USDA Forest Service National Forest System
Data Recording Protocols and Requirements for
Invasive Species *Survey, Inventory, and Treatment*

Integration Version: 01/10/2014

Data Recording Protocols and Requirements for Invasive Species Survey, Inventory and Treatment Activities

Table of Contents

Page

I. Introduction

The management of aquatic and terrestrial invasive species is an important part of the broad research and management work of the USDA Forest Service, particularly with respect to the integrated watershed restoration and resource stewardship activities of the National Forest System (NFS). As defined in Executive Order 13112, and articulated in Forest Service management policy (FSM 2900 - Invasive Species Management), the term "invasive species" refers to any exotic species (including plants, pathogens, algae, fungi, vertebrates, and invertebrates) which causes harm to the environment, the economy, or human health. FSM 2900 also applies to harmful plants regulated as "noxious weeds" under State or Federal Statute. Invasive species impact all aquatic and terrestrial ecosystems. As we implement actions against these exotic invaders, we utilize many kinds of information on the location, extent, impacts, treatment efficacy, and rate of spread of infestations. It is important to maintain accurate records of our invasive species management activities.

The data recorded using these protocols will be a key source of information for reporting invasive species population or infestation levels, invasive species management planning, impact analyses and risk assessments as well as the basis for reporting information related to treatment and treatment monitoring of invasive species. Maintaining accurate records within prescribed protocols, rules, and standards will help provide valuable perspectives over time and help program managers set priorities and adapt management activities to improve future performance. In addition, keeping accurate records will also provide cumulative effects data to support forest planning activities and can help defend our actions during legal challenges to the NFS Invasive Species Management Program, ultimately improving the overall accountability and integrity of the Program.

National Policy Requirements for Record Keeping

The Invasive Species Management directive (Forest Service Manual 2900) provides a solid policy foundation upon which to manage invasive species using proactive and science-based approaches and increased integration and collaboration at all levels. In particular, FSM 2900 stresses the importance of adhering to NFS national protocols, business rules, and standards when collecting, maintaining, and reporting accurate spatial and tabular records for each management activity. National record keeping and reporting requirements apply to all activities conducted to combat aquatic and terrestrial invasive species on national forests, national grasslands, and adjacent areas when accomplished under the Wyden Amendment. All records for these activities (regardless of project funding source or objective) must be collected and maintained within NFS national applications that are maintained within the national Natural Resource Manager (NRM) database structure.

NRM-FACTS (Forest ACtivity Tracking System) and NRM-TESP/IS (Invasive Species Survey and Inventory Application) are, respectively, the Databases of Record for all treatment/treatment monitoring data and all survey/inventory data, related to invasive species management activities occurring on National Forests and Grasslands regardless of funding source or project objective. On July 1, 2012, NRM released the *Invasive Species Integrated User Interface* to the field as the new required data entry/editing application for all spatial and tabular information associated with invasive species survey, inventory, and treatment activities

conducted on National Forests and Grasslands. This new interface requires users to enter data through a single user interface that will feed data appropriately to both of the required Databases of Record (FACTS and TESP/IS). As per the direction from USFS leadership, this new Integrated User Interface will improve NFS invasive species management data integration and meets all national record keeping and reporting standards, protocols, and requirements. This integrated interface is also designed to simplify data entry across the entire NFS invasive species management business area, increase data quality, and meet the Forest Service's national spatial data information requirements for activities conducted on National Forests and Grasslands. As the NFS Invasive Species Management Program grows, all future modifications to these national data applications must meet the national architectural standards, security requirements, and NFS Invasive Species Management program business rules, standards and requirements; as well as be sanctioned and approved by NRM and NFS leadership.

Scope of These National Protocols

These data recording protocols and requirements provide details and direction for properly recording tabular and spatial information associated with invasive species surveys, inventories, and treatments when these activities are conducted on National Forests or National Grasslands, or on adjacent areas under the authority of the Wyden Amendment. These data entry protocols and requirements apply to all aquatic and terrestrial invasive species management activities conducted directly by USFS personnel, and indirectly by other cooperators or partners conducting activities on National Forests or Grasslands under contract, permit, or agreement with the USFS. **These protocols do not apply to information related to native pest management (i.e. native forest pest insects, resident pest mammals, native pest plants, etc.)**.

Additionally, these data recording protocols and requirements provide a standardized approach for the recording of invasive species survey/detection activities, infestation/ occurrence data and treatment data collected in the field.   That is, the user will not find information in this document to help him/her select the most effective integrated treatments available to achieve control of a particular invasive species or group of invasive species, or specifically how to detect a particular invasive species invasion.   A compiled set of guidance on detecting, mapping, controlling, and other management activities against aquatic and terrestrial invasive species will be available in Forest Service Handbook 2909.11 when finalized.

There are six objectives for these Invasive Species record keeping standards, requirements, and protocols:
1. Meet requirements set forth in the NFS Invasive Species Management Policy (FSM 2900).
2. Provide consistent program oversight between levels of the organization; from the Washington Office to Regional Offices, from Regional Offices to National Forests;
3. Clarify the allowable accomplishments and concepts to users and program managers;
4. Maintain transparency for accomplishments across regions and forests;
5. Document protocols for accounting and oversight by other groups;
6. Provide a process to accurately record the occurrence and spread of invasive species on NFS lands, and the management activities applied to NFS landscapes.

A Landscape Approach for Data Sharing

Invasive species infestations cross-jurisdictional boundaries and are seldom managed in isolation. A cornerstone of invasive species management is cooperation and coordination with adjacent land ownerships and jurisdictions. This cooperation requires that information on the management of invasive species be shared. These data recording protocols and requirements are based on internationally recognized standards and meet National Forest System invasive species program reporting requirements. By using universally accepted data management standards and protocols, information can be easily shared between a variety of public and private organizations conducting invasive species management activities. Some of the data elements identified in these protocols may be optional for Forest Service use; but if used, can greatly facilitate data sharing with other cooperators across the broader landscape.

Relationships between Treatment Data and Survey/Inventory Data

The user should be aware of the relationship between treatment data stored in NRM-FACTS and invasive species inventory data stored in NRM-TESP/IS. In most cases, invasive species infestations/occurrences will be surveyed and if found recorded in TESP/IS prior to treatment. There are situations where invasive species treatment activities will occur concurrently with the discovery of a new infestation/occurrence.

In many cases successful invasive species control or eradication programs require multiple treatments on the same site, during the same season/year, or over multiple years. The resulting data collected on these activities can be confusing without adequate descriptors in place to sort the treatments apart. By objectively delineating and recording these reoccurring activities, program managers can more accurately portray the effectiveness of invasive species treatment performance. This protocol outlines the standards for recording field data related to invasive species treatment activities conducted on an infested site, such as pesticide applications, mowing, burning, trapping, and biological control tactics, etc. and will serve to document effectiveness monitoring of the treatment and overall restoration outcomes.

Data can be recorded in the field using the standard field form for Surveys and Infestations then entered into the appropriate application through a set of data entry/editing screens. By using standardized protocols for recording of critical information related to treating invasive species, the quality and value of the data collected will improve. Generally speaking, increasing the amount of data collected does not necessarily equate to better information unless it is properly utilized. Therefore, these protocols and standards represent a selection of required and optional data elements which support the invasive species management activities of the National Forest System and any additional data collected will be determined by the needs of individual Forests and Regions.

INVASIVE SPECIES MANAGEMENT PERFORMANCE

NFS Invasive Species Management activities are conducted in support of broader watershed restoration and condition improvement objectives under the new NFS Integrated Resource Restoration budget structure. Invasive species management activities in aquatic and terrestrial areas are integrated with other management activities designed to improve watershed condition and restore degraded areas. Invasive species survey and inventory activities are typically a key component of a successful invasive species management program. In some

cases, a substantial amount of agency resources are expended on surveying for and recording data for invasive species infestations in order to identify the level of threat, set management priorities, communicate with the public, and develop sound integrated strategic plans.

At the national level, invasive species management success is not measured by the amount of pre-treatment survey and inventory work being completed, and thus there are no associated national performance measures. However as previously mentioned the inventory is a critical element in quantifying threat levels and establishing the foundation for an integrated treatment program.

Local-level invasive species treatment activities and efficacy records will be used to generate output and outcome performance reports at the national level. Within the NFS Invasive Species Management Program, the national performance structure is as follows:

Output 1 *Number of priority acres treated against invasive species*
The total number of priority acres treated is based on the annual program capabilities. Risk assessments and other scientific methods and systems are used to identify priority acres for treatment in a project plan. This applies to all taxa of invasive species treated on National Forests and Grasslands.

Output 2 *Number of priority acres monitored for treatment efficacy*
The acres monitored are based on the level of post treatment efficacy evaluation in relation to the total number of priority acres treated. This applies to all treatment activities conducted on National Forests and Grasslands.

Outcome *Percentage (%) of priority acres successfully restored against targeted invasive species.*
The percentage of priority acres successfully restored is based on the objectives within a project plan – where the targeted species defined in the project plan were prevented, controlled, or eradicated on the priority acres identified in the plan.   The program outcome is a long-term (5 -10 yrs) measure of program performance.   This long term program performance will be calculated from data collected annually that describes annual treatment efficacy. The number of priority acres restored against invasive species is reported in the Performance Accountability System (PAS) by summarizing data from NRM-FACTS.

TRAINING IN THE USE OF THE NATIONAL INVASIVE SPECIES INTEGRATED USER INTERFACE APPLICATION AND THE NATIONAL PROTOCOLS

Record keeping and reporting requirements are available through NRM-sponsored training, and on the Forest Service Intranet website: http://fsweb.wo.fs.fed.us/invasivespecies/.   NRM provides re-occurring on-line and classroom training courses for the Invasive Species Integrated User Interface and related NFS Invasive Species Program business rules, standards, and protocols;   On-line courses will be posted on the NRM Training Calendar.   Regional Foresters, NFS Directors, Regions should work closely with their Regional Resource Information Coordinators (RRIC) to help schedule classroom training on the use of the new Invasive Species

Integrated User Interface before major field operations begin, or as soon as possible. In addition, Regions and Forests should:

1. Ensure that all personnel have access to the required national NRM applications for NFS invasive species management information;

2. Provide access to NRM-sponsored training for all personnel responsible for collecting and recording NFS invasive species management information; and

3. Ensure that all invasive species management activities conducted on national forests and grasslands adhere to the NFS Invasive Species Management Program's national requirements, protocols, business rules, and standards for all spatial and tabular record keeping and reporting.

4. Work closely with non-USFS contractors and cooperators to ensure they provide all invasive species survey, inventory, and treatment information necessary to complete the required fields in the NFS national Databases of Record. When appropriate, Forests may provide access to the Invasives Species Integrated User Interface so cooperators and contractors can enter data directly into the NRM application to streamline the data entry process for USFS offices. Training opportunities should be made available to contractors and cooperators whenever possible to ensure proper record-keeping and data entry is conducted during those respective operations.

II. National Standards and Requirements

The National Protocol is based on searching, detecting and recording single species infestation or occurrence where the target species has been identified as an invasive organism on the project site.

Invasive Species Survey:

Invasive species survey is the process of systematically searching a geographic area for a particular (target) invasive species or a list of numerous species. Surveys may be conducted as part of Early Detection – Rapid Response (EDRR) process as well as during project planning such as road construction, timber sales or prescribed burning where the purpose of the survey is to locate any invasive species within the project area prior to site disturbance.

It is important to know where and when surveys have occurred, even if the object of the survey (target species) was not located. Information on the absence of invasive species in specific areas can be as valuable as information on the presence of the species.

The minimum national requirements for invasive species survey include documenting a set of core attributes:

1. What was the target(s) of the search - requires a standard national **Species Code** that includes scientific name and common name, and **Target Focus**.;
2. What type of survey was conducted – requires **Survey Type** and **Survey Focus**;
3. Where was the survey conducted - requires a **unique identifier** and **spatial polygon**;

4. How large was the search area – requires a polygon, with area calculated in acres from the spatial feature;
5. Who conducted the search – requires **Examiner**;
6. When was the area searched – requires **Survey Date**(s)
7. How was the survey financed – requires the Budget Line Item **Fund Code** that provided financing with the **fiscal year** the funds were obligated or used.

Invasive Surveys can be approached in two ways. One approach is to document the survey as it is completed in the field. All the required core attributes would be recorded during field work and electronically entered in the TESP-IS Application to meet the minimum national business requirements.

The second approach creates Pre-survey records and a set of minimum attributes to describe a proposed or planned survey. Not all of the required core attributes would need to be recorded at this time. Since some surveys may extend over many weeks and over large geographic area, data would then be added to the pre-survey records as the survey is implemented. The updated records would be flagged as "Active". Once the work is completed the entire set of core attributes would be required and the survey record coded as "Completed".

Invasive Species Inventory:

Invasive Species Inventory is a collection of data related to the occurrence, population or infestation of a detected invasive species across a landscape or with respect to a more narrowly-defined area or site.

When a target species is detected, a set of spatial and tabular core attributes are recorded to meet the minimum national requirements**:**

1. What was found - requires a standard national **Species Code** that includes scientific name and common name, and **Species Category**;
2. Where was it found - requires a **unique identifier**, **spatial polygon**, **Ownership** and if necessary **Proclaimed Forest**;
3. How much was found - requires a **spatial polygon, Percent Infested** and **Infested Area**;
4. Who found it - requires **Examiner;**
5. When was it found - requires **Date.**

The national protocol also includes a standard set of attributes that allow users to collect optional descriptive data related to the target species or site at the time of observation. The optional fields can be used to create qualitative and quantitative baseline assessment of the infestation or population for later evaluations.

Invasive Species Treatment:

With respect to invasive species management, the term "treatment" refers to any activity or action taken to directly eradicate, control or otherwise manage the spread of an invasive species infestation. Treatment of an infestation does not necessarily result in the immediate elimination of the infestation, particularly when multiple treatments are required to affect a change in the survival of the target species infestation. Treatments can include actions within any of the 4 general categories of integrated pest management techniques: Biological treatments, Cultural

treatments, Mechanical/Physical treatments, or Chemical treatments. Since the national application where invasive species management data will be stored, is structured to include a broad range of management activities on the National Forests, treatment data includes a set of common fields that all management activities will collect. There are essentially four required categories of data collected on invasive species treatments:

1. Basic elements of documenting Treatment Areas.
2. Spatial features depicting the Treatment Area.
3. Specific treatment activity core attributes including effectiveness monitoring.
4. Identifying the target of the treatment activity through association with invasive species inventory record.

