Line Intercept (LI)

Sampling Method

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SUMMARY

The FIREMON Line Intercept (LI) method is used to assess changes in plant species cover for a macroplot. This method uses multiple line transects to sample within plot variation and quantify statistically valid changes in plant species cover and height over time. This method is suited for most forest and rangeland communities, but is especially useful for sampling shrub cover greater than 3 ft (1 m) tall, because it is difficult to ocularly estimate the cover of tall shrubs. The LI method can be used in conjunction with cover-frequency (CF) transects when vegetation over 3 ft (1 m) exists. Line intercept can also be used to calibrate ocular estimates of shrub cover when the Species Composition (SC) method is used. Cover is recorded as the number of ft (m) intercepted by each species along a transect. Percent cover is calculated by dividing the number of ft (m) intercepted by each species by the total length of the transect.

INTRODUCTION

The Line Intercept (LI) method is designed to sample within-plot variation and quantify changes in plant species cover and height over time using transects located within the macroplot. Transects have random starting points and are oriented perpendicular to the baseline. First, samplers record the transect length and number of transects. Then along each transect, cover intercept and average height are recorded for each plant species.

This method is primarily used when the fire manager wants to monitor changes in plant species cover and height. This method is primarily designed to sample plant species with dense crowns or large basal areas. The LI method works best in open grown woody vegetation (Western United States shrub communities), especially shrubs greater than 3 ft (1 m) in height. The CF method is generally preferred for sampling herbaceous plant communities with vegetation less than 3 ft (1 m) in height. However, the LI method can be used in junction with the CF method if shrubs greater than 3 ft (1 m) exist on the plot (CF quadrats can be used to sample herbaceous vegetation, then the transect used to locate the quadrats can be used to sample shrubs using the LI methods). This is probably the best method of sampling cover in mixed plant communities with grasses, shrubs, and trees. This method is not well suited for sampling single-stemmed plants or dense grasslands. The PO method is better suited for sampling fine textured herbaceous communities such as dense grasslands and wet meadows. Cover measured with line intercept is less prone to observer bias than ocular estimates of cover in quadrats (CF method). However,

if rare plant species are of interest, the CF methods are preferred because rare species are easier to sample with quadrats than with points or lines.

Tansley and Chipp (1926) introduced the line intercept method. A line transect—typically a measuring tape stretched taut on the ground or at a height that just contacts the vegetation canopy—is used to make observations of plant cover. The method consists of measuring the length of intercept for each plant that occurs over or under the tape. If basal cover is of interest, then the tape is placed at ground level. Percent cover is sampled by recording the length of intercept for each plant species measured along a tape by noting the point on the tape where the plant canopy or basal portion begins and the plant canopy or basal portion ends. When these intercept lengths are summed and divided by the total tape length, the result is a percent cover for the plant species along the transect.

The line transect can be any length and, if modified, is usually done so based on the type of vegetation being sampled (Bonham 1989). In general, cover in herbaceous communities can be estimated with short lines (typically less than 50 m), while longer lines (50 m or greater) should be used in some shrub and tree communities. Canfield (1941) recommended using a 15 m transect for areas with 5 to 15 percent cover and using a 30 m line when cover is less than 5 percent. The amount of time needed to measure a transect can also be used to determine the length of the transect (Bonham 1989). Canfield recommended a transect length in which canopy intercepts can be measured by two people in approximately 15 minutes.

The line intercept method is most efficient for plant species that have a dense crown cover (shrubs or matted plants) or have a relatively large basal area (bunch grasses), and is best suited where the boundaries of individual plants are easily determined. Line intercept is not an effective method for estimating the cover of single-stemmed plant species or dense grasslands (rhizomatous species).

Most plant species have some gaps in their canopies, such as bunchgrasses with dead centers or shrubs with large spaces between branches. Because observers treat gaps differently, rules for dealing with gaps must be clearly defined. One solution is for the observer to assume a plant has a closed canopy unless a gap is greater than some predetermined width. We recommend that gaps less than 2 inches (5 cm) be considered part of the canopy.

There are many ways to streamline or customize the LI sampling method. The FIREMON three-tier sampling design can be employed to optimize sampling efficiency. See the sections on **User-Specific LI Sampling Design** and **Sampling Design Customization** below.

SAMPLING PROCEDURE

This method assumes that the sampling strategy has already been selected and the macroplot has already been located. If this is not the case, then refer to the FIREMON **Integrated Sampling Strategy** and for further details.

