

MODULE 1.5:

INVENTORY AND MONITORING

THIS MODULE COVERS:

- Field preparation;
- Field procedures;
- Inventory standards;
- Inventory data recording;
- Sketch maps; and
- Photo inventory.

Invasive plant inventories are important for a variety of reasons. Inventories can be used to determine the extent of localized outbreaks of invasive species, define containment lines for treatment activities, calculate potential control costs, develop strategic plans for managing endemic species, and provide valuable information for research purposes. Regular surveillance can also identify new invaders and help ensure effective implementation of Early Detection and Rapid Response programs.

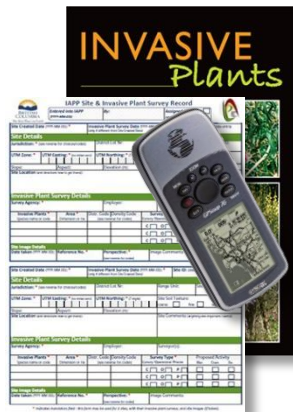
An invasive plant inventory consists of a general review of the species being investigated and the collection of detailed information about the species, such as the physical characteristics of the site, and its location and distribution across the landscape. The inventory may also include proposed treatment activities.

FIELD PREPARATION

Before heading to the field for an invasive plant inventory, existing inventory information should be reviewed to estimate the amount of time required to inventory a particular area or species to a desired standard. The Invasive Alien Plant Program (IAPP) Map Display module (described in Part 3 of this reference guide) allows highlighting of previously inventoried invasive plant species within a given area of interest. Additionally, the IAPP site selection extract function can provide detailed lists of sites that have been previously inventoried in a given area.



Current maps of the area to be inventoried must be obtained and used. The maps should be at a scale of 1:5,000 to up to 1:50,000, with 1:15,000 or 1:20,000 being the typical size used for most invasive plant work, and show features such as roads, water bodies, utility corridors, private land, and First Nations reserves. Satellite imagery and orthophotos of the area are also useful for drawing a spatial polygon of an infestation to be inventoried.



Other equipment needed to complete an inventory include inventory data sheets, plant identification books, related plant keys, and a GPS unit. A plant press is recommended for collection of voucher specimens for species that are new to an area or unknown by the observer.

FIELD PROCEDURES

Invasive plant inventories can be conducted on foot or horseback, or with 4 x 4 or all-terrain vehicles. The chosen mode of transportation should have the least impact on the landscape being reviewed. If vehicles are used, speeds should not exceed 30 km/hour. While some inventories can be conducted by one experienced person, it is recommended that two people complete the work as it improves accuracy of observations, is more efficient, and maximizes safety when using motorized vehicles.

Begin the inventory on a selected road, and branch off onto smaller roads and trails, if necessary. While travelling, make careful observations of areas that have been recently disturbed or that are disturbed on a regular basis, as they are generally the preferred habitats of invasive plant species. These types of sites include road rights-of-way (including ditches), pullouts, landings, cutblocks, recreation sites, openings under the forest canopy, range developments and overgrazed areas, airstrips, and gravel pits.

It is helpful to make a record of the area inventoried and the inventory date, which can be done by creating an Excel spreadsheet, developing a track log with the GPS unit while travelling, or both. Track logs can be plotted on maps to show areas inventoried.



Before leaving the area after the inventory, be sure to check all clothing and travel equipment for any invasive plant parts, to avoid spread to other areas.

INVENTORY STANDARDS

Inventory data should meet the standards set by the respective agency's program. Three standards for conducting inventories are used, depending on the level of detail required and the purpose for which the data will be used, as described in the following table.