Treatment Area (Activity Subunits)

The basis for managing information on invasive species treatment is the creation of a **Treatment Area.** The Treatment Area is a <u>specific</u> piece of land or water on which a management activity or series of management activities occur across the entire area. Treatment Areas may overlap, but cannot be divided. A **Treatment Area** may include an entire invasive species infestation, a portion of an infestation, or include multiple infestations that are adjacent or overlapping. In order to maintain the integrity of program accountability and maintain accurate records of where our invasive species management activities occur on the landscape, each **Treatment Area** is required to have a spatial representation. **Treatment Areas** will be linked to a single spatial feature which will be a polygon.

Treatment Activity

Treatment Activity is a management entry across a treatment area to meet specific resource objectives. With respect to invasive species management, the term "treatment" refers to any activity or action taken to directly eradicate, control or otherwise manage the spread of an invasive species infestation within any of the 4 general categories of integrated pest management techniques: Biological treatments, Cultural treatments, Mechanical/Physical treatments, or Chemical treatments.

<u>The actual spatial extent of the treatment activity will determine if additional Treatment Areas are necessary</u>. For some smaller treatments (typically no more than a few acres in size) which are very closely associated (adjacent or overlapping) on the landscape, it may be appropriate to group these areas under one multi-part polygon. However, it would not be appropriate to group treatments which are significantly distant from each other, because the larger spatial representation would inaccurately depict the actual location where the management activity occurred. This inaccuracy would make it difficult to defend management actions during lawsuits and would provide little value to future managers as a historical account of the management activity applied to the landscape.

National Spatial Requirements for Invasive Species Data

The National Standard requires spatially locating and delineating each survey area, invasive species infestation/occurrence, and each treatment area as polygons. The relationship between the area of the treatment polygon and the tabular acres accomplished should not exceed a 3:1 ratio. In other words the treatment feature area should not exceed three times the area of the acres accomplished. Each polygon represents a single survey area, a single invasive species infestation/occurrence which may overlap. Each treatment polygon (including multiple parts) represents a single site-specific area within which a number of treatment activities may be recorded. Multiple **Treatment Activity** records may be associated with a single **Treatment Area** if the activity covers the entire spatial extent of the treatment area. Otherwise, a new treatment area (subunit) must be created.

The survey area, infestation or treatment area feature may be comprised of more than one polygon (multi-part polygon). For example, a single infestation may be defined by clumps or patches of the same population in close proximity. Species and site tabular data such as % Infested, Cover, Density, and Count would apply to the entire infestation. Although each clump or patch can be individually drawn, acres for all the parts are combined to calculate the Total Area in the NRM application.

Copying an existing polygon created for another purpose – i.e. a timber harvest unit or fuels treatment– for the **Treatment Area** is acceptable only if the **Treatment Activity** covers the entire spatial extent.

The minimum size for a delineated polygon can be as small as 0.0001 acre (4.4 sq. ft.). The NRM application will allow very small polygons to accurately depict and locate small infestations.

Spatial representations can be created by a number of methods:
- Hand-drawing the perimeter of the survey or infestation on maps or aerial photos, then redrawing the feature within the National Application;
- Using a GPS (Global Positioning System) device to define the perimeter, converting them to a shapefile, and importing the file;
- Digitizing with a computerized mapping system (Geographic Information System [GIS]) and importing it.
- Using a combination of Mobile software to create a polygon which is loaded directly into the parent feature class.

Regardless of the method used to delineate an Infestation in the field, the protocol requires that the polygon be digitized and stored in ArcGIS format in the system of record. To ensure consistency, the scale for hand-drawn occurrences on maps should be 1:24,000. This is the scale of United States Geological Survey (USGS) 7.5-minute quadrangle (quad) maps. (**Note:** the 1:24,000 scale is also the standard for invasive plant mapping as recommended by the International Mapping Standards for Invasive Plants). Aerial photos, orthophoto quads and remote sensing approaches can also be useful formats for delineation.

Line and point data (layers) are not supported. Surveys, Infestations or treatments that could be mapped as "lines," such as those occurring along ridges, streams, trails, or roadsides, will be

stored as long, narrow polygons. Tools within the application are available to buffer lines and covert the selected line feature to a polygon.

Using the diagram below as an example, a spatial feature would be created for the insect release of Subunit 004, a single polygon would be created for the two days of herbicide application of Subunit 003, and a spatial feature would be created for the invasive vertebrate trapping project of Subunit 001. If a subsequent treatment occurred on the subunit and the treated area did not change, additional Activity records could be added to the *Activity Subunit* represented by the same spatial feature. As an example, a crew returned to Subunit 002 the following year and treated the entire area, a new activity would be added to the existing subunit. If however, the area of the subsequent treatment is significantly different (30% difference) from the previous activity or a different treatment is used, a new subunit and feature would be created. As an example a crew returns to Subunit 002 the following year and treats the upper 50% of the original unit, a new Activity Subunit (005) would be created.
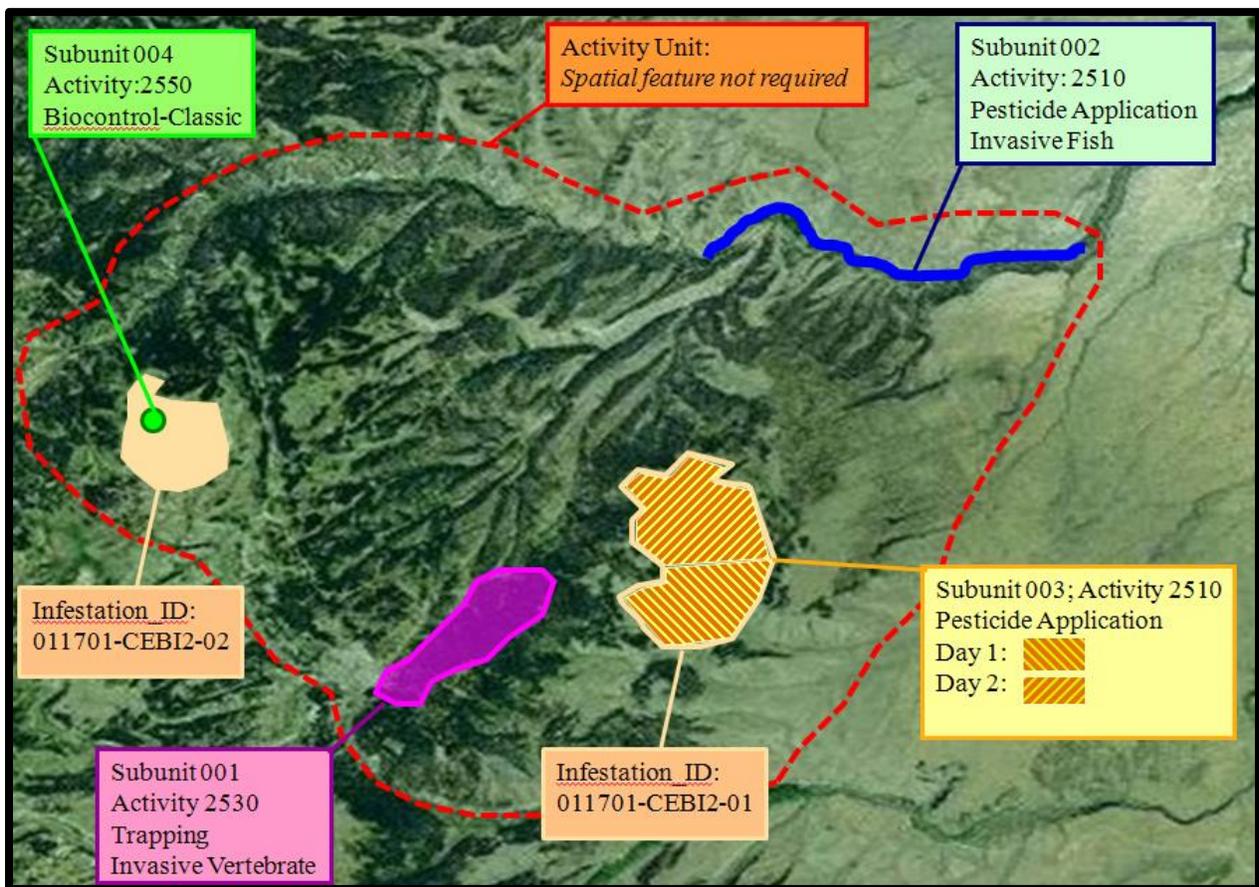
Equipment

The spatial requirement is the basis for the Forest Service corporate data management applications, specifically the TESP-IS Application. The TES-IS application uses an ArcGIS Task Assistant (TA) and Feature Inspector (FI) data entry process to guide the user through a common workflow to enter and edit survey, infestation or treatment area polygons and the associated attributes.

Data collection hardware, such as Global Position System (GPS) devices, desktop computers, portable data recorders (PDR) and/or field tablets, etc can be helpful for efficiently collecting and entering data into the corporate applications, locating and relocating infestation sites, and automating electronic data transfer.

III. Invasive Species Survey Attributes (Required)

Survey ID (*Required*): A unique identifier of the survey. The Survey ID can be any combination of numbers and letters, up to 30 characters in length. It is recommended that the combination of Region, Forest, and District numbers form the first six digits of the Survey ID. An example:

Survey ID	Description
011701IPS05LL01	Region(2), Forest(2), District(2), Protocol(3), FY(2) initials(2), number(2)

Survey Name: A descriptive label for the survey. Up to 240 characters can be used. Include the type of project as appropriate in the survey name.

Status (*Required*), *LOV***:** This field is used primarily to indicate when complete survey results have been documented are ready for use in analysis. The application can be used to enter certain data prior to, during, or after survey field data collection. The List-Of-Values is found in Appendix A.

Source of Work, *LOV:* The primary work force used to perform the survey work. The List-Of-Values is found in Appendix A.

Target Focus (*Required*), LOV: The type of Protocol followed for the survey. Select from a List of Values. This field sets the protocol to follow in the field and the required fields in the application.

Protocol Code	Description
TESP	TES Plant Survey Protocol with required TES Target Species list.
IS	Invasive Species Survey Protocol with required Invasive Species target list(s).
TESP/IS	TES Plant Survey Protocol with both TES plants and Invasive Species designated Target lists.

Visit Date(s) (*Required*): Invasive Species surveys may be conducted over days, weeks and even months. The protocol allows the recording of each day of field survey. These are the actual days that the survey was performed in the field. The first Visit Date represents the first field day a survey was conducted and the last Visit Date is the last field day of the survey. Date provides information on the time of year plants were observed. A weed infestation may look very different in the spring of the year or in the fall of the year after flowering and seed formation.

Examiners (*Required*), *LOV:* The last and first name of all individuals conducting the survey on any given visit date.

Survey Area (*Required*): The size or extent, in acres, of the area within the survey perimeter. The actual area will be generated from the required spatial polygon. A single survey may be comprised of

more than one polygon. Acres for all feature parts comprising a particular survey are combined to calculate the total survey area.

Survey Type (*Required*) *LOV:* The type of survey that was conducted. Up to three survey types may be entered. If the survey types are significantly different from one another, however, use the "Survey Comment" field to describe why. The List of Values is documented in Appendix A.

Survey Focus (*Required*), *LOV:* Record the predominant focus of the survey from the List of Values. More than one choice can be recorded if survey target species occur in more than one of these general habitats. The List of Values is documented in Appendix A.

Survey Funding (*Required*), *LOV:* The Fund Code(s) that was used to finance the Survey from the List of Values. Each survey record may have more than one fund code (BLI). If multiple fund codes (including contributed or volunteers) are used to finance a survey the funding grid must include the additional fund code with an estimated percent funded.

Fiscal Year Obligated (*Required*): The fiscal year that survey funds were obligated to conduct the planned action. If the source of the work was Force Account then FY obligated is the year the personnel conducted the survey. With Force Account crews the financing of invasive species detection activities cannot cross fiscal years. If contracts or agreements are used, FY obligated would be the year that the document was approved or awarded and funds obligated.

Target Species List

This is a series of fields listing the invasive Species that were the target of the survey. At least one target species must be identified. In many instances there may be an extensive list, including the state noxious weed list or Forest/regional invasive species lists. TAXA stewards can compile and maintain Forest lists of locally important invasive species.

Species Code (*Required*), *LOV:* The appropriate species code for the target invasive species for the designated survey. There is no limit to the number of species that may be entered. The Plant Code will be selected from a forest or regional list of invasive species.   When an invasive species code has been selected from the appropriate species list the *Scientific Name and Common Name* will be auto-populated.

Species Found (*Required*), *LOV:* Record (yes/no) whether an infestation of each particular target species was found during the survey. If an invasive species was found in the course of a survey it would be necessary to map the infestation/population and enter the data in Invasive Species Inventory. If a target species initially included in a search list was not assessed in the field, the species name should be removed from the target species list.

IV. Invasive Species Survey Attributes (Optional)

Number of Traverses*:* Designates the number of traverses or passes through the survey area which provides the means to quantify survey intensity. As an example if a 2 person weed crew used pace transects across an open slope and each individual completed 3 passes a total of 6 traverses would be recorded.

Elevation*:* For the spatial extent of the survey area, record the **Average** (or a "predominant") elevation of the land surface occupied by the species as measured in feet from the average of the mean high and mean low tide. **Minimum** and **Maximum** elevation may be recorded if it is determined that the elevation range is significant for that particular infestation (e.g., on a steep slope or a large occurrence on an undulating landscape). Feet will be the default units of measure (UOM).

Survey Parameters: The parameters, strategies or site characteristics that were used to define and direct the survey. They could include such characteristics as habitat types, north slopes, calcareous soils, forty feet on each side of the road. Information in this field may be useful in interpreting survey results.

Survey Comments: Document any relevant information about the survey not covered in previous fields. Record general comments about survey work, survey area, site conditions or observations.

Survey Area Plant List

A list of all plant species found during the survey, or a partial list of species found to meet some desired criteria, can be stored for the survey area. The reasons for compiling species lists for surveyed areas include: 1.) developing floristic information for a Ranger District, National Forest or Grassland; 2.) developing a baseline of what is present in an area for an early detection system and; 3.) refining knowledge about the distribution and frequency of plant species on a Ranger District, National Forest or Grassland.