The sampling procedure is described in the order of the fields that need to be completed on the **LI data form**, so it is best to reference the form when reading this section. The sampling procedure described here is the recommended procedure for this method. Later sections will describe how the FIREMON three-tier sampling design can be used to modify the recommended procedure to match resources, funding, and time constraints.

In the **How-To Guide** chapter, see **How To Locate a FIREMON Plot**, **How To Permanently Establish a FIREMON Plot**, and **How to Define the Boundaries of a Macroplot** for more information on setting up your macroplot.

Preliminary Sampling Tasks

Before setting out for your field sampling, lay out a practice area with easy access. Try to locate an area with the same species or vegetation life form you plan on sampling. Get familiar with the plot layout and the data that will be collected. This will give you a chance to assess the method and will help you

think about problems that might be encountered in the field. For example, how will you take into account gaps in the foliage of the same plant? It is better to answer these questions before the sampling begins so that you are not wasting time in the field. This will also let you see if there are any pieces of equipment that will need to be ordered.

A number of preparations must be made before proceeding into the field for LI sampling. First, all equipment and supplies in the **LI Equipment List** must be purchased and packed for transport into the field. Travel to FIREMON plots is usually by foot, so it is important that supplies and equipment be placed in a comfortable daypack or backpack. It is also important that there be spares of each piece of equipment so that an entire day of sampling is not lost if something breaks. Spare equipment can be stored in the vehicle rather than the backpack. Be sure that all equipment is well maintained and there are plenty of extra supplies such as data forms, map cases, and pencils.

All LI data forms should be copied onto waterproof paper because inclement weather can easily destroy valuable data recorded on standard paper. Data forms should be transported into the field using a plastic, waterproof map protector or plastic bag. The day's sample forms should always be stored in a dry place (office or vehicle) and not be taken back into the field for the next day's sampling.

We recommend that one person on the field crew, preferably the crew boss, have a waterproof, lined field notebook for recording logistic and procedural problems encountered during sampling. This helps with future remeasurements and future field campaigns. All comments and details not documented in the FIREMON sampling methods should be written in this notebook. For example, snow on the plot might be described in the notebook, which would be helpful in plot remeasurement.

It is beneficial to have plot locations for several days of work in advance in case something happens, such as if the road to one set of plots is closed. Plots should be referenced on maps and aerial photos using pin-pricks or dots to make navigation easy for the crew and to provide a check of the georeferenced coordinates. We found that it is easy to transpose UTM coordinate digits when recording georeferenced positions on the plot sheet, so marked maps can help identify any erroneous plot positions. If possible, the spatial coordinates should be provided if FIREMON plots were randomly located.

A field crew of two people is probably the most efficient for implementation of the LI sampling method. There should never be a one-person field crew for safety reasons, and any more than two people will probably result in some people waiting for critical tasks to be done and unnecessary trampling on the plot. The crew boss is responsible for all sampling logistics including the vehicle, plot directions, equipment, supplies, and safety. The crew boss should be the note taker, and the technician should perform most point intercept measurements. The initial sampling tasks of the field crew should be assigned based on field experience, physical capacity, and sampling efficiency. Sampling tasks can be modified and shared, to limit monotony, as the field crew gains experience.

Designing the LI Sampling Method

A set of general criteria recorded on the LI data form allows the user to customize the design of the LI sampling method so that the sampling captures the information needed to successfully complete the management objective within time, money, and personnel constraints. These general fields should be decided before the crews go into the field and should reflect a thoughtful analysis of the expected problems and challenges in the fire monitoring project. However, some of these fields, in particular the number and length of transects, might be adjusted after a pilot study is conducted in the field to determine a sufficient sample size.

Plot ID construction

A unique plot identifier must be entered on the LI sampling form. This is the same plot identifier used to describe general plot characteristics in the Plot Description or PD sampling method. Details on constructing a unique plot identifier are discussed in the **How to Construct a Unique Plot Identifier** section of the **How-To Guide** chapter. Enter the plot identifier at the top of the LI data form.

