

APPENDIX 8 -- QUALITY CONTROL / QUALITY ASSURANCE PROGRAM

Our resource inventories are designed to satisfy specified precision objectives. Much of our resource information comes from a very small sample of actual ground conditions. Our sampling system is statistically sound. The sample plots selected will satisfy the stated precision objectives, if the ground data is free of errors. While there is no way in which the latter can be completely assured, it is obvious that field errors must be kept to a minimum. This objective can be accomplished by establishing and adhering to a Quality Control / Quality Assurance (QC/QA) Program. By setting standards and monitoring fieldwork, we can prevent or at least detect and correct errors, and eliminate the repetition of most errors.

After the initial training period, periodic inspections will be made of every crew's fieldwork. Inspections are the most important mechanism for assuring quality data. Every plot installed has a chance to be inspected. The overall goal shall be to inspect at least 10% of the plots installed. The number of errors detected will determine frequency of inspections. All instances of error will be analyzed and discussed with the crew concerned. Three distinct types of inspections are done: hot checks, cold checks and blind checks. For each type of check, there are national minimal targets: 2 % for hot, 5 % for cold, and 3% for blind.

Hot checks (QA status 7) are normally done as part of the training process. Quality control at the time of data collection is the easiest method for identifying errors. Hot checks are informal, allowing for one-on-one interaction between the trainer and the trainee. Errors encountered during hot checks are corrected.

Cold checks (QA status 2) are done on regular intervals throughout the field season, but may be more frequent for less experienced crews, and less frequent for experienced crews. The inspectors shall select from completed plots to perform cold checks. It is discretion of the inspector as to which variables are checked. Inspectors should use judgment to concentrate their efforts on the variables that are more likely to contain errors. Errors encountered during cold checks are corrected.

Blind checks (QA status 6) need to be performed in a systematic manner to yield statistically valid data to evaluate the accuracy and repeatability of each variable. Blind checks are to be completed by qualified inspections crews only. Prior to the field season a random selection of plots will be determined at Newtown Square for blind checks. Field crews will not be informed as to which plots have been selected for blind checks. Inspection crews will complete these plots

within 2 weeks of the plot completion by the field crew. A blind check must contain a complete set of variable measurements, and the data set must be maintained separately from the original data. No corrections of original data are permitted.

Many of the entries for variables on the tally form are, or can be, obtained by measurements. When those measurements can be repeated with uniform results by several individuals, it is proper to set close tolerance limits that define acceptable data.

There are also many variables that require some degree of subjective evaluation. The attributes with the greater subjectivity should have broader tolerance limits. While it would be desirable for every crew to have the exact same entries for all such variables, it is not a realistic goal. However, it is possible, and should be the goal of all crews, to assign any given variable a similar value on a scale of values. For example, if the scale of possible values is 1 through 5, it is reasonable to expect that all crews would be within \pm one level on the scale.

There are also variables designed to be answered yes/no, present/absent, or other entries that require other mutually exclusive answers. Often the answer depends on the amount of time spent examining the area. Crews are not expected to find needles in haystacks: they are expected to complete every required variable, as best they can, based on their training, instructions received, and evidence on the plot.

The time required to complete a plot will vary with access, terrain, amount of tally, and numerous other factors. In the past, the average on-plot time has been three to four hours. Supervisors will monitor progress and goals, and minimum acceptable performance levels will be adjusted as conditions warrant. The first priority of all crews will be quality work, performed safely. The following allowed limits are applied to fieldwork until revised in writing.

FOR ALL PLOTS

COMPLETENESS -- It is the responsibility of each **crew** to complete all variables before leaving the sample plot. Appendix 11 of the field guide contains guides and examples for many plot situations. The guides indicate which variables must be completed. **There will be no excuse for incomplete data unless there are very unusual circumstances, and those circumstances have been explained in the General Notes section of the tally form.**

When plot data is collected and stored with the aid of an electronic data recorder; the data recorder program will ensure that many

required variable for a plot are completed, but there are many important questions that are still answered on the tally sheets. It is incumbent upon the crew to make sure that all required variables are completed before leaving the sample plot.