Completeness, *LOV:* An indication of how thorough the list of species recorded is for the survey area. *If a list of species is recorded, this field is required.*

Cover Method, *LOV:* Required only if percent cover is recorded for any of the plant species on the species list. This field defines the method used for estimating cover: either a cover class set of codes or actual estimates. NOTE: In this case, cover values are estimated and recorded for the survey polygon(s) as a whole (e.g., these values are not recorded using plot- or transect-based methods). The purpose for entering cover values in this case is simply to provide relative estimates that might be used to compare the general abundance of species in the survey area. As such, these cover values would not be appropriate for more rigorous quantitative analyses of vegetation data. If such rigorous data are desired, then the examiner(s) should use one of the appropriate vegetation protocols available such as ocular macroplot, cover-frequency, or line intercept. The List of Values is documented in Appendix A.

Comments: A text field used to describe guidelines used in recording species or to give a text description of how complete or thorough the species list is. It is good practice to explain in this comment section what criteria were used to collect any partial plant list.

Plant Code, *LOV:* Record all plant code (plant code and/or scientific name) that are to be included in the survey area plant list. Codes for plant species must follow the USDA PLANTS database, plant symbols convention (USDA, NRCS, 2002). Botanical nomenclature should follow a standard flora for the geographic area being sampled.

There is no limit to the number of species that may be entered. It is a good habit to write out the name or a portion of the name on the field form to minimize misapplication of plant codes. The NRIS TES Plant application will auto-populate the entire scientific name when plant codes are entered, and can auto-populate the NRCS plant code when the scientific name is chosen from a standard list. Include the genus, species, and subspecies or variety as needed to properly identify the plant.

Scientific Name, *LOV:* Generated from Plant code.

Lifeform, *LOV* **:** Lifeform is defined as the characteristic form or appearance of a species at maturity. As desired, enter the lifeform code from the LOV for each species recorded in the survey. A default value will be auto-populated when the Plant is enterd. User may edit if the default value is not correct.

Habitat: Text field to briefly indicate the habitat in which that particular species was found in the survey area.

Percent Cover or Class, *LOV:* Ocular estimates of canopy cover of live foliage for plant species are an effective way to quickly collect abundance information about plants. This information can be collected using direct values or by using established canopy cover classes. Indicate the cover class method used. Cover class codes come from a list of values, whereas actual estimates are recorded as a number from 0.1 to 100.0. Since survey areas can be large, these estimates are merely approximate

values, and are intended simply to give a general picture of the composition and relative abundance of species in the area.

V. Invasive Species Infestation Attributes (Required)

The National Standard for Invasive Species record keeping begins with a spatial polygon that represents a single invasive species infestation or population along with a set of infestation and site attributes for a particular target invasive species.

The required, optional, and generated data attributes (or data fields) are identified in this protocol and include instructions for properly recording specific data about the infestation. Although there are numerous optional attributes, (such as soil characteristics, existing vegetation community type and/or associated species, potential vegetation types, aspect, slope and elevation, etc.) completing these fields is encouraged and can be useful information for project management.

Infestation ID *(Required):* A 30 character alpha-numeric code that uniquely identifies the invasive species infestation/population. Although no national convention for this field is mandated, national direction recommends that the region, forest and district form the beginning of the *Infestation_ID*. Using this convention will allow the easy sorting of information and uniquely identify infestations.

Date *(Required):* The calendar month, day, and year the infestation was found or re-measured. This is the day that the information was collected in the field. The format is MM/DD/YYYY.

Species Category *(Required),* **LOV:** The general taxonomic group of the detected Invasive Species, selected from a LOV. This field allows for the categorization of the target species and is used to reduce the species code list when selecting a species code in the following Species Code field.

Species Category
Plant
Pathogen
Vertebrate
Invertebrate

Species Code *(Required),* **LOV:** The accepted Species Code for the target species from the LOV. The Target Species Code is available based on the category selected from Species Category Field.

Scientific Name (*View-only):* This refers to the Latin scientific name for the invasive species. The scientific name is generated from the Species Code.

Common Name (*View-only):* This refers to the common or colloquial name, if any, for the target invasive species. This field is generated from the Species Code.

Total Area (*Generated, view-only):* An area, in acres, occupied by an invasive species delineated by a polygon that may represent a general area where the population is found or may represent the spatial extent of the infestation/ population. Total Area is calculated from the area of the spatial feature. Total Area may contain significant areas that are *not* within the perimeter of the target invasive species infestation in which case "% Infested" would be less than 100%.

Percent Infested *(Required):* Percent (%) Infested is the proportion of the Total Area that is infested with the target invasive species. The default will be 100*% Infested*. In other words the application will assume that the spatial feature that represents the infestation is 100% infested. If the spatial feature represents a large area that contains significant area that is *not* within the perimeter of the target invasive species infestation, enter a percent that approximates the proportion that is actually infested based on the definition of "Infested Area". A "0" may be used to document an infestation that currently contains no detectable individuals. A value of '0' for percent infested is allowed only for re-measured infestations, indicating that treatment has eradicated an infestation or under natural conditions an infestation has been eliminated.

Infested Area (*Generated, view-only*)*:* Infested Area is defined as an area of land or water, in acres, containing a single invasive species infestation/ population delineated by the actual perimeter of the infestation or population as defined by the outer edge of the canopy cover of the plants or the visible population (i.e. Home Range or stream reach) of other invasive taxa, excluding adjacent areas not infested **and** outside the perimeter of the population. Generally, the smallest area of infestation mapped is 1/10,000th (.0001 acre or 4.4 sqft) of an acre. This field is the product of Total Area multiplied by the % Infested.

Discussion: Total Area, Percent Infested**,** and Infested Area are critical components of the national protocols. The estimate of "% Infested" is influenced by the perimeter of the infestation, the distribution of plants within the perimeter, species growth characteristics, site characteristics and the degree to which the created feature represents the actual infestation. Areas containing only occasional invasive plants per acre do not equal one acre infested. If an infestation of yellow starthistle, for example, has 1-5% canopy cover with plants and patches scattered evenly across a grassland site and the 2 acre created polygon captures the spatial extent of the infestation, the "% Infested" is 100% or equal to the area of the created polygon. If, however, Canada thistle is found growing in a series of stringer draws or narrow swales with 35% canopy cover but due to the complexity of the site and the distribution of Canada thistle along the draws a single large polygon is created that does not follow the perimeter of stringer draws. Even though the polygon is 20 acres the "% Infested" would typically be a much lower value such as 10%, or in other words, 2 acres of Canada thistle within a 20 acre mapping area.

Infested Area is a calculated estimate of the actual extent or size of the infestation. The *Infested Area* field will be used to answer the question "How many acres of spotted knapweed are there on the National Forest?" The results will be generated from summing all the *Infested Area* fields for records *(Infestation_IDs)* where spotted knapweed is found.

Some infestations are very large or discontinuous and it is difficult or not useful to delineate the actual perimeter of the infestation or population. The increase in accuracy gained by plotting a specific area of an individual population may not compensate for the increase in cost or manpower. The general spatial area on the landscape and an estimate of area infested may be sufficient to meet management requirements. In these situations the delineated spatial feature is assumed to include more area than the actual perimeter of an invasive population or infestation and % Infested would be less than 100.

Example: A large spotted knapweed infestation is located in the West Fork drainage. By driving around the area and looking at aerial photos the weed infestation is contained within an approximately 600 acre *area*. There are significant portions of the general area outside the perimeter of the knapweed infestation. It is estimated that approximately 40% of the delineated area is actually within the perimeter of a infestion. The value in ***Total Area*** is 600 generated from the area of the spatial feature and the **% Infested is 40**. Infested Area would be calculated by 600 acres X 40% = 240 acres. In this case there was no added value or utility in mapping the smaller infestation within the larger area of 600 acres.

Examiners *(Required), LOV:* The person that detected the infestation and collected the data, enter last and first name from the list of values.

Ownership *(Required), LOV:* The ownership of the land where the infestation is located. In the case of multiple ownerships, record the ownership where the preponderance of the infestation or population is located.

Proclaimed Unit *(Required), LOV:* The proclaimed National Forest/National Grassland number and name when the infestation is located on National Forest System Lands.

Project Name*, LOV:* A project is a grouping of multiple infestations related by a specific purpose or geographic area. Multiple records can be within the same project name. A project name is a useful way to group records. The project name code is selected from a drop down menu that was created by a data steward.

Survey, *LOV:* Where a survey record has been created that detected the invasive species population or infestation, the survey ID can be recorded. This field provides a method of linking the detected invasive species population or infestation with the survey.

Invasive Status (*View-only*): Invasive Status code is a locally created list of values used to rank or stratify invasive species at a specific scale. Status is attached to individual species at the invasive species list level and therefore respresents a ranking at the geographic scale in which the list is applied (Regional or Forest level). There is no limit to the number of *Status Sets* for a particular list of invasive species. Field units are not limted to officially designated status, it could contain rankings generated by a cooperative weed management area, forest, or district.

Watershed HUC # *(Generated, View-only)*: A single watershed 6th code will be auto-populated for each inventory polygon and stored in the application. The value will be generated from a NRM web service process and displayed on the form as view only. For inventory polygons that cross multiple watersheds, a 6th code value for the watershed with the largest area will be entered in the application.

Latitude and Longitude Coordinates (*Generated, View-only):*

Latitude is the term for the distance from the middle of the circle, or, in the case of the Earth, the equator. The equator is designated 0 degrees, with each <u>pole</u> being 90 degrees. Longitude is the vertical measurement--current convention places the zero degree point at Greenwich, England (also known as the Prime Meridian), with 180 degrees being on the opposite point on the globe.

When a polygon is created an Insert/Update Trigger will auto-populate Decimal Degrees fields with a centroid coordinate of the feature. The resulting coordinate will be stored within the application and be displayed on the Location Detail Page of the form.

> **Latitude Decimal Degree:** Latitude in a degree value to at least 6 decimal places.

> **Longitude Decimal Degree:** Longitude in a degree value at least 6 decimal places.

VI. Optional Invasive Species Infestation Attributes

The following data elements allow users to collect optional descriptive data related to the target species at the time of observation.   The optional fields can be used to create qualitative and quantitative baseline assessment of the infestation or population for later evaluations.

Density: The number of individuals of a target species per specified unit of measure.

Density UOM *LOV***:** The Unit of Measure for density.

UOM	Description
Acres	Acres
SqFt	Square Foot
SqM	Square Meter
SqMi	Square Mile

Count: Count is the total number of individuals (i.e. number of animals, stems, or plants, etc) across the population or infestation. This is an optional field and may be useful for small infestations or populations with a limited number of individuals occupying an area.

Count UOM *LOV***:** The Unit of Measure of the total count.

COUNT UOM
Stem
Plant
Individuals

Canopy Cover

Ocular estimates of canopy cover of live foliage for invasive plants are an effective way to quickly collect abundance information about the species. Cover is a meaningful attribute for nearly all plant life forms, which allows their abundances to be evaluated in comparable terms (Daubenmire 1968, Mueller-Dombois and Ellenberg 1974). *Canopy cover* is "the percentage of ground covered by a vertical projection of the outermost perimeter of the natural spread of foliage of plants, small openings within the canopy are included" (SRM 1989, NRCS 1997). Canopy cover is synonymous with canopy closure (Helms 1998). For woody plants, canopy cover is synonymous with crown cover (NRCS 1997, Helms 1998).

The estimate of canopy cover is in relation to the Infested portions of the delineated spatial feature. Cover values are estimated and recorded for the Infested Area (e.g., these values need *not* be recorded using plot or transect based methods). The purpose for entering cover values is simply to provide relative estimates to compare the abundance of plant species. As such, these cover values would *not* be appropriate for more rigorous quantitative analyses of vegetation data.

Canopy Cover Set *LOV:* The name of the cover class set you are using to describe canopy cover. Only three classess, Daubemire (6 Point), Ten Point Cover Class or the Greater Yellowstone Area are available.

Cover Class Code: *LOV*: The percent of a fixed area occupied by the plant species, life form, or ground cover type. Percent cover is obtained by projecting the outline of the foliage or surface feature to a horizontal plane and determining what percent of the fixed area it covers. This field is used for measured or estimated percent cover. Some measurement of canopy cover is required but this infomration can be entered in this field or by cover classes.

Cover Percent: Canopy cover is the percent of the ground, covered by foliage of a particular weed species. Percent cover is obtained by projecting the outline of the foliage or surface feature to a horizontal plane and then determining what percent of the fixed areas covered. This field is used to measure or estimate percent cover. In some cases canopy cover could exceed 100% when multiple layers of weed plants are present such as plants in the rosette and mature stages.

Life Stage *LOV***:** The predominant life stage of the non-plant target invasive species at the time of detection. In cases where there are un-definable mixtures of adult and juveniles in the population, the examiner has discretionary privilege to make the determination. This field should be used for invasive species taxa other than plants. See Appendix A for a List of Values.

Phenology *LOV***:** The predominant life stage of the target invasive plant at the time of inventory or survey. In cases where there are un-definable mixtures of flowering and vegetative stages in the infestation, the examiner has discretionary privilege to make the determination. This field only applies to invasive plants.

Distribution *LOV***:** The spatial arrangement of individual invasive species across the infestation or population at the time of inventory or survey. Select from the LOV. See Appendix A for a List of Values.

Life Form *LOV*: Lifeform is defined as the characteristic form or appearance of a plant species at maturity. See Appendix A for a List of Values. This field only applies to invasive plants.

Treatment Priority *LOV*: Treatment Priority refers to the relative importance of treating or managing a spacific invasive infestation/population. In some cases it may refer to a state designed priority category such as category A, B or C weeds. It could also be used to identify priorities for a Weed Management Area, county and environmental analysis. Treatment Priority is used at the infestation or occurrence level and will be stored with specific infestation records. Codes and definitions will be developed locally, however a national default code set displayed below is included:

Priority code	Description
Very High	Population poses a very high risk to susceptible resources and requires immediate or very rapid treatment to eradicate, contain, or prevent its eminent spread from the place of establishment.
High	Population poses a high risk to susceptible resources, or has a high potential for rapid spread, and should be treated immediately to prevent expansion and establishment into un-infested areas.
Medium	Population poses a moderate risk to susceptible resources, or has a slow rate of spread, and should be treated or contained as soon as possible to prevent expansion and establishment into un-infested areas.
Low	Population poses a low or marginal risk to susceptible resources, or has a low potential to spread into new areas, or is associated with a larger established population which has been contained.