Determining the sample size

The size of the macroplot ultimately determines the length of the transects and the length of the baseline along which the transects are placed. The amount of variation in plant species composition and distribution determines the number and length of transects required for sampling. The typical macroplot sampled in the LI method is a 0.10 acre (0.04 ha) square measuring 66 x 66 ft (20 x 20 m), which is sufficient for most monitoring applications. Shrub-dominated ecosystems will generally require larger macroplots when sampling with the LI method. Dr. Rick Miller (Rangeland Ecologist, Oregon State University) has sampled extensively in shrub-dominated systems, and we have included a write-up of his method in **Appendix C: Rick Miller Method for Sampling Shrub Dominated Systems**. If you are not sure of the plot size to use, contact someone who has sampled the same vegetation that you will be sampling. The size of the macroplot should be adjusted to accommodate the size of the vegetation. However, it is more efficient if you use the same plot size for all FIREMON sampling methods on the plot.

The recommended transect length is 66 ft (20 m) for a 66 x 66 ft (20 x 20 m) macroplot. However, the macroplot size may be adjusted to accommodate longer or shorter transects based on the variability in plant species composition and distribution.

We recommend sampling five transects within the macroplot. However, there are situations when more transects should be sampled. See **How To Determine Sample Size** in the **How-To Guide** chapter for more details. Enter the number of transects in Field 1 on the LI data form.

The following section is designed to help the sampling crew lay out the FIREMON LI sampling plot. For simplicity these directions assume that the crew has decided to use the recommended macroplot size. However, the size of the LI plot may need to be modified based on resource constraints and vegetation attributes. Permanent sampling plots will need to be laid out only once. On subsequent sampling visits, field crews will simply need to locate each end of the line intercept transects, stretch the measuring tape between them, and resample the vegetation.

Once the permanent FIREMON plot has been monumented (see **How To Permanently Establish a FIREMON Plot** in the **How-To Guide** chapter) the sampling crew can begin laying out the LI sampling plot, which is accomplished in two steps: 1) locate the baseline and 2) locate the transects where vegetation will be sampled.

Conducting LI Sampling Tasks

Locating the baseline for transects

Once the plot has been monumented, a permanent baseline is set up as a reference from which you will orient all transects. The baseline should be established so that the sampling plots for all of the methods overlap as much as possible. See **How To Establish Plots with Multiple Methods** in the **How-To Guide** chapter. The recommended baseline is 66 ft (20 m) long and is oriented upslope with the 0-ft (0-m) mark at the lower permanent marker and the 66-ft (20-m) mark at the upper marker. On flat areas, the baseline runs from south to north with the 0-ft (0-m) mark on the south end and the 66-ft (20-m) mark on the north end. See **How To Establish a Baseline for Transects** in the **How-To Guide** chapter for more details.

Locating the transects

Transects are located within the macroplot, perpendicular to the baseline and across the slope. For permanent plots, determine the compass bearing of the transects and record it on the plot layout map. All transects should be at the same azimuth. Starting locations for each transect are determined using the FIREMON random transect locator or from supplied tables. If the LI method is used in conjunction with other replicated sampling methods (CF, PO, RS or DE), use the same transects for all methods. In successive remeasurement years, it is essential that transects be placed in the same location. See **How To Locate Transects and Quadrats** in the **How-To Guide** chapter for more details.

Carefully stretch a measuring tape, which represents the transect, from the starting point on the baseline out 66 ft (20 m) at an azimuth perpendicular to the baseline. The measuring tape will be stretched taut and straight on the ground or at a height above the vegetation canopy (fig. LI-1) if measuring crown cover. If basal cover is recorded, then the tape is always placed at ground level.

There are two reasons that the tape must be as straight as possible and not zigzagging around the vegetation. First, a tape stretched straight between the permanently marked transect ends will ensure that the same vegetation sampled during the initial visit will be resampled on subsequent visits. Second, the crown cover estimate could be biased if the tape is bent around the stems because more of the tape lies under the plant canopy.

If the tape is to be stretched above vegetation, the crew will need some way to hold it taught and above the canopy. One method is to drive a rebar at each end of the transect then slip a piece of metal electrical conduit over the bar and attach the tape ends to the conduit with wire, hooks, or tape. Rebar is an excellent way to permanently mark the ends of the transects. However, it should not be left in place if there are horses, other livestock, or people that frequent the study site because the rebar can injure feet and legs. Also, in areas where people are recreating, any visible rebar may be objectionable because it is incongruous with natural surroundings.

Line Intercept Sampling

First, enter the transect number in Field 2 on the LI data form. Next, enter the plant species or item code for each item recorded in Field 3. FIREMON provides plant species codes from the NRCS Plants database. However, local or customized plant species codes are allowed in FIREMON. See **Populating the Plant Species Codes Lookup Table** in the **FIREMON Database User Manual** for more details.

