

MAPPED_DATE: Date the site was added to table. Required.

INTRODUCED OCCURRENCES FEATURE CLASS:

IO_ID: Unique identifier for each introduction occurrence

IO_NUM: Number that identifies this particular occurrence of the introduced element. Not unique within the table, unique only within a single species.

SCI_NAME: Scientific name of the introduced element.

COM_NAME: Common name of the introduced element as defined by the Washington Natural Heritage Program.

IO_COMMENTS: Comments about the introduced occurrence.

INTRODUCED SOURCE FEATURES FEATURE CLASS:

INTRO_SOURCE_FEATURE_ID: A unique identifier for each introduced source feature

IO_ID: Unique identifier for each introduction occurrence. This is not unique in this table as there can be multiple introduced source features within one introduced occurrence.

SCI_NAME: Scientific name of the introduced element.

COM_NAME: Common name of the introduced element as defined by the Washington Natural Heritage Program.

PROVENANCE: Where the seed or plugs of the introduced occurrence originated.

INTRODUCED_DATE: Date on which the introduction occurred

INTRODUCED_YEAR: Year in which the introduction occurred

INTRODUCTION_LAYOUT: Describe how the introduction was laid out. (i.e. were seeds dispersed in a grid or along a transect, were plugs planted according to a grid scheme or randomly, etc.)

INTRODUCED_QUANTITY: How many plugs or seeds were introduced

INTRODUCED_QUANTITY_UNIT: Units of how many seeds or what size plugs were introduced. Not constrained to the values listed below.

POUNDS

OUNCES

GRAMS

4 INCH

INTRODUCED_QUANTITY_TYPE: Type of introduction:

SEED

PLUG

INTRODUCTION_COMMENTS: Comments about the introduction

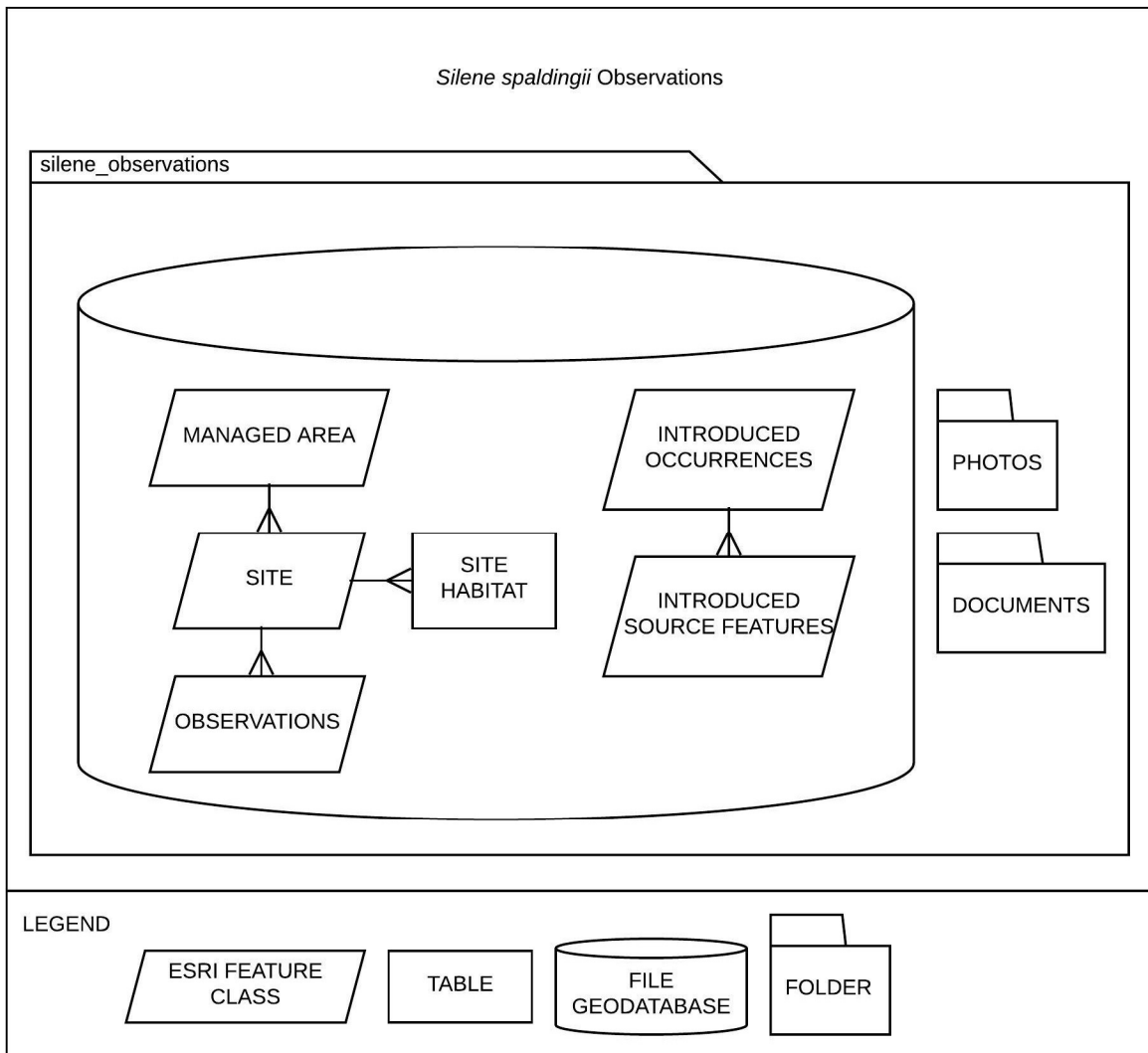
INTRODUCTION_TYPE: Records if this is an augmentation of a naturally-established population or a brand new introduction

AUGMENTATION: augmentation of a naturally-established population

OUTPLANTING: introduction where there were no recorded occurrences or the occurrence was extirpated

INTRO_SOURCE_PHOTO_PATH: Path to the folder of photos of the introduction area. Use UNC paths.

Data Diagram



Glossary

Element – A species or ecological community

Element Occurrence – A specific geographic area in which a species or ecological community exists or has existed in the past

For more information

Washington Natural Heritage Program:

<https://www.dnr.wa.gov/natural-heritage-program>

Element Occurrence Data Standard:

http://help.natureserve.org/biotics/biotics_help.htm#Methodology/EO_DataStandard.pdf%3FTocPath%3DMethodology%2520%2526%25C2%25A0Guidelines%7C_____3

NatureServe:

<http://www.natureserve.org/>