Inventory Standard	Description
Cursory	<p>This inventory standard provides a systematic process for acquiring baseline inventory data. Cursory inventories are often conducted for low-priority invasive plant species or for species that are endemic but not well-represented in existing inventory databases. The collected data are not as detailed as operational or precise inventory data. Cursory data may be used to indicate the presence of an invasive plant, and to inform other field personnel and researchers about a given site. These data cannot be used for analysis or research purposes.</p> <p>Only the minimum mandatory fields are required for entry into the IAPP application. They include, but are not limited to:</p> <ul style="list-style-type: none"> • invasive plant species, • GPS co-ordinates, • area, and • comments.
Operational	<p>The operational standard provides a systematic approach to acquiring accurate inventory data that can be used for analyses, as well as the following applications:</p> <ul style="list-style-type: none"> • containment and control activities, • compliance and enforcement needs, • unit-based contract prescriptions, and • Pest Management Plan reporting requirements. <p>Conducting an operational inventory of an infested site over 0.2 ha in area requires drawing a spatial polygon on a map. The polygon should represent the extent of the infestation to within 20 m of accuracy. The accuracy standard can be met by drawing the polygon on forest cover or orthophoto maps at a scale of 1:5,000 to 1:20,000. Spatial polygons are not required for invasive plant sites smaller than 0.2 ha.</p> <p>The mandatory fields for an operational inventory are the same as those required for IAPP data entry, as well as:</p>



- site location,
- digital polygon for infestations larger than 0.2 ha,
- distribution code, and
- density code.

Precise

This standard provides a systematic process for acquiring accurate and highly detailed inventory data. It is designed for use in research and data analysis. These data can be used for various applications, including:

- determining the rate of spread of an invasive species,
- determining the risk and potential impacts of invasive plant populations, and
- evaluating impacts of biological control agents on invasive plant populations.

During spatial data collection, the perimeter of each infestation must be walked, and each polygon must be distinguished by a change in density greater than a factor of 2. Spatial polygons should be recorded as described in the operational inventory method above.

The mandatory fields for a precise inventory are the same as those required by for IAPP data entry, as well as:

- site location,
- distribution code,
- density code, and
- soil texture

INVENTORY DATA RECORDING

When a target species is found, information about it must be recorded on the "Site & Invasive Plant Inventory Record" form. Print-ready copies of this form can be downloaded from the "IAPP Field Forms" section under IAPP Resources: https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/invasive-species/iapp-resources/site_and_survey_recordform.pdf.

If the species was found on a new site, information about the site must be recorded in addition to the data gathered during the inventory of the infestation(s). If the target species was found on an existing site, only the Site ID and data gathered during the inventory need to be recorded.



If field personnel are unable to correctly identify a particular plant species as an "invasive alien", a photo or sample should be taken for later verification of the plant's identity. Care must be taken not to spill any seeds or plant parts during collection and travel, however. A sealed paper bag works well for transporting samples.

Generally, continuous invasive plant occurrences with less than a 100-m gap between plants are recorded as one site. Occurrences over 100 m apart with no target species between them are recorded as separate sites.

A GPS location is required for any site. Ideally, the co-ordinates are taken at the centre of the infestation (When using a GPS unit to obtain site co-ordinates, ensure that the NAD 83 datum is selected.)

Extremely large infestations (greater than 5 ha) can be assigned a best estimate of the total area, average density, and distribution.

When a single site supports multiple invasive plant species, record all the species on that site. Exceptions to this can occur when a priority invasive plant species with limited distribution in the survey area is found within a larger patch of another species, or group of species. In this case the observer may choose to identify a separate site for the priority species from the larger, surrounding infestation. Species may also be recorded as separate sites if one or more species occupies less than 0.2 ha, while other species have larger areas for which spatial data have been collected.

Under the *Freedom of Information and Protection of Privacy Act*, personal information collected from landowners during invasive plant inventories must be obtained directly from the individual with his/her knowledge of its intended use. However, personal information must not be entered into IAPP.

SKETCH MAPS

A good way to later relocate an invasive plant site is through a sketch map showing access to the site. The map should include the names of nearby towns and communities, road names, and the distance and direction travelled on each road leading to the site. Sketch maps can be scanned and added to IAPP provided that each image is under 200 KB in size.