Next enter the plant species status in Field 4 on the LI data form. Status describes the general health of the plant species as live or dead using the following codes:

Figure LI-1—The measuring tape is stretched taught below, in, or above the canopy vegetation, whichever position allows the easiest estimation of cover without the tape zigzagging around plants.

L—Live: plant with living tissue.

D—Dead: plant with no living tissue visible.

NA—Not Applicable.

Plant status is purely qualitative, but it does provide an adequate characteristic for stratification of preburn plant health and for determining postburn survival.

Size class

Plant species size classes represent different layers in the canopy. For example, the upper canopy layer could be defined by large trees, while pole-size trees and large shrubs might dominate the middle layer of the canopy, and the lower canopy layer could include seedlings, saplings, grasses, and forbs. Size class data provide important structural information such as the vertical distribution of plant cover. Size classes for trees are typically defined by height for trees less than 4.5 ft (1.37 m) tall and diameter at breast height (DBH) for larger trees. Size classes for shrubs, grasses, and forbs are typically defined by height. If the vegetation being sampled has a layered canopy structure, then cover can be recorded by plant species and by size class. Total size class cover for a plant species could equal more than 100 percent for each plant species due to overlap between different size classes.

FIREMON uses a size class stratification based on the ECODATA sampling methods (Jensen and others 1994). Field crews can group individual plants by species into one or more trees size classes (table LI-1) or shrub, grass, and forb size classes (table LI-2). There can be multiple size classes for each species. In the **How-To Guide** chapter, see **How To Measure DBH** for detailed information on measuring DBH to group trees into size classes and see **How to Measure Plant Height** for detailed information on measuring height for grouping shrubs into size classes.

If cover is being recorded by size class, enter the size class code for each plant species in Field 5 on the LI data form. If size class data is not recorded, then record only the total cover for each plant species. When recording total cover for a species, enter the TO code in Field 5 to indicate that the cover estimate is for all of the size classes.

Table LI-1—Tree size class codes.

	Tree size class	
Codes	**English**	**Metric**
TO	Total cover	Total cover
SE	Seedling (<1 inch DBH or <4.5 ft height)	Seedling (<2.5 cm DBH or <1.5 m height)
SA	Sapling (1.0 inch–< 5.0 inches DBH)	Sapling (2.5–<12.5 cm DBH)
PT	Pole tree (5.0 inches–<9.0 inches DBH)	Pole tree (12.5–<25 cm DBH)
MT	Medium tree (9.0 inches–<21.0 inches DBH)	Medium tree (25–<50 cm DBH)
LT	Large tree (21.0 inches–<33.0 inches DBH)	Large tree (50–<80 cm DBH)
VT	Very large tree (>33.0 inches DBH)	Very large tree (>80 cm DBH)
NA	Not applicable	Not applicable

Table LI-2—Shrub, grass, and forb size class codes.

	Shrub/herb size class	
Codes	**English**	**Metric**
TO	Total cover	Total cover
SM	Small (<0.5 ft height)	Small (<0.15 m height)
LW	Low (0.5–<1.5 ft height)	Low (0.15–<0.5m height)
MD	Medium (1.5–<4.5 ft height)	Medium (0.5–<1.5 m height)
TL	Tall (4.5–<8 ft height)	Tall (1.5–<2.5 m height)
VT	Very tall (>8 ft height)	Very tall (>2.5 m height)
NA	Not applicable	Not applicable

Enter the transect length in Field 6 of the LI data form. Transect length is entered by item and size class allowing transect length to vary by species and size class.

Estimating cover (intercept)

The procedure for measuring the live crown intercept bisected by the transect line is illustrated in figure LI-2. Proceed from the baseline toward the opposite end of the tape and measure the horizontal linear length of each plant that intercepts the line. The start and stop point for each intercept are recorded in feet (m). When measuring intercepts in feet, use a tape that is marked in 10ths and 100ths of feet. Measure the intercept of grasses and grass-like plants, along with rosette-forming plants, at ground level. For forbs, shrubs, and trees measure the vertical projection of the vegetation intercepting one side of the tape. Be sure not to inadvertently move the tape and carefully look under tall dense crowns to be sure you are sampling all species and size classes. The measurements are recorded by plant species or item in Start and Stop fields on the LI data form to the nearest 0.1 ft (0.03 m). The FIREMON data entry screens populate the Intercept field automatically when the start and stop points are entered.