VII. Optional Site Attributes

Elevation: For the spatial extent of the infestation, record the **Average** (or a "predominant") elevation of the land surface occupied by the species as measured feet from the average of the mean high and mean low tide. **Minimum** and **Maximum** elevation may be recorded if it is determined that the elevation range is significant for that particular infestation (e.g., on a steep slope or a large occurrence on an undulating landscape). Feet will be the default units of measure (UOM).

Aspect: Direction in which a slope faces, measured in degrees of azimuth or cardinal direction. Record the predominant aspect as measured in the field that is characteristic of the site on which the infestation or population occurs.   Either azimuth in degrees or cardinal direction can be used.

> **Azimuth** (Range 0-360): The direction that the slope predominantly faces at a defined point of the infestation, such as the center point. Azimuth is recorded in degrees from north, in a clockwise manner. Use "360" for north. Use "0" when there is no slope.

> **Cardinal** *LOV:* The generalized cardinal direction that the landscape predominantly faces at a defined position, such as the center point of the infestation. (Accuracy Standard: ± 11.25 degrees). See Appendix A for a List of Values.

Percent Slope: The ratio of vertical rise to horizontal distance for the site expressed as percent, taken at an average point on the site, or as an average for a site.

Slope Position *LOV*: A description of the two dimensional position on the slope profile of the landform. Record the position of the infestation on the landform as observed in the field.

Soil Texture *LOV*: Soil texture is the proportions of the various size groups of individual mineral soil grains less than two millimeters equivalent diameter in a mass of soil, expressed as a class measured at the surface horizon.

Horizontal Distance to Water: The measured or estimated distance in feet to open or surface water from the edge of the infestation. The distance is measured as a direct line from the edge of the infestation to the nearest surface water. It is often useful to separate sites by the distance to water. This information is helpful in grouping or classifying weed sites into management or treatment zones. Conversely this field could be used to group sites where it is highly unlikely or improbable that herbicides could enter the water. Groupings based on distance to water can be useful for environmental analysis and discussions of potential effects within NEPA.

Vertical Distance to Water: The estimated vertical distance in feet from the surface to subsurface water directly below. Distance is measured in a direct line from the center of the infestation to the nearest subsurface water. It would identify areas where it is likely or possible that water movement through the soil profile could result in herbicides entering groundwater or other subsurface water systems. Conversely it could be used for grouping sites where it is highly unlikely or improbable that herbicides could enter groundwater systems.

Remarks: Narrative field to allow additional information on the characteristics of the target invasive species at the time of survey or inventory.

Vegetation Classification (Optional)

Existing Vegetation classifications provide context regarding the seral stage or current plant community in which the invasive species occurs and may be recorded whenever possible.

Plant Community: An assemblage of plants occurring together at any point in time denoting no particular successional status; a unit of vegetation. The class set name, class code and class name associated with a given community type.

SAF Cover Type *LOV*: The code and name for the Society of American Foresters (SAF) national forest cover type.

SRM Cover Type *LOV*: The code and name for the Society for Rangeland Management (SRM) national rangeland cover types. The kind of existing plant community with distinguishable characteristics described in terms of present or existing vegetation that dominates the aspect or physiognomy.

Potential Vegetation *LOV***:** The taxonomic classification name or code for the potential natural vegetation type that accurately describes the site where the Invasive Species is found. In addition to code and name, the following fields are used to locate the correct record from a List of Values: Classification Level, Classification Code, Classification Short Name and Classification Set.

Potential vegetation classifications include hierarchical levels (i.e. classification levels) with nomenclature such as series, plant association, habitat types, or phases of plant associations and habitat types. Ecological type information, which by design integrates soil, geology, geomorphology and potential vegetation, should be used at the landtype or landtype phase level when available.

Ecological Type *LOV*: The taxonomic classification name or code for the ecological type classification that accurately describes the EO. In addition to code and name, the following fields are used in NRIS (as stewarded and stored regionally) to locate the correct record from a List of Values: Classification Level, Classification Code, Classification Short Name and Classification Set.

Dominant Life Form *LOV*: The characteristic form or appearance of the most common plant found on the site. Select from a list-of-values.

Dominant and Co-Dominant Species

Enter the dominant and co-dominant plant species; the species that occurs the most frequently on the site. Enter the dominant species plant code from the NRCS PLANTS database, and its scientific name will auto-populate. Enter the two or three co-dominant species by order of occurrence from most to least. Enter the co-dominant species code from the NRCS PLANTS database.

> **Plant Code** *LOV*: For vascular plant species, use the (most codes are less than 8 chars long) alpha-numeric code from the NRCS PLANTS data base.

> **Scientific Name:** The latin, scientific name for the Dominant or Co-dominant plant. This field will auto populate when the Plant Code is entered.

Associated Species (Optional)

An Associated Species is defined as any plant (or other) species that occurs, is associated with or commonly found growing or living on the site with the target invasive species. Associated species are those found in the same habitat and same location and should not include species that are not directly within or related to the polygon or site.

Species Code *LOV*: For vascular plant species, use the alpha-numeric code from the NRCS PLANTS data base. Identify plants to species and subspecies, if possible. For genus identification, enter the appropriate genus code, and enter subspecies code.

Scientific Name: This refers to the latin, scientific name for the plant growing in association with the target invasive weed. This field will auto populate when the Plant Code is entered.

Comment Field: This field is available to the user to enter any relevant information on the weed infestation or characteristics of the site not covered by the site and setting fields.

VIII. Invasive Infestation Monitoring (Re-measurements)

Infestations can change dramatically over time. Populations can expand exponentially, spreading along roads, trailsand streams. Conversely, infestations can be reduced through treatment. Separate infestations can merge to form a single, large infestation. An infestation can spread by forming separate subpopulations or patches where one previously existed.

An essential element of invasive species management is observing changes in infestation/populations over time. The National protocols document changes in invasive species populations or infestations through characteristics such as spatial expansion or contraction of a given infestation. **Subsequent visits to a known infestation for re-measurement is considered infestation or population monitoring**. This is not to be confused with effectiveness monitoring of management activities, which is addressed under the Section XVI Treatment Efficacy Monitoring**.**

Each re-measurement will require the completion of a new infestation polygon with attributes to document the results. Repeated observations of the same infestation or population will be identified with the same *Infestation_ID*, but differentiated by the visit date. Stable site characteristics and location information from the previous record can be copied to the new record when appropriate. The copied information about the invasive species infestation or population can be updated. Changes in an infestation following treatment can be monitored through reduction in *Canopy Cover, Count, Density, % Infested* or reduction in spatial extent.

The *Infestation_ID* must remain constant for a particular infestation through time. Changes in the spatial or tabular data (i.e. size, shape, abundance, distribution etc.) can be traced over time through subsequent monitoring, differentiated by the recorded *Date*. There is no limit to the number of re-measurements.

Expansion from a Single Perimeter: An individual infestation can expand, contract or even move across the landscape. All observations are tied together by the *Infestation_ID* and differentiated from each other by the date of the observation. For each observation make any needed adjustments to the information contained in the existing or parent record.

Expansion from Subpopulations/Patches or Split Infestations: Infestations cannot only merge or spread across a single front but may also split into or spread as subpopulations or discrete patches. There are a number of factors that could lead to splits such as partially treating an infestation. In this type of expansion, a single ("parent") infestation changes to a multi-part infestation with discrete patches or subpopulations ("Children"). Many of the principles in polygon and *Infestation_ID* management discussed in the previous paragraph are applicable. All

observations are tied together by the *Infestation_ID* and differentiated from each other by the date of the observation. In this situation the re-measurement would result in the creation of a multi-part polygon. Characterization of the infestation would be an estimated average across all the polygon parts.

Merging Infestations: Two geographically separate invasive infestations can grow and expand overtime, merging into a single infestation. It is important to monitor and document this expansion over the landscape. The two "parent" sites with their *Infestation_ID*s will merge into a single site with one *Infestation_ID*. This new site is called the "child" and will retain the *Infestation_ID* from one of the "parents". All the previous infestations and their relationships will be maintained. While there is no limit to the number of merges, the number of merged infestations can be minimized by carefully drawing infestation boundaries and the understanding and use of multi-part polygons. If sites are relatively close and will soon grow together, consider mapping these adjacent sites as a single site, using multi-part polygons.

Eradicated Infestations: All visual evidence of an infestation may disappear after treatment such as the application of herbicides. Though above ground the weed may have disappeared there may be roots, stems and other plant parts that may recover and sprout. Seeds are stored in the soil profile for many years and may remain viable for 15 years or longer. The relative time of monitoring visits compared to other years and/or yearly climate fluctuations may also affect the observations. For these reasons it is important to monitor sites for many years, even after all evidence of invasive plants has disappeared.

For re-measurements that turn up no visual evidence of the invasive plant, create a new, very small - polygon representing the current infestation with a *% Infested* as "0" (zero), copying the most recent site and species attributes. Entering a canopy cover, density and/or count of "0" (Zero) may also be useful to document no visual evidence of the target species. Enter appropriate notes or narrative in the "Comment" field. Recording a new re-measured polygon and related data in the interim allows for monitoring of the site until there is adequate evidence that the infestation has in fact been eradicated.

IX. Invasive Plants without a Crosswalk in PLANTS Database

NRM uses codes from the PLANTS Database to enter plant information. The application will not allow the user to enter a name in the *Genus, Species, Common Name* or any of the plant fields. Because of this constraint a plant code from the PLANTS Database must exist for a plant name to be entered. Sometimes a plant will be identified, where a code in the PLANTS Database does not yet exist. This can be the result of **new** taxonomy, **new** nomenclature and, in the case of invasive exotic species, **new** species to North America. It may take up to two years for a new species to be added to the PLANTS Database. This group of fields allow you to record this information in the interim period until PLANTS establishes a code. To use these fields enter NO-XWALK in the *Plant Code* field and a No-XWALK tab will appear on the form. Do not use these fields for plants that you cannot identify. The follow fields should be entered to extent possible if *Plant Code* is NO-XWALK.

Common Name: These are the weed names most commonly used in conversation. They are often descriptive e.g., yellow star thistle.

Genus: The scientific name for the Genera.

Species: The scientific name for the species

Subspecies: A finer delineation of species such as subspecies and refers to the scientific name for the subspecies.

Variety: A finer delineations of species, the variety name.

Authority: The first individual to classify the plant into this name. Enter the abbreviation for the name of the authority.

Collection Number: The collection number from the specimen label. This field can be up to 30 charactrers in length and any combination of numbers and letters.

Remarks: A comment field that stores any relevant information up to 240 characters in length.

X. Optional Location Detail for Survey and Inventory

In addition to storing the spatial representation of the invasive species infestation, the TESP-IS Inventory application will automatically derive and populate required tabular geopolitical fields (State, County, Region, Forest and District) based on the location of the spatial feature in the NRIS application. However, it can be useful to record the political or administrative units on the field form. An infestation may span two or more geopolitical units for any particular field. For example, an infestation may extend across a state, county or National Forest boundary. In this case, record all that apply.

Narrative Direction: A set of narrative direction such as Metes and bounds - a system or method of describing property or real estate when it is surveyed and uses physical features of the geography along with directions and distances to define a piece of land*; or* information on starting point of a traverse leg such as reference azimuth and distance - a physical marking of a site, i.e., tree, stake, and could indicate the start of a transect, or a point from which to locate the transect.

Aerial Photo Information: A narrative that describes a particular set of photos, with a photo number, flight line code, and date and time photo set was taken.

USGS Quad Number: The number of the primary USGS quadrangle map containing the infestation or population. These codes are stewarded nationally by the ALP application. *(Note: only one representative quad can be entered in the NRIS application.)*

USGS Quad Name: The name of the primary USGS quadrangle map containing the infestation or population. These codes are stewarded nationally by the ALP application. *(Note: currently only one representative quad can be entered in the NRIS application.)*

Forest Quad Number: The locally stewarded number for the primary USGS quad map where the infestation or population is located. *(Note: currently only one representative quad can be entered in the NRIS application.)*

Forest Quad Name: The locally stewarded name for the primary USGS quad map where the infestation or population is located. *(Note: currently only one representative quad can be entered in the NRIS application.)*

GPS Equipment Used: A text field to record such as the type, manufacturer and model number of the GPS unit used.

Legal Description (Public Land Survey System PLSS)

For areas of the country where the Public Land Survey System is available, it may be desirable to record this information to an appropriate level of detail. Since legal descriptions cannot be auto-populated from the spatial feature, this information must be manually recorded.

Meridian: *LOV:* The code for the line of longitude from north to south that is the basis for local legal descriptions. These lines are also known as Principal Meridians and have distinct names. This information is available on the USGS Quadrangle map.

Township/Direction and Range/Direction *LOV:* A unit of land containing 36 mile-square sections. Townships run in rows that parallel the local Base line. Each Township row is sequentially numbered relative to the row's order from, and whether it's north or south of, the local Base line; e.g., T2N (for the second township row north of the local Base line). To accommodate fractions of townships an additional code is required after the Township number, where 0 will equal no fraction; 1 equals ¼; 2 equals ½, and 3 equals a ¾ township (see table of examples below).

The Range numbers run parallel to the local Principal Meridian. Range rows are sequentially numbered relative to the row's order from, and whether it's east or west of, the Principal Meridian; e.g. R2E (for the second Range row east of the Principal Meridian). This information is available on the USGS Quadrangle map.

Section: Each 36 square-mile township is subdivided into smaller squares called Sections. Record the Section where the center of the infestation is located. A Section is equal to one square mile, 640 acres, or 1/36 of a township. This information is available on the USGS Quadrangle map.

> **Quarter Section** *LOV:* The ¼ section subdivision where the infestation is located. For example: the NE quarter of section 4 (NE ¼)

> **Quarter, Quarter Section** *LOV:* The ¼¼ section subdivision where the site is located. For example: the NW quarter of the NE quarter of Section 4 (NW ¼ NE ¼)

> **Quarter, Quarter, Quarter Section** *LOV:* The ¼¼¼ section subdivision where the site is located. For example: the SE quarter of the NW quarter of the NE quarter of Section 4 (SE ¼ NW ¼ NE ¼).

> **Quarter, Quarter, Quarter, Quarter Section** *LOV:* The ¼¼¼¼ section subdivision where the site is located. For example: the SW quarter of the SE quarter of the NW quarter of the NE quarter of Section 4 (SW ¼ SE ¼ NW ¼ NE ¼).