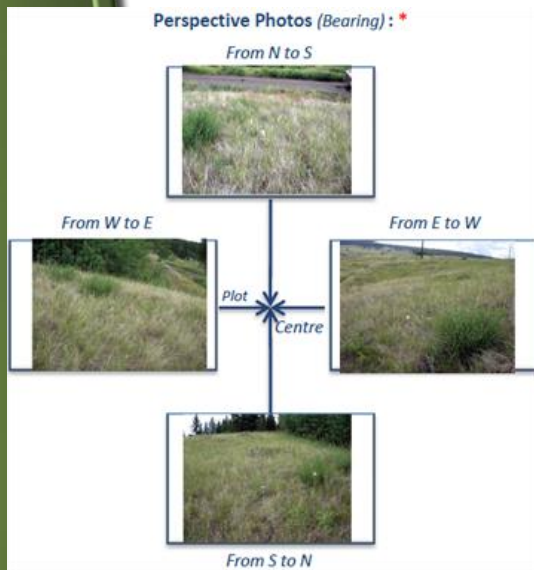


PHOTO INVENTORY

A photo inventory can be helpful to visually monitor changes in an invasive plant infestation over time. Either take individual photos of an invasive plant or infested site, or make a complete photo inventory consisting of a group of photos of the infestation. To monitor changes in the height of an invasive plant, a stadia rod (range pole) should be erected adjacent to a permanent photo point. A complete photo inventory of an infestation should include the following:

- Photos taken from each cardinal direction (north, south, east, and west). Photos should be taken 3 m from, and be directed toward, the photo point; and,
- A landscape photo that captures the best representation of the entire infestation while encompassing the release site.

Landscape Photos (overview):



Avoid taking pictures with people in them, or where unavoidable, ensure the individuals in the photograph are not recognizable (i.e. no facial shots). As previously stated, under the *Freedom of Information and Protection of Privacy Act*, personal information may not be disclosed to the public, and this includes photographs where the person within the photo can be easily identified.

Individual invasive plant inventory photos can be recorded in the image details section of the "Site & Invasive Plant Inventory Record". However, if a photo inventory has been completed, photo information should be recorded on the "Photoplot Record Form" which can be downloaded from the "IAPP Field Forms" section under the IAPP Resources:

https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/invasive-species/iapp-resources/photoplot_record.pdf

Inventory photos should be uploaded into IAPP, but individual photos must be no larger than 200 KB. Copies of the photos may be kept in the project file and/or in a digital archive system created by the agency that conducted the inventory. The date, direction in which the photo was taken, and site number should be recorded on the back of each photo in the release file.



Each field of the Site & Invasive Plant Inventory Record form is explained below:

Field	Description
Data Entered into IAPP	Checkbox to designate that the site details have been entered into the IAPP Data Entry module, which demonstrates that the data exist electronically.
By	Text entry of the name of the individual who entered the data into IAPP. This allows for checking if data errors are noted or additional information is required.
Assigned Site IDs recorded on this form	Checkbox to be checked when the data entry has been completed, and the Site ID created by IAPP has been written in the Site ID box.
Site Created Date	Mandatory text entry; refers to the date when the field staff filled in the data on the form (<i>not</i> the date when the data entry staff member enters the record into the database)
Invasive Plant Survey Date	If the Site already exists in IAPP, then the Site Details portion of the form does not require to be filled out; however, the date for the survey details does need to be recorded.
Site ID	This unique identifier is created by IAPP. If the site already existed in IAPP, write the existing number here. If not, then write it in during the data entry process (see item 3 in this list).
Jurisdiction	Mandatory text entry to identify the legal entity that is responsible for the land on which the site is located
District Lot Nr.	Text entry to provide information regarding the lot that may be useful to Regional District users.
Range Unit ID	Text entry of a MFR administrative unit within a stock range
Site Paper File ID	Text entry to provide information, up to 20 characters, for cross-referencing paper and electronic files for a given site. The format of this field varies widely among agencies.
UTM Zone	Mandatory number entry; the zone in which the UTM easting and northing for the site location fall. Ensure the GPS unit is set to NAD 83.
UTM Easting	Mandatory number entry; although the GPS unit will display this as a 7-digit number starting with a zero, the initial zero is not recorded in IAPP.
UTM Northing	Mandatory number entry - a Northing will always have 7 digits, and will start with either a 5 or 6, depending on how far north the site location is.
Site Soil Texture: Coarse, Fine, or Organic	Checkbox for the relative amount of sand, silt, clay, and organic matter in a soil. (For in-house use only; this field cannot be entered into IAPP)