Canopy overlap within a species is not distinguished but canopy overlap between different species *is* recorded (fig. LI-3).

Percent cover is calculated by totaling the intercept measurements for all individuals of that species (in the Intercept field) along the transect and dividing by the total length of the transect. Most plant species have some gaps in their canopies, such as bunchgrasses with dead centers or shrubs with large spaces between branches. Examiners must determine how to deal with gaps in the canopy. One solution is for the observer to assume a closed canopy unless the gap is greater than some predetermined length. We recommend that gaps less than 2 inches (5 cm) be considered part of the canopy (fig. LI-4).

The FIREMON data entry screens and database allow an unlimited number of intercepts for each plant species along a transect.

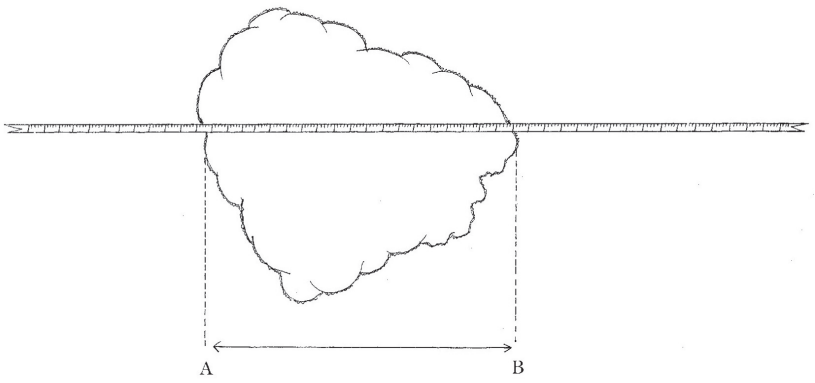

Figure LI-2—Measure cover intercept in feet (m) along the measuring tape. Since canopy intercept can vary on each side of the measuring tape, measure intercept on one side of the measuring tape only. We suggest using the right side as you move along the tape. Record the start of the plant intercept (A) in the Start field and the end intercept (B) in the Stop field.

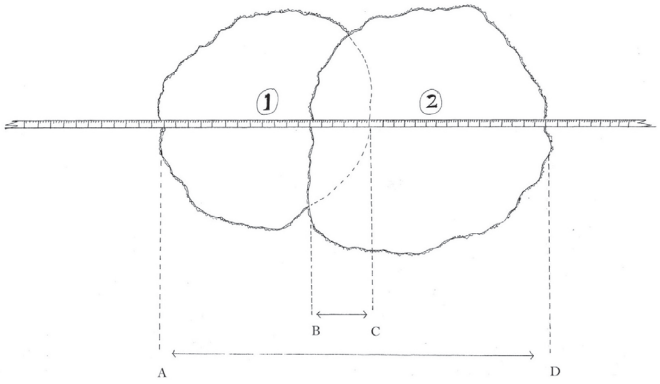

Figure LI-3—Canopy overlap (points B to C) is not measured if the canopy of two or more plants of the same species overlap. For example, if shrubs 1 and 2 are the same species, then the canopy intercept is measured from points A to D. If shrubs 1 and 2 are different species, then canopy intercept is measured from points A to C for shrub species 1 and from points B to D for shrub species 2.