XI. Treatment Area Attributes (Required)

The follow set of fields represent many of the general administrative fields that may be needed for **Treatment Areas**. The following section does not represent all the possible fields for NRM-FACTS, but covers most attributes that would be entered by invasive species management personnel.

Recorded invasive species treatment data will be based on the management activity within the Treatment Area (Activity Subunit). The attributes of the treatment activity is linked to a spatial feature through the use of Subunit ID or *SUID*. The SUID is a concatenated string of characters that creates a unique ID for the *Activity Subunit*.

The fields that make up the SUID include:

Field Name	Description
Region	Two (2) character numeric code for the Forest Service Region. (ie 01 = Northern Region)
Forest	Two (2) character numeric code for the National Forest. (ie 12 = Bitterroot NF)
District	Two (2) character numeric code for the Ranger District. (ie 04 = West Fork District)
FACTS ID	Ten (10) character alpha/numeric code for the activity unit. All 10 characters must be filled
Subunit	Three (3) character alpha/numeric code for a specific subunit.

Treatment Area Name: A local descriptive name for the Activity Subunit.

Area (*Generated, view-only):* An area, in acres, of the Treatment Area delineated by a polygon that represents the location of the treatment and the spatial extent of the activity. The area is calculated from the spatial polygon.

Ownership *(Required), (LOV):* The entity (private, Agency, Tribal) that owns the land where the activity subunit is located. FS is the default.

Proclaimed Forest *(Required), (LOV):* The proclaimed National Forest/National Grassland number when the treatment is located on National Forest System Lands. **Required** when Ownership = FS.

State *(Required):* A code for the state in which the site is located. These codes are the same as postal codes.

Watershed HUC (*Generated, View-only*): A single watershed 6th code will be auto-populated for each Treatment area polygon and stored in the application. The value will be generated from a NRM data service process and displayed on the form as view only. For treatment polygons that cross multiple watersheds, a 6th code value for the watershed with the largest area will be entered in the application.

Latitude and Longitude Coordinates (*Generated, View-only*): When a Treatment Area polygon is created an Insert/Update Trigger will auto-populate Decimal Degrees fields with a centroid coordinate of the feature. The resulting coordinate will be stored within the application and be displayed on the form.

> **Latitude Decimal Degree:** Latitude in a degree value to at least 6 decimal places.

> **Longitude Decimal Degree:** Longitude in a degree value at least 6 decimal places.

XII. Basic Invasive Species Treatment Activity Attributes (Required)

The most successful invasive species management programs utilize a fully-integrated approach to treating infestations. Program managers can design their treatment activities to utilize any combination of **mechanical/physical, biological**, **cultural/fire** and **pesticide** treatment techniques. Once completed, the

specific treatment should be monitored for effectiveness, with subsequent treatments based on an adaptive management approach.   The data recorded for treatment of invasive species infestations must accurately describe the applied treatment used.

Each Invasive Species Activity record may have only one treatment specified by an Activity Code. If more than one Activity Code is used on the same infestation, the specific treatments should be accurately recorded by creating additional Activities for the existing Activity Subunit if the spatial extent is the same or by creating an additional Activity Subunit when the spatial extent is different.   For example, if you released a biological control agent and used herbicides in the same area against the same target species, then two subunits must be created (one for each activity).

It is required that treatment activities be associated with an invasive species infestation. For an invasive species infestation or occurrence, the site record would exist in NRM-TESP/IS prior to associating with a treatment activity. Where an inventory record does not exist, an inventory record can be created concurrently with the treatment area and entered in NRM-TESP/IS.

Activity Code *(Required), (LOV):* Activity Code represents the general integrated pest management (IPM) technique used across the treatment area selected from a LOV of standard codes. The Activity Code acts as a trigger for special data for that specific treatment.

Activity Code	Description
2510	Pesticide Application
2530	Mechanical /Physical
2540	Cultural/Fire
2550	Biocontrol Classic
2560	Biocontrol Livestock

Local Qualifier *(Required not null), (LOV):* The Local Qualifier is for local use to add descriptive value to the National activity codes.

Date Planned *(Required):* Date the activity is planned to occur (mm/dd/yyyy). The date planned must be earlier than or equal to the date accomplished.

 # Units Planned *(Required), (LOV):* Number of units planned expressed as acres (99999.9). This defaults from the acre value generated from the Treatment area polygon.

Application Site *(Conditionally Required), for pesticide application) (LOV):* Application site is the general land type on which the pesticide was applied, selected from a LOV. This is a required field when the Activity Code is Pesticide Application. It is an optional field for all other treatments.

Administrative
Forest
Improved Pasture
Rangeland
Right of Way
Riparian
Trail/Trailhead
Campground
Irrigation Ditch
Stream/River
Lake/Pond

Equipment Code *(Required), (LOV):* Equipment is a set of codes that describe the equipment used in association with a Method in which the activity was accomplished across the Activity Subunit. The user will select from a List-Of-Values (LOV).

NEPA Project ID *(Required), (LOV):* A field that uniquely identifies a NEPA document on which the treatment is based. The NEPA Project ID is generated from PALS and is displayed in a LOV.

Fund Code *(Required), (LOV):* The Fund Code(s) that was used to finance the Treatment Activity from the List of Values. Each treatment record may have more than one fund code (BLI). If multiple fund codes (including contributed or volunteers) are used to finance a Treatment Activity the funding grid must include the additional fund code with an estimated percent funded.

Cost/Acre *(Required not null):* The invasive business rules do not require a cost value entered in this field, however due to the structure of the application, the field cannot be null (blank) in FACTS. Therefore, the invasive form allows an acceptable value ranging from 0 to 999999, with a form default value of 0.00. User may accept the default or change the default to another value. If the default value is changed, Cost per acre or Planned Direct Costs associated with the activity record is the direct cost incurred the day(s) the treatment activity was implemented. Costs include contract costs and/or costs associated with force account treatments such as labor, vehicles, equipment, fuel, supplies, etc. Cost per acre does not represent an overall program cost nor does it include general overhead costs and NEPA costs.

Examiner's Last & First Name *(Conditionally Required):* Name of project leader, contract administrator, or crew leader with direct control of the treatment. Examiner is required for 2530-Mechanical/Physical and 2540-Cultural/Fire.

Date Accomplished *(Conditionally Required):* The date when the activity is awarded under contract and funds are obligated. Generally refers to an award date.

Date Completed *(Conditionally Required):* The date when the activity is actually completed on the ground. If Date Accomplished is Null, entering Date Completed will back fill Date Accomplished.

The three dates - Planned, Accomplished and Completed - must be equal or in chronological order. As an example, for a recently discovered invasive plant infestation, **Date Planned**, **Date Accomplished** and **Date Completed** could potentially be the same. For some activities performed under agreement or contract, the **Date Accomplished** will be different than the **Date Completed**. For example: Activities that are completed by a service contract, the **Date Accomplished** should equal the date the contract is awarded and funds obligated. The **Date Completed** is entered when the activity is actually completed on the ground.

Acres Accomplished *(Conditionally Required):* The number of acres that were actually treated (aquatic or terrestrial areas). This field is used to summarize treatment accomplishments within the Treatment Area (Activity Subunit). For pesticide, biological releases and livestock applications, this field will equal the sum of Application Area. Note: The Number of Acres Accomplished will supply the data for reporting project/program performance Output #1 across **all** treatment activities.

XIII. Inventory/Target Species Attributes

Invasive species infestations/occurrences that have been previously recorded in NRM-TESP/IS application will be associated to a treatment activity. Linking infestation/occurrences provide a means to identify the target invasive species that was treated. Multiple infestations of the same invasive category can be recorded for each treatment so long as the infestations are adjacent or overlapping. Once the Infestation ID is selected through a spatial selection or intersection the following information will auto-populate from the inventory record.

Field Name	Description
Infestation ID	The 30-character code that identifies the invasive species inventory record.
Plant Code	Vascular plant species. Display only.
Scientific Name	Genus and species for the invasive plant. Display Only
Common Name	The most commonly used non-technical plant names in conversation. Display only.

Field Name	Description
Inventory Date	Invasive Plant/weed inventory site start date. Display only.
Project Name	Project Name. Display only.
Infested Area	Area containing a single invasive plant delineated by the actual perimeter of the infestation. See NRIS-TERRA for complete definition. Display only
Treatment Priority	Treatment Priority refers to the relative importance of an invasive species to management actions. Treatment Priority is used at the infestation or occurrence level. Display only.

<u>**Infested Acres Treated**</u>   **(*Required*): *The treated portion, measured in acres, of an area infested by a single invasive species*.** The "Infested Acres Treated" represents the portion of a single species infestation or population that was prioritized and treated. Due to the potential for species overlap on a particular area, if more than one infestation or population is associated in the inventory gird the sum of Infested Acres Treated may be greater than the Acres Accomplished or Application Area. If the area treated is less or more than the defaulted Infested Acres, enter the actual acres. See Appendix B for an example. **This field allows a user to summarize the treated area of individual invasive species infestations regardless of population overlap**.

XIV. PESTICIDE APPLICATION RECORDS

Field units currently fill out two types of information for pesticides treatment. The first type of information is the annual Pesticide Use Proposal (FSH 2151.04) using Form FS 2100-2. This form is completed for a project or District and is, at a minimum, reviewed annually prior to treatment.

The second are daily logs required by USDA and the states. This is a **daily record by site** of the location, time and amount of chemicals applied. There is some variation in the record keeping requirements between states, but there is more similarity than differences in the daily log requirements.

From the daily log and pesticide applied, pesticide use can be summarized at various temporal or spatial scales. All the information necessary to summarize data and create an Annual Pesticide Use Report is contained **within the required fields**. The protocol will allow the user to collect and store information for the USDA, State required Pesticide Daily Logs, or Pesticide Application Forms.

Pesticide Daily Log

This section documents the application of pesticides using a site specific daily log. The business protocols allow for multiple daily log entries for a single treatment, as well as multiple pesticide products (tank mixes) for each daily log record. The daily log grid records herbicide application across multiple concurrent days on large treatment sites. If herbicide application is separated by a number of days, it is necessary to segregate the application into additional activity records or new subunitstreatment area. **If the number of days between the last application date within the daily log and the previous daily log date is greater than 14 days it is assumed to be a new treatment and therefore requires a new treatment area**. If treating a large continuous infestation over multiple days the sum of the Application Area would equal the Acres Accomplished. Daily log grid is also structured so that the user records the **pesticide product** used on the site for a specified date. If two or more chemical products are applied through a tank mix, the two products with the application rate are required for the daily log. **If two or more pesticide products are recorded for a single daily log record, the two chemical products will be viewed as a tank mix**. Examples of three possible scenarios:

1. **Product Mix**. A commercial pesticide formulation or product with two or more Active Ingredients. Curtail, with the two active ingredients 2,4-D and Clopyralid, is applied to a weed infestation. A daily log record is created with one chemical product.

2. **Tank Mix**. Two or more pesticide products custom mixed in a single spray tank by an applicator. As an example Tordon 22k (AI = Picloram) and Weedar 64 (AI = 2,4-D) is mixed

in a tank and applied to a weed infestation. A daily log record is created with two chemical products. **If two or more pesticide products are recorded for a single daily log record, the two products are assumed to be a tank mix**.

3. **Two Applications with one Product:** When a pesticide product is applied on different portions of a site with different equipment and calibrations, two daily log records are required, one for each equipment-calibration.

If within an existing treatment area a second chemical is used on another species a new treatment area (and polygon) is required since it is a new treatment action. By adding this situation to an existing activity record through a daily log entry, the application is unable to associate the second species treated with the individual daily log/pesticide product record under a single activity record.

Application Date: **(*Required*)** The calendar month, day, and year the treatment was initiated within the Activity Subunit. The format is MM/DD/YYYY. If treatment occurred over several days at a specific site, you may have daily log records that cooorespond to each day.

Application Area (*Required*): Application Area is the actual extent in acres of the pesticide application for the specified Application Date. It is the non-overlapping area, in acres, where pesticides are applied on a particular date. **The sum of the *Application Area* should approximate the spatial extent of the Treatment Area feature (polygon) and equal the "Acres Accomplished" for the Activity Subunit (see Appendix B for further discussion).** This field is summarized for the Pesticide Use Report.

Certified Pesticide Applicator's Last and First Name *(Required), (LOV):* Name of the responsible certified/licensed pesticide applicator under whose license the pesticides were applied. Certified/Licensed Pesticide Applicator may be a requirement in most states regardless of the type of pesticide applied. Certified Pesticide Applicator's Name will be selected from a LOV table.

Time Start: The time of day the treatment began based on a military clock, a 24-hour day.

Time Stop: The time of day the treatment ended based on a military clock, a 24-hour day.

Temperature: The temperature at the time of the pesticide application. Often this will be an estimate. The unit of measure (UOM) will be recorded as Fahrenheit.

Wind Speed: The wind speed recorded or estimated at the time of treatment. The unit of measure (UOM) will be recorded as "MPH".You can enter a measured value or use the wind speed classes.

Wind Class *(LOV):* The wind speed at the time of treatment based on the following wind speed classes from the US Weather Service.

Wind Direction *(LOV):*   The wind direction at the time of treatment from the List of Values.

Code	Description
E	East
N	North
NE	Northeast
S	South
SE	Southeast
SW	Southwest
W	West
NW	Northwest

Cloud Cover **(LOV):** Cloud cover at the time of treatment from the List of Values.

Clear
Mostly Clear

Partly Cloudy
Mostly Cloudy
Overcast

Relative Humidity: The recorded or estimated relative humidity, recorded as a percent (%)

Distance to Water: Distance to water is the linear distance in feet of surface water to a pesticide application. For pesticide applications over water, the distance will be zero (0).

Applicator's Last and First Name: Name of the applicator conducting the pesticide application.

Pesticide Application Volumes

Calibrated Volume (Conditionally Required): The acre volume of diluent and pesticide to be applied based on pre-measured output of applicator, equipment, and application method. The area volume (gallons per acre) is used to determine a mixing rate.

Volume Applied (Required): The total amount or volume of diluents, pesticide and adjuvant that was applied on the site for a specified date.

Unit of Measure (Required), *(LOV):* The appropriate unit of measure, for Volume Applied with Gallons as the default.

Diluent Used (Required), *(LOV):* Enter the carrier for the pesticide. For most applications the Dilutant will be water.