Slope %	Number entry to provide a measurement of how much the land surface deviates from the horizontal; measured with a clinometer (must be an integer between 0 and 90 in IAPP)
Aspect	Number entry to identify the direction that a slope faces; measured with a compass (must be an integer between 0 and 360 in IAPP)
Elevation (m)	Text entry to identify the height of land above sea level; measured with a GPS unit or an altimeter.
Site: Location	Text entry to provide the location of, and directions to, a site. Locations should start general and get more specific. For example: "Near Kamloops → North on Deadman Vidette Road → 15.2 km Criss Creek FSR."
Site: Comments	Text entry to provide an opportunity to enter any additional information about the site that has not been captured elsewhere. For example: "Must obtain gate key" or "Very steep terrain; not suitable for truck access".
Survey Agency	Mandatory text entry to identify the agency that conducted the inventory. "Agency" is defined as the legal entity that pays to have the inventory done.
Employer	Text entry of the employer who conducted the inventory. This may often be the name of a contractor hired to perform the work on behalf of the Survey Agency.
Surveyor(s)	Text entry to identify the individual(s) who conducted the inventory.
Invasive Plants	Mandatory text entry to indicate which invasive plant species are present at the site. For additional information, see the Invasive Plant Codes in Part 4 - Appendices.
Area (Ha)	Mandatory number entry of the estimated area of an invasive plant infestation, measured in hectares. Often, this is entered on the form in the field as a dimension, which is then translated into hectares by the data entry staff member.
Distribution Code	Text entry to describe the spatial distribution of invasive plants on a site. For additional information, see the Distribution Codes in Part 4 - Appendices.
Density (plants/m²)	Text box to provide an estimate of the number of plants per square metre, expressed in density classes. For additional information, see the Density Class Codes in Part 4 - Appendices.
Survey Type: Cursory, Operational, or Precise	Checkbox to identify the type of inventory completed at a site. See the definition of cursory, operational, and precise inventories provided earlier in this module.
Proposed Activity: M, C, B	Checkbox to provide an opportunity to recommend a treatment option following the inventory: M (mechanical), C (chemical), or B (biological).



Image Section: Date taken	If a picture is to be uploaded to the site, record the date the picture was taken.
Perspective	Mandatory text entry to indicate the direction in which the photo was taken (e.g., north to south)
Reference No.	Mandatory text entry of up to 20 characters to allow cross-referencing of the filing location/number of the image to the electronic image file
Image Comments	Text entry to provide space for entering any additional information about the photos taken that was not captured elsewhere.

Each field of the "Photoplot Record" form is explained in the table below:

Field	Description
Data Entered into IAPP	Checkbox to designate that the site details have been entered into the IAPP Data Entry module.
Entered By	Text entry of the name of the individual who entered the data into IAPP. This allows for checking if data errors are noted or additional information is required.
Date	Date that the photos were taken in the field.
Site ID	Automatically generated by IAPP; if the site already exists, enter the Site ID here; if the site does not yet exist then the data entry staff member will enter this number on the form once the site has been created.
Treatment / Monitoring ID	If the treatment or monitoring record, to which these photos will be attached, already exist in IAPP you may enter them here. Otherwise, the treatment or monitoring ID will be generated by IAPP at time of data entry.
Reference No.	Mandatory text entry of up to 20 characters to allow cross-referencing of the filing location/number of the image to the electronic image file
Photos Taken By	Name of the individual who took the photos.
Location	Accurate description of the location where the individual taking the photo was standing; important for future retakes for comparison purposes.
Purpose	Checkboxes for biorelease or weed/veg inventory. If the purpose is 'other', write a short purpose description.
Photo Retake?	Checkboxes indicating whether the photos are retakes.
Distance From Plot Centre	Number entry, in metres.
Camera Used:	Name, type and number of the equipment
Photo Numbers	Text entry to allow cross-referencing of the filing location/numbers of the images to the electronic image file.



Perspective Photos (graphic boxes)	Spaces to enter the photo numbers, indicating the direction in which they were taken.
Landscape Photos (graphic boxes)	Spaces to enter the photo numbers, indicating they were overview images of the site / infestation.
Aerial Photos (graphic box)	Space to enter the photo number(s), indicating they were ground shots (taken at a 90 ⁰ angle above the ground).
Comments	Text entry to provide an opportunity to enter any additional information about the photos that has not been captured elsewhere.