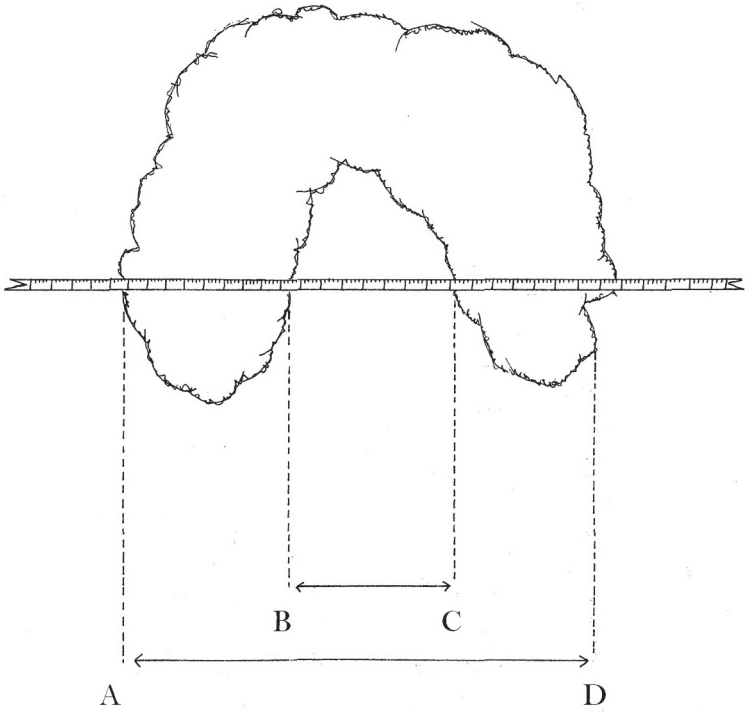

Figure LI-4—Gaps in the canopy (points B to C) greater than 2 inches (5 cm) are not measured. The canopy intercept for this shrub is measured from point A to D if the distance from B to C is less than or equal to 2 inches (5 cm) or measured from points A to B and points C to D if the gap is greater than 2 inches (5 cm).

Estimating average height

Estimate the average height in feet (meters), within +/– 10 percent, for each plant species (fig. LI-5). The estimation should be for only the part of the plant that is intercepted by the tape, not the entire plant.

Enter plant height in the Height field on the LI data form for each item or species intercept. If plant species are recorded by size class, measure the average height for the plant species by each size class

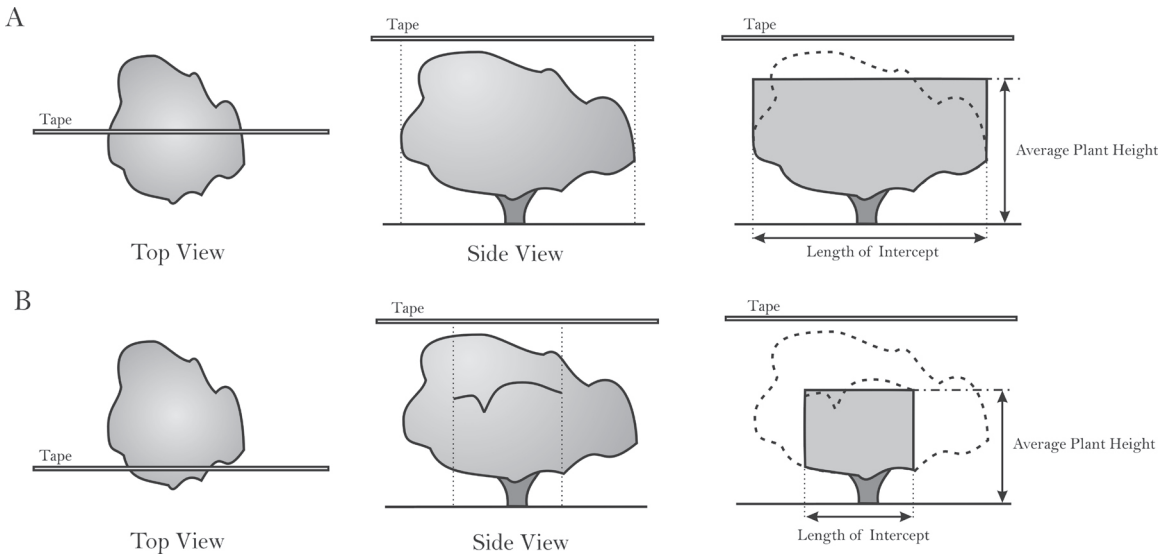

Figure LI-5—Estimate the average plant height only for the portion of the plant intercepted by the tape. If the tape crosses the entire plant then average the height for the entire plant (A). If the tape only crosses a portion of the plant, estimate the average height for only the part that is intercepted (B).

recorded. See **How to Measure Plant Height** in the **How-To Guide** chapter for more details. Plant height may be recorded at one intercept representing an average for the entire transect, at a few intercepts, or at every intercept. Be sure to record this information in the FIREMON Metadata table.

Precision Standards

Use the precision standards listed in table LI-3 for the LI sampling.

SAMPLING DESIGN CUSTOMIZATION

This section will present several ways that the LI sampling method can be modified to collect more detailed information or streamlined to collect only the most important tree characteristics. First, the suggested or recommended sample design is detailed, then modifications are presented.

Recommended LI Sampling Design

The recommended LI sampling design follows the Alternative FIREMON sampling intensity and is listed below:

Collect plant species data. Make one estimate of height for each species that is representative of the entire transect.