Diluent
Water
Diesel Oil
Neat
Oil(Petroleum)
Oil(Vegetable)
Other
038A

Remarks: Narrative field to allow the user space for addtional information on the daily treatment

---

Pesticide Application: Product and Product Rate Information

There are two approaches for recording actual pesticide application. One approach is to calculate the %Solution (2.00%). The second approach is based on Product Rate (16 oz/acre), and Calibrated Volume. The application will allow the user to record one of the methods. It is not required to complete both sets of fields within the Pesticide Use Grid.

Product Name (Required), *(LOV):* The name of the Pesticide **Product** applied to the site. You may enter multiple product names if the products are components of a tank mix.

Common Name (Auto-populated): The active ingredient name of the product formulation: This field will auto-populate when product name is entered.

%Solution (Conditionally Required): The amount of pesticide in the final mix expressed as a percentage of the total solution mixed in the tank. This value is typically a volume/volume ratio. %Solution is used when the pesticide application is not area based, but rather is individual plant treatment such as stump applications. Example: 1.0% solution is 1gal of product in 100 gallons of dilutant. Calibrated volume is not necessary with "%Solution".

Product Rate *(Conditionally Required):* The label rate in which the product is to be applied,

typically expressed as ounces or pounds of product per acre. Product Rate along with Calibrated Volume is used to determine a mixing rate. Enter Product Rate and Calibrated volume when the pesticide application is area based.Calibrated volume is required when using product rate.

- For all liquid formulations enter oz/ac (ounces per acre)
- For dry formulations such as dry flowable powders for Escort, Oust, or Ally enter oz/ac
- For dry formulations where the product is applied dry in granular or pellet form enter lb/ac (pounds per acre). An example: Spike 20P (Tebuthiuron) is applied at a rate of 10 lb/ac.

Unit of Measure (Conditionally Required) LOV: Enter the appropriate unit of measure for Product Rate. Ounces per acre (oz/ac) will be the default.

Adjuvant Product Name LOV: The name of the Adjuvant Product mixed with the pesticide, from a LOV.

Ingredient Type (Auto-populated) LOV: The Type of Adjuvant the Adjuvant product represents: The Ingredient Type will auto populate from a LOV Table when Adjuvant Product Name is selected.

Rate Applied: The rate the adjuvant was applied.

Adjuvant Unit of Measure LOV: The unit of measure of the adjuvant rate.

XV. BIOLOGICAL TREATMENT RECORDS

Using another living organism (including pathogens) to control or eliminate an invasive species infestation has been widely recognized as a very effective tool in the integrated pest manager's arsenal. While the most effective programs supplement biological control activities with a combination of other pesticide, cultural, or mechanical/physical techniques, it is possible to achieve management objectives through the use of selective biological control agents on target invasive species.

Classic Biocontrol Daily Log

Release Date (Required): The specific date - calendar month, day, and year - when the agent was released on the Treatment Area of the targeted invasive species infestation. The format is MM/DD/YYYY.

Application Area (Required): Application Area is the actual extent in acres of the biological control agent release for the specific Release Date. If the target species is an invasive plant, the national standard allows a five (5) acre credit to be claimed as an accomplishment. For other target species (vertebrates, invertebrates, or pathogens), the user may need to modify the default value. Natural expansions of the populations through time are not considered additional accomplishment.

Time Start: The time of day the treatment began based on a military clock, a 24-hour day.

Time Stop: The time of day the treatment ended based on a military clock, a 24-hour day.

Temperature: The temperature at the time of the pesticide application. Often this will be an estimate. The unit of measure (UOM) will be recorded as Fahrenheit.

Wind Speed: The wind speed recorded or estimated at the time of treatment. The unit of measure (UOM) will be recorded as "MPH".You can enter a measured value or use the wind speed classes.

Wind Class (**LOV**): The wind speed at the time of treatment based on the following wind speed classes from the US Weather Service.

Wind Direction *(LOV):*   The wind direction at the time of treatment from the List of Values.

Code	Description
E	East
N	North
NE	Northeast
S	South
SE	Southeast
SW	Southwest
W	West
NW	Northwest

Cloud Cover (LOV): Cloud cover at the time of treatment from the List of Values.

Clear
Mostly Clear
Partly Cloudy
Mostly Cloudy
Overcast

Classic Biocontrol with Invertebrates (Insects) or Pathogens

The following fields refer to bio-control with invertebrates (Insects), Pathogens or Vertebrates excluding Livestock. There is currently an effort underway to standardize the core data requirements for the release and monitoring of biocontrol agents, in the United States. The data elements and codes used in this section reflect the preliminary work on these standards and the information requirements that are already are in common use. There may be some modification to the data elements described here, when the final core standards are released.

Agent Code (Required), *(LOV):* The accept name code of the agent from a List-Of-Values of agent names and assigned codes. The Agent code is created from the first two letters of the genus and first two letters of the species.

Biological Agent (**Auto-populated):** The scientific name of the species auto-populated when Agent Code is selected from the LOV.

Total Number Released (Required): The number of agents released. With many insect releases this is likely an approximation.

Life Stage (Required), *(LOV):* The life stage of the biocontrol agent at the time of the release.

Egg
Larva/nymph
Pupa
Adult
Multiple Stages

Released By (Required):   The name of the individual that released the biocontrol agent.

Collection Date: The date the biological control agents were collected from the insectory, rearing site or field location.

Collected By: The name of the individual that collected the biocontrol agent.

Source State (LOV): The state in which the agents were collected, selected from a List-of-Values.

Source County (LOV): The county code in which the agents were collected, selected from a List-of-Values. County name will auto populate when county code is entered.

Remarks: Narrative field to allow the user to provide information on the characteristics of the biocontrol agent release.

Pathogen Application Rate: (Required): Enter the quantify rate of pathogens released for the purpose of biological control.

Pathogen Application Rate UOM, (Required), LOV: If a value for Application Rate is entered, a unit of measure must also be selected from a List-Of-Values.

Gr/mm
Kg/m

Pathogen Release Medium (Required), LOV: The type of medium used to release the pathogen, selected from a List-Of-Values.

Soil
Water
Oil
Dry Talc

Biocontrol with Livestock (Includes Cattle, Sheep, Goats)

Livestock can play an important role in the management of invasive plants.   These fields should be used for those instances where livestock are introduced into an area under a documented management prescription with the primary objective of controlling or managing invasive plants, not when incidental benefit is achieved by permitted livestock grazing (FSM 2200). Livestock grazing with the primary objective of invasive weed control should not be reported as AUMs grazed under permittted livestock use (FSH 2200).

Animal Kind (Required), (LOV): The kind of animal that was used to treat the target invasive plant, selected from a list of values (Cattle, Sheep, Goats).

Animal Class (Required), (LOV): The Class of animal that was used to treat the target invasive plant, selected from a list of values. For example: Ewe-lamb, cow-calf, nanny-kid, yearling, adult, etc.

Cow-calf
Ewe-lamb
Nanny-kid
yearling
Steer
Adult

Livestock Numbers (Required): The total number of individual animals used to treat the infestation.

Livestock On Date (Required): Date livestock entered the treatment area.

Livestock Off Date (Required): Date livestock were removed from treatment area.

Application Area (Required):   Application Area is the actual extent in acres of the target infestation grazed by livestock for the specific purpose of invasive plant control. It is the total area disregarding over-lapping infestations.

Contractual Instrument: Contract number or service agreement number referencing the instrument that authorized the livestock treatment.

XVI. TREATMENT EFFECTIVENESS MONITORING

Monitoring treatment efficacy is an important part of a comprehensive invasive species management program. Monitoring treatment efficacy helps to validate treatment priorities, adapt future treatment techniques to meet project needs, determine the effect of treatments on non-target organisms, and generally complete project implementation. Monitoring treatment activities also allows program managers to identify changes in the extent, distribution and density of the invasive species populations and changes to the environment, non-target organisms and other biotic and abiotic factors in the affected ecosystem.

Management activities and techniques to prevent spread, control, or eradicate an invasive species will vary from project to project and depends on many factors, including but not limited to the targeted species, the mobility of the species, the resistance to control measures, the type of habitat that has been infested, social and political considerations, and the potential for collateral damage and non-target effects. No matter what invasive species management technique or activity will be conducted, the project plan should include a data collection provision for monitoring the treatment efficacy. The tools and methodologies selected to monitor invasive species treatment activities varies with the monitoring requirements contained in Forest Plans, NEPA decisions and the needs of individual projects. This section describes data recording protocols related only to the qualitative monitoring of invasive species treatments effectiveness.

Numerous methodologies can be used for detailed quantitative measurement of the changes in existing infestations of invasive species following treatment. There are specific characteristics of change in a population that can be measured using a scientific basis for analysis and modeling. Analysis of populations is a quantitative discipline and in many cases mathematical models are used to understand and measure population responses and determine treatment efficacy. For invasive plants, such methods for monitoring the changes to infestations following treatment may include line intercept, cover frequency and nested frequency measurements. Changes in distribution, target species productivity, cover of an infestation, as well as changes in the infestation size (extent) can be important characteristics used to measure treatment efficacy.

For invasive species infestations, the re-measurement procedures found under NRM-TESP/IS Inventory section can be helpful when monitoring changes of invasive weed infestation. For other categories of invasive species (vertebrates, invertebrates, or pathogens), measuring the changes in the habitat quality or measuring the response of native species to the removal of invasive species may provide the best measurements of treatment efficacy. Although the methodologies will vary with the target species and the location of the infestation, the objective is to evaluate performance by measuring the changes in the characteristics of the infestation as a result of treatment activities. It is Forest Service Policy (FSH 2109.14-53) that post-treatment evaluation be conducted for all projects involving pesticides. Treatment efficacy data transcends into the overall program performance outcome measure. As a result, it is critical for the program to accurately document treatment efficacy across all treatments.

The following post-treatment evaluation fields may be collected to supplement the previously mentioned methodologies, or as a minimum meet the requirements for assessing the effectiveness of invasive species treatment when other monitoring protocols are not use. In addition to these required fields, Forests may choose to include additional site-specific (or project specific) data requirements.

This section provides an approach to document **qualitative** monitoring of invasive species treatment as required through Forest Service Policy (FSH 2109.14-53).

I. Primary Treatment Efficacy Measurements

Target Species (*Required*): The targeted invasive species code from the look-up table of invasive species names. The LOV will display only the species code from the Infestation record that was treated.

Examiner(s): (*Required*): Name of the person(s) which conducted the evaluation.

Evaluation Date (*Required*): Date on which the monitoring of treatment efficacy took place.

Control (*Required*): The percent-code of the targeted invasive species population (infestation) that was controlled by the treatment technique/activity.   Information reported here will be used to measure program performance outcome at the field, regional, and national levels. Enter the control code from the look-up table that best approximates the control level:

CODE	PERCENT EFFICACY	RATING	DESCRIPTION
0	0	No effect	No effect can be detected on the target species population
03	1-5	Failure	Little to no effect can be detected on the target species population.
15	6-25	Poor	Treatment killed less than a quarter of the target species population.
35	26-50	Marginal	Less than half of the target species population was controlled
65	51-75	Fair	Over half of the target species population was controlled.
85	76-90	Good	Treatment was successful in killing most of the target species population
95	91-99	Excellent	Over 90% of the target species population has been killed with the treatment.
100	100	Complete	Not a single individual of the target species population was found after a complete survey of the site. Infestation was eradicated on the site.

II Optional Treatment Efficacy-Target Species Characteristics

Density: The number of individuals of the target species per unit area after treatment. The Unit of Measure (UOM) of the total density of the infestation post-treatment:

Square Foot
Square Meter
Acre
Square Mile

Count: The total number of individuals within the infestation measured post-treatment. This is an optional field and may be useful for small infestations with a limited number of individuals. The Unit of Measure of the total count:

Stems
Plants
Individuals

Plant Distribution (LOV): The spatial arrangement of the remaining weeds across the site. Values are selected from a LOV (List Of Values).

Code	DESCRIPTION
Continuous	Weeds are evenly distributed through out the treatment area.
Isolated	A few individual weeds are found widely scattered in the treatment area.
Linear	Weeds are generally found as strips across the treatment area.
None	Weeds are not found in the treatment area.
Patchy	Weeds are found in discrete clumps with few to no indivduals between groups.
Scattered-Patchy	Weeds are found in discrete clumps with indivduals scattered between groups.
Scattered	Weeds are generally found as scattered individuals across the treatment area.

Canopy Cover (LOV): The percent code of the invasive plant Canopy cover after treatment. Select value from the List of Values.

Height: Estimated average height, in feet (2 decimal points), of the remaining live invasive weeds after treatment.

Population Age Structure (*Invasive Animals*) **(LOV):** The age structure of the target species infestation post-treatment. Enter the Population Age Class Code from the LOV. Typically used for non-plant invasive species.

AGE CLASS CODE	PERCENT JUVENILE	PERCENT ADULT	DESCRIPTION
1	0-10	90-100	At least 90% of the targeted invasive species in the population are breeding-age adults following treatment.
2	11-25	75-89	Breeding-age adults represent between 75% and 89% of the population.
3	26-50	50-74	Breeding-age adults represent between 50% and 74% of the population.
4	51-75	25-49	Breeding-age adults represent between 25% and 49% of the population.
5	76-89	11-24	Less than 25% of the targeted invasive species in the population are breeding-age adults.
6	90-100	0-10	Less than 10% of the targeted invasive species in the population are breeding-age adults.

Appendix A

GENERAL TERMINOLOGY

Invasive Species: Executive Order 13112 defines an invasive species as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." The Forest Service relies on Executive Order 13112 to provide the basis for labeling certain organisms as invasive. Based on this definition, the labeling of a species as 'invasive' requires closely examining both the origin and effects of the species. The key is that the species must cause harm and be exotic to the ecosystem it has infested before we can consider labeling it as "invasive". **Thus, native pests are not considered 'invasive", even though they may cause harm.** Invasive species infest both aquatic and terrestrial areas and can be identified within any of the following taxonomic categories: Plants, Algae, Vertebrates, Invertebrates, and Pathogens. Additional information on this definition can be found in Executive Order 13112 and FSM 2900.

Noxious Weed: The term "Noxious Weed" is defined for the Federal government in the Plant Protection Act of 2000 and in some individual State statutes. For purposes of this chapter, the term has the same meaning as found in the Plant Protection Act of 2000 as follows: The term "noxious weed" means any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment. The term typically describes species of plants that have been determined to be undesirable or injurious in some capacity. Federal noxious weeds are regulated by USDA-Animal and Plant Health Inspection Service under the Plant Protection Act of 2000 which superseded the Federal Noxious Weed Act of 1974. State statues for noxious weeds vary widely, with some states lacking any laws defining or regulating noxious weeds. Depending on the individual State law, some plants listed by a State statute as "noxious" may be native plants which that state has determined to be undesirable. **When the species are native they are not considered invasive species by the Federal government**. However, in most cases, State noxious weed lists include only exotic (non-native) species. See FSM 2900 for additional information.