LEGIBILITY -- Tally forms are the basis for the inventory. Tally forms that are not legible will be considered as evidence of unsatisfactory work. **If the recorded data is not legible enough to be processed correctly it is useless, no matter how accurate it may have been.**

PLOT ESTABLISHMENT

PLOT IDENTIFICATION LABEL -- The label with plot identification variables should have been adhered to the page 3 tally sheet during plot setup. If blank variables are present, or if previously made entry appears to be incorrect, report this to your supervisor.

2.110 STARTING POINT -- An entire plot may be rated unsatisfactory if the starting point (SP) is pinpricked incorrectly (i.e., off more than 1/50th of inch), or if the SP is difficult to locate. Selection guidelines should be followed closely for all starting points and witness trees. Pinpricks made by anything other than a fine pin or needle will not be tolerated. Pinpricks are to be labeled on the back of the photo, and the locations of the SP and witness trees well defined.

2.120 COURSE TO PLOT -- Plots must be established at the correct locations, and in a manner, which facilitates the sure and efficient return, by future crews.

Distance to the plot, measured from the aerial photograph, should be within one half of one 1/50 of an inch, from the same measurement of an inspector. If GPS coordinates were used to determine course to plot, procedures as written in Chapter 2 should have been followed.

Although a compass line may not read the same as the inspector's, it must be accurate once it is established. Carefully check all calculations in the area provided on page 4 of the tally form. Draw and label the reference line and the traverse line on the face of the aerial photograph, if applicable. Again if GPS coordinates were used to determine course to plot, procedures as written in Chapter 2 should have been followed.

The tolerance for 100 ft chaining intervals varies from $\pm .5$ ft to ± 2.0 ft, depending on the slope of the traverse and the density of ground cover. It is important that tapes be kept straight in both the horizontal and vertical planes when "chaining". Accuracy over the entire traverse should be within 2 ft per every 1000 ft of the calculated distance.

Slope corrections must be within ± 5 percent.

Line trees must be established and species must be identified correctly. If something other than a tree is referenced, it must be noted. Other line tree requirements are:

- DBH must be within 2 inches
- Distances must be within 2 ft
- Direction must be within a one hour interval
- Scribes must point in the correct direction

Make a note when the line crosses a stream, fence or boundary line.

AT PLOT CENTER -- Must be located correctly and the plot center witness trees must be accurately recorded, or the entire plot will be considered unsatisfactory. Also an entire plot may be rated unsatisfactory if the plot center (PC) is pinpricked incorrectly (i.e., off more than 1/50th of inch).

For new plots established by GPS coordinates, crews must be within **100.0 ft** of the label coordinates for satisfactory plot establishment.

For remeasured plots, the plot must be relocated at the same location that it was previously established. **In the rare case when it appears that the previous crew established a plot in the wrong location it is important that it be reestablished at that same location.** The data from such a plot can still be very useful. Complete the plot and bring the situation to the attention of the Field Supervisor.

2.170 PLOT DIAGRAMS -- Streams, fences, fields, or other land features are to be noted, when they exist. Condition boundaries must be included.

2.181 SKETCH MAP OF PLOT LOCATION -- Sketch maps should provide enough information so that a plot can be relocated without the use of the aerial photos or GPS coordinates. Details (bridges, rivers, trails, etc.) and mileage to an easily located intersection or reference point must be included.

Inspectors check the quality of a sketch map by attempting to locate a plot with the sketch map. A plot that cannot be located due to a poor sketch will be considered unsatisfactory.

Neatness and clarity are desired. Artwork is not necessary and is not required. A good sketch map should take no more than five to ten minutes to complete.

**A BASIC EDIT FOR COMPLETENESS AND OBVIOUS ERRORS
MUST BE MADE BEFORE LEAVING THE PLOT.**

Crews will be informed of any errors detected in their work. They will be expected not to repeat those errors. The goal of this QA/QC program is to insure that all field data is of the highest possible quality. If any variable of the field tally procedure is unclear, ask your supervisor for clarification.

The following tables (pages 258-268) show the MQO, tolerance, values, and units for each CORE data element from the National Core Field Guide, Version 1.7. Refer to the main portion of this text (Northeast Field Guide, Version 1.7) for quality standards of REGIONAL data elements in the following chapters.