Macroplot Size: 0.1 acre, 66 x 66 ft (400 m^2, 20 x 20 m).

Number of Transects: 5.

The number of transects sampled should be adjusted according to the sample size determination described in the **How-To Guide** chapter of the FIREMON manual.

Streamlined LI Sampling Design

The streamlined LI sampling design follows the Simple FIREMON sampling intensity and is designed below:

The number of transects sampled should be adjusted according to the sample size determination described in the **How-To Guide** chapter of the FIREMON manual.

Collect plant species data.

Macroplot Size: 0.1 acre, 66 x 66 ft (400 sm^2, 20 x 20 m).

Number of Transects: 3.

Comprehensive LI Sampling Design

The comprehensive LI sampling design follows the Detailed FIREMON sampling intensity and is detailed below:

Collect plant species data by size class and measure average plant height at each intercept.

Macroplot Size: 0.1 acre, 66 x 66 ft (400 m^2, 20 x 20 m).

Number of Transects: 5.

Table LI-3—Precision guidelines for LI sampling.

Component	Standard
Size class	±1 class
Start	±0.1 ft/0.03 m
Stop	±0.1 ft/0.03 m
Height	±10 percent average height

The number of transects sampled should be adjusted according to the sample size determination described in the **How-To Guide** chapter of the FIREMON manual.

User-Specific LI Sampling Design

There are many ways the user can adjust the LI sample fields to make sampling more efficient and meaningful for local situations. Adjust the number and length of transects based on plant species size and distribution. Longer transects capture more variability in plant species cover, reducing the number of transects required to accurately estimate cover (Elzinga and others 1998).

The LI method is generally used for sampling shrub communities with vegetation greater than 3 ft (1 m) in height. However, this method can be used to sample taller vegetation if sighting devices are used to record the start and stop points for each intercept along a transect. Sighting devices may be mounted to a tripod and pointed downward to sample shorter vegetation (grasses, forbs, and small shrubs) and pointed upward to sample taller vegetation (tall shrubs and trees).

Sampling Hints and Techniques

Examiners must be able to identify plant species and know how to collect cover data by measuring canopy intercepts along a measuring tape. Line intercepts should be recorded along only one edge of the measuring tape—the right side as you proceed to the end of the tape. It is important to prevent the tape from moving so that certain plants are not inadvertently included or excluded. For instance it could be difficult to sample using the LI method when it is windy because the tape will not be stationary.

The accuracy of this method depends on how well the FIREMON crew can estimate the vertical projection of vegetation along the tape. Observer bias occurs because the sighting line used to determine canopy starts and stops is not perpendicular to the tape. This bias can be minimized by using two measuring tapes (one above and one below) and sighting along the right side of the top tape to the right side of the bottom tape. Another solution is to suspend the measuring tape above the vegetation and use a plumb bob to record intercepts. For overhead vegetation, a pole with a level can be used. When measuring low and high vegetation, the most accurate method is to use a type of optical sighting device.

Measuring tapes are made from a variety of materials and are available in varying lengths and increments. Examiners should choose English (metric) tapes for this method and select a tape that is at least as long, or a little longer, than the transect length being sampled. When measuring plant species intercepts in feet, use a tape that is marked in 10ths and 100ths of feet. Steel tapes do not stretch and are the most accurate over the life of the tape. Steel is probably the best choice for permanent transects where remeasurement in exactly the same place each time is important. Cloth and fiberglass tapes will stretch over the life of the tape but are easier to use than steel tapes because they are lighter and do not tend to kink.

The sampling crew may encounter an obstacle, such as a large rock or tree, along one of the transect lines that interferes with the quadrat sampling. If that happens, offset using the directions described in **How To Offset a Transect** in the **How-To Guide** chapter.

When entering data on the LI data forms, examiners will most likely run out of space on the first page. The form was designed to print one copy of the first page, and several copies of the second page. The second page can be used to record more plant species intercepts for the plant species or items recorded on the first page or for additional plant species and items. The second page of the data form allows the examiner to write the intercept number on the form. This allows the examiner to design the form to accommodate the number of intercepts sampled. Print out enough pages to record all species on all transects for the required number of intercepts.

LINE INTERCEPT (LI) FIELD DESCRIPTIONS

Field 1: **Number of Transects**. Total number of transects on the plot.

Field 2: **Transect Number**. Sequential number of the sample transect.

Field 3: **Item Code.** Code of sampled entity. Either the NRCS plants species code or the local code for that species, or ground cover code. Precision: No error.