Invasive Species Management: Activities to prevent, control, contain, eradicate, survey, detect, identify, inventory, and monitor invasive species; includes rehabilitation and restoration of affected sites and educational activities related to invasive species. Management actions are based upon species-specific or site-specific plans (including forest plans, IPM plans, watershed restoration plans, and so forth), and support the accomplishment of plan goals and objectives and achieve successful restoration or protection of priority areas identified in the respective plan(s). See FSM 2900 for additional information.

Integrated Pest Management: A pest (in this context an invasive species) control strategy based on the determination of an economic, human health, or environmental threshold that indicates when a pest population is approaching the level at which control measures are necessary to prevent a decline in the desired conditions (economic or environmental factors). In principle, IPM is an ecologically-based holistic strategy that relies on natural mortality factors, such as natural enemies, weather, and environmental management, and seeks control tactics that disrupt these factors as little as possible. Integrated pest management techniques are defined

within four broad categories: 1) Biological, 2) Cultural, 3) Mechanical/Physical, and 4) Chemical techniques. See FSM 2900 for additional information.

Treatment: Any activity or action taken to directly prevent, control, or eradicate a targeted invasive species. Treatment of an invasive species infestation may not necessarily result in the elimination of the infestation, and multiple treatments on the same site or population are sometimes required to affect a change in the status of the infestation. Treatment activities typically fall within any of the four general categories of integrated management techniques: Biological treatments, Cultural treatments, Mechanical/Physical treatments, or Chemical treatments. For example, the use of domestic goats to control invasive plants would be considered a biological treatment; the use of a piscicide to control invasive fishes would be characterized as a chemical treatment; designing and implementing a prescribed burn specifically for invasive plant control would be considered a cultural treatment technique; developing an aquatic species barrier to prevent invasive species from spreading throughout a watershed would be considered a physical treatment. See FSM 2900 for additional information.

Targeted Invasive Species: An individual invasive species or population of invasive species, which has been prioritized at the project-level for management action based upon risk assessments, project objectives, economic considerations, and other priority-setting decision support tools. See FSM 2900 for additional information.

Priority Area Treated: Program or project plans (primarily at the district or forest level) will identify priority areas on which to focus integrated management actions to directly prevent, control, or eradicate a priority/high-risk aquatic or terrestrial invasive species. Priority areas indentified for invasive species treatments may include any specifically-delineated project area. Examples include, but are not limited to: a fuels treatment area, a developed recreation area, a transportation corridor, a facility, a sensitive habitat for rare species, a wetland, a river, a lake, a stream, an irrigation ditch, a grazing allotment, a stock pond, a fire camp, wildlife winter range, a burned area, a fire-break, a timber sale area, a wilderness area, a Research Natural Area, an energy transmission right of way, and so forth). The size of the priority area treated will typically be measured in acres.   For linear features (such as a stream/river, trail, roadway, power-line, ditch, and so forth) the area size can be calculated from the length and average width. In some cases, a smaller portion of a delineated project area infested by invasive species may be prioritized for treatment over the larger infestation. See FSM 2900 for additional information. Other guidance on determining and establishing priorities for invasive species management will be provided in the Forest Service Invasive Species Management Handbook (FSH 2909.11).

Monitoring: For the purposes of these treatment data entry protocols, the term "monitoring" refers to the observance and recording of qualitative information related to the responses to treating an infestation. For the purposes of invasive species program performance and accountability, the term "monitoring" refers to the observance and recording of information related to the responses to treating an invasive species infestation, and reported as treatment efficacy. By monitoring the treatment results over time, a measure of overall programmatic treatment efficacy can be determined and an adaptive management process can be used in subsequent treatment activities. See FSM 2900 for additional information.

Eradication: With respect to invasive species (plant, pathogen, vertebrate, or invertebrate species), eradication is defined as the removal or elimination of the last remaining individual

invasive species in the target infestation on a given site. It is determined to be complete when the target species is absent from the site for a continuous time period (that is, several years after the last individual was observed). Eradication of an infestation of invasive species is relative to the time-frame provided for the treatment procedures. Considering the need for multiple treatments over time, certain populations can be eradicated using proper integrated management techniques. See FSM 2900 for additional information.

Restored: With respect to performance specifically, the invasive species program is driven by an outcome-based performance measure centered on 'restoration'. An area treated (see "treatment" definition) against invasive species has been 'restored' when the targeted invasive species defined in the project plan was controlled or eradicated directly as a result of the treatment activity. In some instances, actions taken across particular areas to prevent the establishment and spread of specific invasive species are also included in this treatment definition. 'Restored' acres are a subset of 'treated' acres, which are tracked annually to determine the effectiveness of treatments. Preventing, controlling, or eradicating invasive species assists in the recovery of the area's resilience and the capacity of a system to adapt to change if the environment where the system exists has been degraded, damaged, or destroyed (in this case by invasive species); and helps to reestablish ecosystem functions by modifying or managing composition and processes necessary to make terrestrial and aquatic ecosystems sustainable, and resilient, under current and future conditions (as described in FSM 2020). In most cases, this is a performance measure defined in the project plan, and project managers have the flexibility to set the parameters for determining when the treated areas have been restored. Absence of an individual invasive species organism, whether through eradication or prevention efforts, is most often the criteria used to determine when acres have been restored. Monitoring treatment efficacy is critical to reporting invasive species management performance. See FSM 2900 for additional information.

NRM: Natural Resource Manager, a national Forest Service organization that is responsible for coordinating software development activities for four Forest Service Natural Resource Application modules whose data are accessible through a Web platform or the Enterprise Data Center.

FACTS: Forest Service Activity Tracking System, a module of Natural Resource Manager (NRM) designed to store records on management activities that have actually occurred on the National Forest System landscapes.

TESP-IS: Threaten Endangered Sensitive Plants & Invasive Species, a module of Natural Resource Manager (NRM) designed to store records for Invasive Species Survey, Inventory and infestation trend or spread.

TESP-IS Integrated User Interface: The NFS Invasive Species Management Program's required data entry/editing portal that meets all national record keeping and reporting standards, protocols, and requirements including the spatial data information requirements for activities conducted on national forests and grasslands.

Invasive Species Survey: An invasive species survey is a process of systematically searching a geographic area for a particular (targeted) invasive species, or a group of invasive species, to determine if the species exists in that area. It is important to know where and when surveys have occurred, even if the object of the survey (target species) was not located.

Information on the absence of an invasive species can be as valuable as information on the presence of the species, and can be used as a foundation to an early detection system. Unlike inventories, surveys typically do not collect additional detailed attributes of the infestation or the associated site. See FSM 2900 for additional information.

Invasive Species Inventory: Invasive species inventory is defined as a collection of information documenting the occurrence, population or infestation of a detected invasive species across the landscape or with respect to a more narrowly-defined area or site. Inventory attributes and purposes will vary, but are typically designed to meet specific management objectives which need information about the extent of an invasive species infestation. Inventory records document the extent of, and other attributes related to, infestations identified during survey activities. See FSM 2900 for additional information.

Infested Area: An area of land or water, in acres, containing a single invasive species delineated by the actual perimeter of the infestation as defined by the outer edge of the canopy cover of plants or the visible population (i.e. home range or stream reach for vertebrates) of other taxa, excluding adjacent areas not infested <u>and</u> outside the perimeter of the population. See FSM 2900 for additional information.

Treatment Area: A specific piece of land or water on which invasive species treatment activities occur; Synonymous with Activity Subunit with a focus on invasive species management. Treatment Areas may overlap, but cannot be divided.

Treatment Activity: A management entry across a treatment area to meet specific resource objectives. Pesticide application or mowing is considered to be an activity. With respect to invasive species management, the term "treatment" refers to any activity or action taken to directly eradicate, control or otherwise manage the spread of an invasive species infestation.

Appendix B

INFESTED AREA TREATED AND APPLICATION AREA

The protocol provides the capability to document the treated area with two related but different data-fields. The "Infested Area Treated" represents the area of a single species infestation that was treated. Since the inventory protocol tracks individual species infestations, it is allowable to associate more than one infestation with a treatment activity. If two infestations overlap and each are treated the sum of "Infested Area Treated" may be greater than the actual area of the treatment application. This is due to the overlapping nature of many weed populations. The second data field, Application Area, which is found in the chemical and bio-control daily log grids, is based on the activity for a given day on a single site regardless of the number of species or infestation overlap These two data-fields (Infested Area Treated and Application Area) allow the Forest Service to track different aspects of invasive species management. As an example the question: How many acres of each weed species were treated, is a different question than how many acres were treated with herbicides? Each question is answered with different data-fields.

There is also a relationship between Acres Accomplished, Infested Acres Treated and Application Area. Typically, where treatment is accomplished across a single infestation on a single day, Acres Accomplished, Infested Acres Treated and Application Area would be equal. However, where multiple overlapping infestations are being treated, infested Area Treated may not be equal to the Acres Accomplished due to the overlapping nature of many invasive species populations. It would be uncommon to document treatment acres (Acres Accomplished and Application Area) significantly greater than the infested acres treated since that would imply that treatment is occurring across areas that are not infested with an invasive species.

The diagram below depicts the three area measurements with infestation overlap:
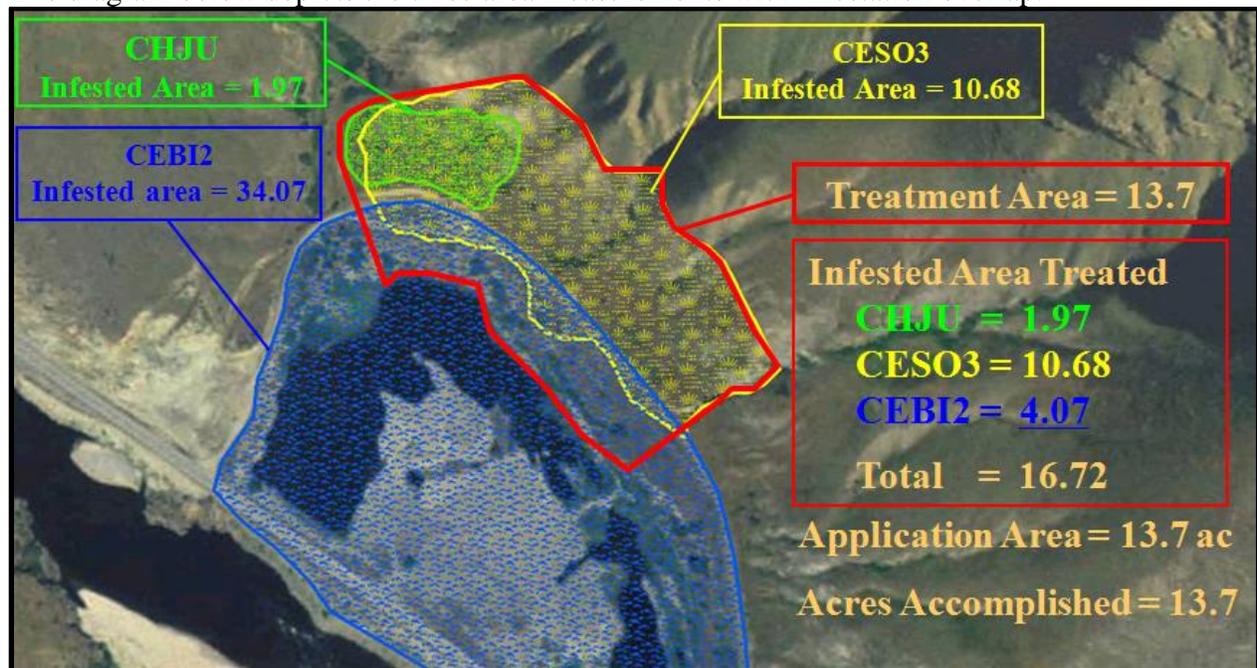
Biocontrol Agent Releases: The dispersal or release of insects or pathogens on an invasive species (see definition of infested area), with the intent of reducing the density of the infestation and/or slowing the spread of the target species. An agent can be an insect, fungus, bacterium, or other life form that preys on the target species. The release of agents can occur at a single location or scattered over a site. The release can be a few individuals, a container of many individuals or several containers with thousands of individuals.

Releases at different locations, with the intent of establishing separate populations (approximately 1/4 mile apart), constitute separate releases. A release of a mixture with two agents, at the same location (within 1/4 mile), at the same time is a single release.

Example 1: A leafy spurge infestation on the Mckenzie River Grasslands is 1,000 acres in size. The district intends to release the biological control agent, <u>Apthona</u> <u>nigriscutis</u>, on the site. They want to quickly establish a population on the site so they release three (3) containers of 1200 bugs each at a single location, over an approximate three (3) acre area. This is a single release, whether they release 500 or 3,000 bugs and whether they release them all at the exact location or over a 3-acre area. **A single release would be entered and the application area would equal 5 acres**.

Example 2: On the same 1,000 acre leafy spurge infestation the objective is to establish several populations of Apthona nigriscutis on the 1,000-acre infestation. The district plans three release sites, one at the north end, one at the south end and, one in an area of high spurge density at the eastern end of the infestation. The north and south release sites are approximately 1 mile apart and the eastern release is approximately 1/2 mile from the north release site. In this situation, the district may claim three (3) releases. While the area is mapped as a single weed infestation (1,000 acres infested), the intent is to establish three populations. Over time, the Apthona populations may merge, but the district can still claim three releases. **Three releases would be entered and the application area would total 15 acres**.

Livestock: Application Area is the actual area grazed of the target invasive plant Infested Area (acres). If multiple overlapping infestations are under the same prescription, the Application Area and Infested Area Treated would follow the concept discussed in the previous paragraphs and would not be equal. **Grazing which occurs for invasive weed control should not be reported as AUMs grazed under permitted livestock use (FSH 2200).**

Cultural and Mechanical/Physical Treatment Types: At the present time Acres Accomplished" is the data-field that would be used for Application Area, since Manual and Mechanical treatments do not have special pages. It should not include areas affected by the treatment but the actual prioritized acres manually or mechanically treated.