PLOT LEVEL DATA

CONDITION, BOUNDARY AND SUBPLOT DATA

SEEDLING DATA

TREE AND SAPLING DATA

SITE INDEX DATA

OWNERSHIP DATA

NONFOREST / DENIED ACCESS / HAZARDOUS PLOTS

Tolerance / MQO / Value / Units Table for the National Core Field Guide, Version 1.6

Core optional variables are in italics.

N/A is not applicable.

| Variable Name | Tolerance | MQO | Values | Units |
|--|------------------|---------------------------------|--|----------------|
| Plot Level Data | | | | |
| STATE | No errors | At least 99% of the time | Appendix 1 | N/A |
| COUNTY | No errors | At least 99% of the time | Appendix 1 | N/A |
| PLOT NUMBER | No errors | At least 99% of the time | 0001 to 9999 | N/A |
| SAMPLE KIND | No errors | At least 99% of the time | 1 to 3 | N/A |
| MANUAL VERSION | No errors | At least 99% of the time | 1.1 and higher | N/A |
| YEAR | No errors | At least 99% of the time | Beginning with 1998, constant for a given year | year |
| MONTH | No errors | At least 99% of the time | Jan – Dec | month |
| DAY | No errors | At least 99% of the time | 01 to 31 | day |
| <i>DECLINATION</i> | <i>No errors</i> | <i>At least 99% of the time</i> | <i>-359.0 to 359.0</i> | <i>degrees</i> |
| TRAILS OR ROADS | No errors | At least 90% of the time | 0 to 5 | N/A |
| HORIZONTAL DISTANCE TO IMPROVED ROAD | No errors | At least 90% of the time | 1 to 9 | N/A |
| ROAD ACCESS | No errors | At least 90% of the time | 0 to 4, 9 | N/A |
| PUBLIC USE RESTRICTIONS | No errors | At least 90% of the time | 0 to 3, 9 | N/A |

| Variable Name | Tolerance | MQO | Values | Units |
|-------------------------|------------------|--------------------------|---|------------------|
| RECREATION USE 1 | No errors | At least 90% of the time | 0 to 7, 9 | N/A |
| RECREATION USE 2 | No errors | At least 90% of the time | 0 to 7, 9 | N/A |
| RECREATION USE 3 | No errors | At least 90% of the time | 0 to 7, 9 | N/A |
| WATER ON PLOT | No errors | At least 90% of the time | 0 to 5, 9 | N/A |
| QA STATUS | No errors | At least 99% of the time | 1 to 7 | N/A |
| CREW TYPE | No errors | At least 99% of the time | 1, 2 | N/A |
| GPS UNIT | No errors | At least 99% of the time | 0 to 4 | N/A |
| GPS SERIAL NUMBER | No errors | At least 99% of the time | 000001 to 999999 | N/A |
| COORDINATE SYSTEM | No errors | At least 99% of the time | 1,2 | N/A |
| LATITUDE | ± 140 ft | At least 99% of the time | | degrees, seconds |
| LONGITUDE | ± 140 ft | At least 99% of the time | | degrees, seconds |
| UTM ZONE | No errors | At least 99% of the time | 03-19Q and 03-19W | |
| EASTING (X) UTM | ± 140 ft | At least 99% of the time | | |
| NORTHING (Y) UTM | ± 140 ft | At least 99% of the time | | |
| AZIMUTH TO PLOT CENTER | ± 3° | At least 99% of the time | 000 at plot center 001 to 360 not at plot center | degrees |
| DISTANCE TO PLOT CENTER | ± 6 ft | At least 99% of the time | 000 at plot center 001 to 200 if a Laser range finder not used 001 to 999 if a Laser range finder is used | feet |