Field 4: **Status**: Plant status—Live, Dead. or Not Applicable. (L, D, NA). Precision: No error.

Field 5: **Size Class**. Size of the sampled plant. Valid classes are in tables LI-1 and LI-2 of the sampling method. Precision: $\pm$1 class

Field 6: **Transect Length**. Length of transect. May be different for different species/life forms (ft/m).

Start. Enter the starting point of each intercept for the plant species or life-form along the transect (ft/m). Precision: $\pm$0.1 ft/0.03 m

Stop. Enter the stopping point of each intercept for the plant species or life-form along the transect (ft/m). Precision: $\pm$0.1 ft/0.03 m

Height. Enter the average height for each plant species or life-form at one or more intercepts along the transect. Precision: $\pm$10 percent of average height

FIREMON LI Cheat Sheet

Status codes

Code	Description
L	Live
D	Dead
NA	Not applicable

Precision

Component	Standard
Size class	± 1 class
Start	±0.1 ft/0.03 m
Stop	±0.1 ft/0.03 m
Height	±10 percent average height

Tree size class

Tree size class		
Codes	**Description (English)**	**Description (Metric)**
TO	Total cover	Total cover
SE	Seedling (<1 inches DBH or <4.5 ft height)	Seedling (<2.5 cm DBH or <1.5 m height)
SA	Sapling (1.0 inches–< 5.0 inches DBH)	Sapling (2.5–<12.5 cm DBH)
PT	Pole tree (5.0 inches–<9.0 inches DBH)	Pole tree (12.5–<25 cm DBH)
MT	Medium tree (9.0 inches–<21.0 inches DBH)	Medium tree (25–<50 cm DBH)
LT	Large tree (21.0 inches–<33.0 inches DBH)	Large tree (50–<80 cm DBH)
VT	Very large tree (>33.0 inches DBH)	Very large tree (>80 cm DBH)
NA	Not applicable	Not applicable

Shrub and herbaceous size classes

Shrub/herb size class		
Codes	**Description (English)**	**Description (Metric)**
TO	Total cover	Total cover
SM	Small (<0.5 ft height)	Small (<0.15 m height)
LW	Low (0.5–<1.5 ft height)	Low (0.15–<0.5m height)
MD	Medium (1.5–<4.5 ft height)	Medium (0.5–<1.5 m height)
TL	Tall (4.5–<8 ft height)	Tall (1.5–<2.5 m height)
VT	Very tall (>8 ft height)	Very tall (>2.5 m height)
NA	Not applicable	Not applicable

Line intercept (LI) equipment list

Camera with film	Map protector or plastic bag
LI data forms	Magnifying glass
Clipboard	Pocket calculator
Compass	Plot sheet protector or plastic bag
File	Field notebook
Graph paper	Reinforcing bar (2) to mark baseline
Hammer	Reinforcing bars or bridge spikes to mark transects
Indelible ink pen (Sharpie, Marker)	Metal electrical conduit (lengths) to attach tape
Lead pencils with lead refills	Tape 75 ft (25 m) or longer, marked in 0.01 units (2)
Maps, charts and directions	Yardstick or meter stick

Line Intercept (LI) Form

Field 1
Number of Transects:_____

Plot Key

RegistrationID: _ _ _ _

ProjectID: _ _ _ _ _ _ _ _ _

PlotID: _ _ _

Date: _ _/ _ _/ _ _ _ _

Field 2	Transect Number		Field 2	Transect Number		Field 2	Transect Number		Field 2	Transect Number		Field 2	Transect Number		Field 2	Transect Number	
Field 3	Item Code		Field 3	Item Code		Field 3	Item Code		Field 3	Item Code		Field 3	Item Code		Field 3	Item Code	
Field 4	Status		Field 4	Status		Field 4	Status		Field 4	Status		Field 4	Status		Field 4	Status	
Field 5	Size Class		Field 5	Size Class		Field 5	Size Class		Field 5	Size Class		Field 5	Size Class		Field 5	Size Class	
Field 6	Transect Length (ft/m)		Field 6	Transect Length (ft/m)		Field 6	Transect Length (ft/m)		Field 6	Transect Length (ft/m)		Field 6	Transect Length (ft/m)		Field 6	Transect Length (ft/m)	
Start	Stop	Height	Start	Stop	Height	Start	Stop	Height	Start	Stop	Height	Start	Stop	Height	Start	Stop	Height