Appendix C

LIST OF VALUES (STANDARD CODES)

Following are the standard codes or List of Values used for this protocol. Additional values should not be added to these lists without National approval because they will not be able to be entered into TESP-IS Application.

Survey Type List-of-Values

Code	Description
Cursory	**A rapid search where the entire area is traversed at least once**. By its nature, the cursory visit is rapid, but does not provide in-depth environmental information. The entire area is traversed at least once. For example, stand condition as seen in aerial photography can be verified by a cursory visit to a location.
Field Check	**A quick search where the surveyor does not traverse through nor examine the entire project area**. Field Check is where the area is given a quick "once over" but do not walk completely through the project area.
General	**A thorough search of most of the area and perimeter using multiple traverses without pre-established search pathways**. The area is given a closer look by walking through the area and perimeter or by walking more than once through the area. Most of the area is examined
Focused (Intuitive Controlled)	**A thorough search of the area by first determining suitable habitat for each target species and focusing the search in these habitats**. The intuitive controlled survey is the most commonly used and most efficient method of surveying. During pre-field analysis, potential suitable habitat is identified for each species of interest and the survey effort is focused in those areas. This method requires adequate knowledge of suitable habitat in order to accurately select the areas of focused search.
Random	**Search for target species in a series of undirected traverses, plots or transects through a project area.** The random traverses or transects are employed either when there is inadequate natural history information about a species to discern its suitable habitat and the surveyor is simply searching for occurrences.
Stratified Random	**Search for target species in a series of undirected traverses, plots or transects within a predetermined strata**. The stratified random survey is most often used within known population areas of target species or when an area of unknown suitability to be surveyed is relatively large. Stratified random surveys employ a series of randomly selected plots of equal size within a project area that are each thoroughly searched for target species. When conducting a stratified random survey, it is important to search an adequate number of sites that are of sufficient size to represent an adequate sample.
Systematic	**Search for target species in a series of systematically located traverses, plots or transects through the project area.** Systematic surveys are often employed either within focused search areas (e.g., stratified random and intuitive controlled methods), or when a proposed project is likely to produce significant habitat alterations.
Aerial	**Detecting invasive animals, plants, insects or pathogens from helicopter or fix-wing.**
Ground	**Detecting invasive animals or pathogens through standard ground based species specific survey protocols.**
Traps	**Detecting invasive animals or insects through the systematic placement of a series of traps following standard species specific protocols.**

Aquatic	**Detecting invasive aquatic invertebrates, vertebrates or pathogens through standard aquatic survey protocols.**

Survey Focus: List of Values.

Code	Description
Aquatic	Surveys confined within water bodies such as streams, lakes, ponds and irrigation canals.
Features	Surveys focused on areas in or adjacent to developed features such as road, trails, campgrounds, parking lots and boat launches.
Riparian	Surveys within areas defined as transitional between permanently saturated wetlands and upland areas or that follow the shoreline of water bodies.
Terrestrial	Surveys within upland areas.

Survey Status: List of Values.

Code	Description
Presurvey	Minimum information to assist in survey planning and fieldwork preparation. Spatial survey boundary, Survey ID and survey status are required at this stage. Formulate a target species list, if information is available, which would enable printing a list of target species to take in the field.
Active	Surveys that initial fieldwork and results are being entered into the application, but the survey project is not yet complete. Since surveys may span an extended period of time within the field season, it may be advantageous to begin data entry prior to the completion of fieldwork. This category indicates that the survey is incomplete and should not be used for final data interpretations. In addition to the spatial survey boundary, the survey ID and survey status are required at this stage of data entry.
Inactive	Surveys that have been suspended for a variety of reasons, including when the proposed project that required the survey is postponed or suspended.
Cancelled	Surveys that are stopped, for a variety of reasons, before they are completed. The proposed project that triggered the need for the survey may have cancelled, including funding and personnel changes or modified priorities.
Completed	Fieldwork and data entry work are complete for the survey, and survey data are ready to be certified for analysis. The survey polygon and all required fields from the field survey protocol must be entered before the status field of "Complete" can be used in the application.

Source of Work List of Values.

Code	Description
Force Account	Seasonal or permanent Forest Service employees
Contract	A contracted work crew or consultant(s)
Volunteer	Survey provided by unpaid volunteer(s)
Academia	Faculty, graduate student(s) or researcher(s) from an academic or research institution
Historic	Survey conducted previously, with source of work unknown
Other	Personnel from local agencies or organizations in cooperation with the Forest Service.

Ownership List of Values

CODE	Description
BIA	BUREAU OF INDIAN AFFAIRS
BLM	USDI BUREAU OF LAND MANAGEMENT
BOR	CITY/BOROUGH LANDS
BRC	BUREAU OF RECLAMATION
CTL	CONSERVATION TRUST
CTY	COUNTY
DOD	DEPARTMENT OF DEFENSE
DOE	DEPARTMENT OF ENERGY
ESL	ENCUMBERED SELECTED LANDS
FFP	FOREIGN FORESTRY
FOA	FOREIGN OTHER AGENCY
FPV	FOREIGN PRIVATE
FS	USDA FOREST SERVICE
FWS	USDI FISH AND WILDLIFE SERVICE
IND	INDIAN LANDS
MUN	MUNICIPAL OWNED/MGMT
NPS	USDI PARK SERVICE
O&C	O&C LANDS
OFA	OTHER FEDERAL AGENCIES
OGV	OTHER GOVERNMENT ENTITIES
OLA	OTHER LOCAL AGENCY
OSA	OTHER STATE AGENCY
PIF	INDUSTRIAL FORESTRY
PIO	INDUSTRIAL OTHER
PUB	PUBLIC (PRIVATE CITIZEN)
PVT	PRIVATE
RUR	RURAL FIRE PROTECTION
STA	STATE
STF	STATE FORESTRY
STP	STATE PARK
STS	STATE SCHOOL
STW	STATE WILDLIFE
TNL	TRIBAL NATION
ARL	Argriculture Research Land
COE	Corp of Engineers
NWR	National Wildlife Refuge
RR	Railroad

Canopy Cover Class Sets List of Values:

Canopy Cover Set	Description
NRMCOV	Ten Point Cover Class
DAUBEN	Daubemire Cover Classes
GYA	Greater Yelllowstone Area Cover Classes

Canopy Cover Class Values – Listed by Set

Ten Point Cover Classes

Class Code	CoverClass	Mid Point
T	0-1.0%	0.5%
0	1.1-5.0%	3.0%
1	5.1-15.0%	10.0%
2	15.1-25.0%	20.0%
3	25.1-35.0%	30.0%
4	35.1-45.0%	40.0%
5	45.1-55.0%	50.0%
6	55.1-65.0%	60.0%
7	65.1-75.0%	70.0%
8	75.1-85.0%	80.0%
9	85.1-95.0%	90.0%
A	91.1-99.0%	97.0%
X	99.1-100%	99.5%

Daubenmire Classes

Class Code	Cover Class	Mid Point
T	0 - 1.0%	0.5%
1	1.1 - 5.0%	3.0%
2	5.1 - 25.0%	15.0%
3	25.1 - 50.0%	37.5%
4	50.1 - 75.0%	62.5%
5	75.1 - 95.0%	85.0%
6	95.1 – 100%	97.5%

Greater Yellowstone Area Cover Classes
Guidelines for Coordinated Management of Noxious Weeds

Cover Code Class	Cover	Mid Point
T – Trace	0-1%	0.5%
L – Low	1.1 – 5.0%	2.5%
M – Moderate	5.1 – 25%	15%
H- High	25.1 – 100%	63%

Distribution List of Values:

Code	Class
Cl	Clumpy
SP	Scattered Patchy
SE	Scattered Even
LI	Linear

Lifeform List of Values:

Code	Name	Description
FB	Forb/herb	Vascular plant without significant woody tissue above or at the ground. Forbs and herbs may be annual, biennial, or perennial but always lack significant thickening by secondary woody growth and have perennating buds borne at or below the ground surface.
GR	Graminoid	Grass or grass-like plant, including grasses (Poaceae), sedges (Cyperaceae), rushes

Code	Name	Description
		(Juncaceae), arrow-grasses (Juncaginaceae), and quillworts (Isoetes).
LC	Lichen	Organism generally recognized as a single plant that consists of a fungus and an alga or cyanobacterium living in symbiotic association. Often attached to solid objects such as rocks or living or dead wood rather than soil.
LI	Liana	Climbing plant found in forests with long, woody, rope-like stems of anomalous anatomical structure. A shrub in the FGDC classification.
NP	Nonvascular	Nonvascular, terrestrial green plant, including mosses, hornworts, and liverworts. Always herbaceous, and often attached to solid objects such as rocks or living or dead wood rather than soil.
SH	Shrub	Perennial, multi-stemmed woody plant that is usually less than 4 to 5 meters or 13 to 16 feet in height. Shrubs typically have several stems arising from or near the ground, but may be taller than 5 meters or single-stemmed under certain environmental conditions.
SS	Subshrub	Low-growing shrub usually under 0.5 m or 1.5 feet tall (never exceeding 1 meter or 3 feet tall) at maturity..
TR	Tree	Perennial, woody plant with a single stem (trunk), normally greater than 4 to 5 meters or 13 to 16 feet in height; under certain environmental conditions, some tree species may develop a multi-stemmed or short growth form (less than 4 meters or 13 feet in height).
UN	Unknown	Lifeform is unknown.
VI	Vine	Twining/climbing plant with relatively long stems, which can be woody or herbaceous..
AL	Algae	A general name for the single-celled plant plankton, seaweeds, and their freshwater allies.
FU	Fungi	A non-flowering plant of the kingdom Fungi, lacking chlorophyll.

Phenology List of Values:

Code	Description
G1	Graminoids: Leaves partially developed; no heads
G2	Graminoids: Inflorescence inside the sheath (in the boot)
G3	Graminoids: Inflorescence partially or fully exerted from sheath
G4	Graminoids: Seeds maturing or mature
G5	Graminoids: Senescent; dormancy
F1	Forb-Shrub: Pre-flowering (vegetative, rosettes, and bolting)
F2	Forb-Shrub: Flowering
F3	Forb-Shrub: Fruiting
F4	Forb-Shrub: Senescent; dormancy

Lifestage List of Values:

Code	Description
Adult	Sexually mature adult
Alates	Alates
C-1	First copepodite stage
C-2	Second copepodite stage
C-3	Third copepodite stage
C-4	Fourth copepodite stage
C-5	Fifth copepodite stage
Egg Mass	Mass of developing ova
Gemmule	Asexual reproduced stage

Glochid	Glochidia parasitic larval stage
Instar	Immature stages between molts
Instar-1	First Instar
Instar-2	Second Instar
Instar-3	Third Instar
Instar-4	Fourth Instar
Instar-5	Fifth Instar
Instar-6	Sixth Instar
Instar-7	Seventh Instar
Instar-8	Eight Instar
Juvenile	Immature life stage
King	Adult King
Larva	Immature life stage
Larvae	Larvae
Medusa	Motile free swimming stage of Cridaria
N-1	First Naupliar stage
N-2	Second Naupliar stage
N-3	Third Naupliar stage
N-4	Fourth Naupliar stage
N-5	Fifth Naupliar stage
N-6	Sixth Naupliar stage
Planula	Immature stage between medus
Polyp	Sessile stage of Cridaria
Pupae	Pupae
Queen	Adult Queen
Statobla	Asexually produced capsule
Veliger	Nonparasitic larval stage
Worker	Workers and Soldiers
Zooid	Asexually morphological stage

Slope Position List of Values:

Code	Name	Description
BS	Backslope	The steepest portion of the slope where material is generally in transit.
FS	Footslope	The lower portion of the slope where material is generally re-deposited.
SH	Shoulder	The upper slope where material generally moves through creep processes.
SU	Summit	The uppermost slope.
TS	Toeslope	The lowermost slope position where material moves generally through alluvial processes.

Aspect: Cardinal Direction List of Values:

Code	Name	Description
A	Includes all aspects	a conical depression or elevation and all aspects are represented
E	East	East
ENE	East northeast	East northeast
ESE	East southeast	East southeast
FL	Flat (no aspect)	Flat (no aspect)
N	North	North
NE	Northeast	Northeast
NNE	North northeast	North northeast
NNW	North northwest	North northwest
NW	Northwest	Northwest
S	South	South
SE	Southeast	Southeast
SSE	South southeast	South southeast
SSW	South southwest	South southwest
SW	Southwest	Southwest
W	West	West
WNW	West northwest	West northwest
WSW	West southwest	West southwest

Soil Texture List of Values:

Code	Name	Description
C	clay	A term used in the U.S. and by the International Society of Soil Science for a rock or mineral particle in the soil, having a diameter less than 0.002 mm (2 microns)
CL	clay loam	A soil containing 27-40% clay, 20-45% sand, and the remainder silt.
L	loam	A rich, permeable soil composed of a friable mixture of relatively equal and moderate proportions of clay, silt, and sand particles, and usually containing organic matter
S	sand	A term used in the U.S. for a rock or mineral particle in the soil, having a diameter in the range of 0.05-2 mm.
SI	silt	A rock or mineral particle in the soil, having a diameter in the range of 0.002-0.05 mm.
SIL	silt loam	A soil containing 50-88% silt, 0-27% clay, and 0-50% sand; e.g. one with at least 50% silt and 12-27% clay, or one with 50-88% silt and less than 12% clay.
SL	sandy loam	A soil containing 43-85% sand, 0-50% silt, and 0-20% clay, or containing at least 52% sand and no more than 20% clay and having the percentage of silt plus twice the percentage of clay exceeding 30, or containing 43-52% sand, less than 50% silt, and less than 7% clay.

Wind Classes

Class	Knots	Knots Specification
1	<1	Calm; smoke rises vertically.
2	1-3	Direction of wind shown by smoke drift not by wind vanes.
3	4-6	Wind felt on face; leaves rustle; vanes moved by wind.
4	7-10	Leaves and small twigs in constant motion; wind extends light flag.
5	11-16	Raises dust, loose paper; small branches moved.
6	17-21	Small trees in leaf begin to sway; crested wavelets form on inland waters.
7	22-27	Large branches in motion; whistling heard in overhead wires; umbrellas used with difficulty
8	28-33	Whole trees in motion; inconvenience felt walking against wind.
9	34-40	Breaks twigs off trees; impedes progress.
10	41-47	Slight structural damage occurs.
11	48-55	Trees uprooted; considerable damage occurs.
12	56-71	Widespread damage.