| Variable Name | Tolerance | MQO | Values | Units |
|------------------------------------|------------------|---|--|--------------|
| GPS ELEVATION | | At least 99% of the time | -00100 to 20000 | feet |
| GPS ERROR | No errors | At least 99% of the time | 0 to 70 if possible 71 to 999 if an error < 70 cannot be obtained | feet |
| NUMBER OF READINGS | No errors | At least 99% of the time | 1 to 999 | N/A |
| GPS FILENAME | No errors | At least 99% of the time | English, alpha-numeric | N/A |
| PLOT-LEVEL NOTES | N/A | N/A | English, alpha-numeric | N/A |
| P3 HEXAGON NUMBER | No errors | At least 99% of the time | | N/A |
| P3 PLOT NUMBER | No errors | At least 99% of the time | 1 to 9 | N/A |
| Condition Class Information | | | | |
| CONDITION CLASS NUMBER | No errors | At least 99% of the time | 1 to 9 | N/A |
| CONDITION CLASS STATUS | No errors | At least 99% of the time | 1 to 7 | N/A |
| RESERVED STATUS | No errors | At least 99% of the time | 0, 1 | N/A |
| OWNER GROUP | No errors | At least 99% of the time | 10, 20, 30, 40 | N/A |
| FOREST TYPE | No errors | At least 99% of the time in group At least 95% of the time in type | Appendix 2 | N/A |
| STAND SIZE CLASS | No errors | At least 99% of the time | 0 to 6 | class |

| Variable Name | Tolerance | MQO | Values | Units |
|---------------------------------|--|--------------------------|--|--------------|
| REGENERATION STATUS | No errors | At least 99% of the time | 0, 1 | N/A |
| TREE DENSITY | No errors | At least 99% of the time | 1 to 3 | N/A |
| OWNER CLASS | No errors | At least 99% of the time | 11-13; 21-25; 31-33; 41-45 | class |
| PRIVATE OWNER INDUSTRIAL STATUS | No errors | At least 99% of the time | 0, 1 | N/A |
| ARTIFICIAL REGENERATION SPECIES | No errors | At least 99% of the time | Appendix 4 | N/A |
| STAND AGE | ± 10% | At least 95% of the time | 000 to 997, 998, 999 | year |
| DISTURBANCE 1 | No errors | At least 99% of the time | 00; 10; 20; 30-32;40-46; 50-54; 60; 70; 80 | N/A |
| DISTURBANCE YR 1 | ± 1 year for 5-year measure. cycles +/- 2years for > 5-year measure. cycles | At least 99% of the time | Since the previous plot visit, or the past 5 years for plots visited for the first time; 9999 if disturbance occurs continuously over time | year |
| DISTURBANCE 2 | No errors | At least 99% of the time | 00; 10;20; 30-32;40-46; 50-54; 60; 70; 80 | N/A |

| Variable Name | Tolerance | MQO | Values | Units |
|----------------------|--|--------------------------|--|--------------|
| DISTURBANCE YR 2 | ± 1 year for 5-year measure. cycles +/- 2years for > 5-year measure. cycles | At least 99% of the time | Since the previous plot visit, or the past 5 years for plots visited for the first time; 9999 if disturbance occurs continuously over time | year |
| DISTURBANCE 3 | No errors | At least 99% of the time | 00; 10;20; 30-32;40-46; 50-54; 60; 70; 80 | N/A |
| DISTURBANCE YR 3 | ± 1 year for 5-year measure. cycles +/- 2years for > 5-year measure. cycles | At least 99% of the time | Since the previous plot visit, or the past 5 years for plots visited for the first time; 9999 if disturbance occurs continuously over time | year |
| TREATMENT 1 | No errors | At least 99% of the time | 00, 10, 20, 30, 40, 50 | N/A |
| TREATMENT YEAR 1 | ± 1 year for 5-year measure. cycles ± 2 years for >5-year measure. cycles | At least 99% of the time | Since the previous plot visit, or the past 5 years for plots visited for the first time | year |
| TREATMENT 2 | No errors | At least 99% of the time | 00, 10, 20, 30, 40, 50 | N/A |
| TREATMENT YEAR 2 | ± 1 year for 5-year measure. cycles ± 2 years for >5-year measure. cycles | At least 99% of the time | Since the previous plot visit, or the past 5 years for plots visited for the first time | year |

| Variable Name | Tolerance | MQO | Values | Units |
|--|---|--------------------------|--|--------------|
| TREATMENT 3 | No errors | At least 99% of the time | 00, 10, 20, 30, 40, 50 | N/A |
| TREATMENT YEAR 3 | ± 1 year for 5-year measure. cycles ± 2 years for >5-year measure. cycles | At least 99% of the time | Since the previous plot visit, or the past 5 years for plots visited for the first time | year |
| PHYSIOGRAPHIC CLASS | No errors | At least 80% of the time | xeric: 11, 12, 13, 19 mesic: 21, 22, 23, 24, 25, 29 hydric: 31, 32, 33, 34, 35, 39 | N/A |
| PAST NONFOREST / INACCESSIBLE LAND USE | No errors | At least 99% of the time | 10-15; 20; 30-33; 40; 90-94 | N/A |
| PRESENT NONFOREST LAND USE | No errors | At least 99% of the time | 10-15; 20; 30-33; 40; 90-94 | N/A |
| NONFOREST YEAR | ± 1 year for 5-year measure. cycles ± 2 years for > 5-year measure. cycles | At least 70% of the time | 1999 or higher | year |
| Boundary Data | | | | |
| SUBPLOT NUMBER | No errors | At least 99% of the time | 1 to 4 | N/A |

| Variable Name | Tolerance | MQO | Values | Units |
|--------------------------------|------------------|-------------------------------|--|--------------|
| PLOT TYPE | No errors | At least 99% of the time | 1 to 3 | N/A |
| BOUNDARY CHANGE | No errors | At least 99% of the time | 0 to 3 | N/A |
| CONTRASTING CONDITION | No errors | At least 99% of the time | 1 to 9 | N/A |
| LEFT AZIMUTH | ± 10° | At least 90% of the time | 001 to 360 | degrees |
| CORNER AZIMUTH | ± 10° | At least 90% of the time | 000 to 360 | degrees |
| CORNER DISTANCE | ± 1 ft | At least 90% of the time | microplot: 1 to 7 subplot: 1 to 24 annular plot: 1 to 59 | feet |
| RIGHT AZIMUTH | ± 10° | At least 90% of the time | 001 to 360 | degrees |
| Subplot Information | | | | |
| SUBPLOT NUMBER | No errors | At least 99% of the time | 1 to 4 | N/A |
| SUBPLOT CENTER CONDITION | No errors | At least 99% of the time | 1 to 9 | N/A |
| MICROPLOT CENTER CONDITION | No errors | At least 99% of the time | 1 to 9 | N/A |
| SUBPLOT SLOPE | ± 10 % | At least 90% of the time | 000 to 155 | percent |
| SUBPLOT ASPECT | ± 10° | At least 90% of the time | 000 to 360 | degrees |
| SNOW/WATER DEPTH | ± 0.5 ft | At the time of measurement | 0.0 to 9.9 | feet |
| SUBPLOT/ANNULAR PLOT STATUS | No errors | At least 99% of the time | 0, 1 | N/A |

| Variable Name | Tolerance | MQO | Values | Units |
|--|---|--|---|--------------|
| <i>SUBPLOT/ANNULAR PLOT CONDITION LIST</i> | <i>No errors</i> | <i>At least 99% of the time</i> | <i>1000 to 9876</i> | <i>N/A</i> |
| Tree and Sapling Data | | | | |
| SUBPLOT NUMBER | No errors | At least 99% of the time | 1 to 4 | N/A |
| TREE RECORD NUMBER | No errors | At least 99% of the time | 000, 001 to 999 | N/A |
| CONDITION CLASS NUMBER | No errors | At least 99% of the time | 1 to 9 | N/A |
| AZIMUTH | ± 10° | At least 90% of the time | 001 to 360 | degrees |
| HORIZONTAL DISTANCE | microplot: ± 0.2ft subplot: ± 1.0 ft annular plot: ± 3.0 ft | At least 90% of the time | microplot: 00.1 to 6.8 subplot: 00.1 to 24.0 annular plot: 00.1 to 58.9 | feet |
| TREE STATUS | No errors | At least 95% of the time | 0 to 4 | N/A |
| NEW TREE RECONCILE | No errors | At least 95% of the time | 1 to 4 | N/A |
| <i>MORTALITY</i> | <i>No errors</i> | <i>At least 85% of the time</i> | <i>0, 1</i> | <i>N/A</i> |
| LEAN ANGLE | No errors | At least 99% of the time | 0, 1 | N/A |
| SPECIES | No errors | At least 99% of the time for genus At least 95% of the time for species | Appendix 4 | N/A |

| Variable Name | Tolerance | MQO | Values | Units |
|------------------------------|--|--------------------------|------------------------------|--------------|
| DIAMETER | ± 0.1 inch per 20 inches of diameter on trees with a measured diameter | At least 95% of the time | 0001 to 9999 | inches |
| DIAMETER CHECK | No errors | At least 99% of the time | 0 to 2 | N/A |
| ROTTEN / MISSING CULL | ± 10% | At least 90% of the time | 0 to 99 | percent |
| TOTAL LENGTH | ± 10% of true length | At least 90% of the time | 005 to 400 | feet |
| ACTUAL LENGTH | ± 10% of true length | At least 90% of the time | 005 to 400 | feet |
| LENGTH METHOD | No errors | At least 99% of the time | 1 to 3 | N/A |
| CROWN CLASS | No errors | At least 85% of the time | 1 to 5 | N/A |
| UNCOMPACTED LIVE CROWN RATIO | ± 10% | at least 90% of the time | 00 to 99 | percent |
| COMPACTED CROWN RATIO | ± 10% | At least 80% of the time | 00 to 99 | percent |
| DAMAGE LOCATION 1 | ± 1 location class | At least 80% of the time | 0 to 9 | class |
| DAMAGE TYPE 1 | No errors | At least 80% of the time | 1-5; 11-13; 20-25; 31 | N/A |
| DAMAGE SEVERITY 1 | No errors | At least 80% of the time | Defined for each DAMAGE TYPE | class |
| DAMAGE LOCATION 2 | ± 1 location class | At least 80% of the time | 0 to 9 | class |
| DAMAGE TYPE 2 | No errors | At least 80% of the time | 1-5; 11-13; 20-25; 31 | N/A |
| DAMAGE SEVERITY 2 | No errors | At least 80% of the time | Defined for each DAMAGE TYPE | class |

| Variable Name | Tolerance | MQO | Values | Units |
|--------------------------------------|---|--|------------------------|--------------|
| CAUSE OF DEATH | No errors | At least 80% of the time | 10 to 90 | N/A |
| MORTALITY YEAR | ± 1 year for 5-year measure. cycles ± 2 years for > 5-year measure. cycles | At least 70% of the time | 1995 or higher | year |
| DECAY CLASS | ± 1 class | At least 90% of the time | 1 to 5 | class |
| UTILIZATION CLASS | No errors | At least 99% of the time | 0, 1 | N/A |
| LENGTH TO DIAMETER MEASUREMENT POINT | ± 0.2 ft | At least 90% of the time | 0.1 to 15.0 | inches |
| PERCENT ROUGH CULL | ± 10 % | At least 90% of the time | 00 to 99 | percent |
| MISTLETOE CLASS | ± 1 class | At least 90% of the time | 0 to 6 | class |
| TREE NOTES | N/A | N/A | English, alpha-numeric | N/A |
| Seedling Data | | | | |
| SUBPLOT NUMBER | No errors | At least 99% of the time | 1 to 4 | N/A |
| SPECIES | No errors | At least 99% of the time for genus At least 95% of the time for species | Appendix 4 | N/A |
| CONDITION CLASS | | | | |

| Variable Name | Tolerance | MQO | Values | Units |
|------------------------------|--|--|---|--------------|
| SEEDLING COUNT | No errors | At least 95% of the time | 1 to 5 exact count 6 more than 5 individuals by species by condition class | number |
| Site Tree Information | | | | |
| CONDITION CLASS LIST | No errors | At least 99% of the time | 1 to 9 or 10000 to 98765 | N/A |
| SPECIES | No errors | At least 99% of the time for genus At least 95% of the time for species | Appendix 5 | N/A |
| DIAMETER | ± 0.1 inch per 20 inches of diameter on trees with a measured diameter | At least 95% of the time | 0001 to 9999 | inches |
| SITE TREE LENGTH | ± 10% of true length | At least 90% of the time | 001 to 999 | feet |
| TREE AGE AT DIAMETER | ± 5 years | At least 95% of the time | 001 to 999 | year |
| SITE TREE NOTES | N/A | N/A | English, alpha-numeric | N/A |
| SUBPLOT NUMBER | No errors | At least 99% of the time | 1 to 4 | N/A |
| AZIMUTH | ± 10° | At least 90% of the time | 001 to 360 | degrees |
| HORIZONTAL DISTANCE | ±5 ft | At least 90% of the time | 000.1 to 200.0 | feet |

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