



Campsite Monitoring Manual

Daniel Boone National Forest^{1,2}

(version 6/30/04)

This manual describes procedures for conducting inventories and resource condition assessments necessary to document changes in the condition of backcountry campsites. It was developed for assessing conditions at designated campsites within the Daniel Boone National Forest. Three general approaches are used for assessing campsite conditions: 1) photographs from permanently referenced photo points, 2) a condition class assessment determined by visual comparison with six described levels of campsite impact, and 3) predominantly measurement-based assessments of several impact indicators.

For the purposes of this manual, campsites are defined as backcountry areas of disturbed vegetation, surface litter, or soils caused by human use as overnight camping activities. In areas with multiple sites or use areas there may not always be undisturbed areas separating sites and an arbitrary decision may be necessary to define separate sites.

Monitoring measurements should be taken near the middle or end of the visitor use season but before leaf fall. Site conditions generally recover during the fall/winter/spring periods of lower visitation and reflect rapid impact during early season use. Site conditions are more stable during the mid- to late-use season and reflect the resource impacts of that year's visitation. Subsequent assessments should be completed as close in timing to the original year's measures as possible. Generally monitoring should be replicated at 3-5 year intervals, unless conditions are changing rapidly.

Materials

(Check before leaving for the field)

- Topographic maps (1/24,000) with copier enlargements of areas with dense concentrations of sites (cut out and copy scale bars with enlargements)
- Compass, peephole type (not corrected for declination) and/or KVH Data Scope, digital compass
- Tape measure (100 ft. in tenths) and/or Sonin Combo Pro distance measuring device
- Field forms, maps, and photographs from previous campsite surveys
- Flagged wire pins (25 minimum w/additional set of different color for remeasurement)
- Large steel reference point stake
- Camera, 35mm or APS, wide angle lens and ASA 400 or 200 color print film (store in freezer)
- Aluminum numbered tags, 4 in. galvanized steel nails
- Clipboard, monitoring manual, blank field forms (some on waterproof paper), pencils
- Backpacking trowel
- Magnetic pin locator (site remeasurement only)

1 - Developed by Dr. Jeff Marion, USGS Patuxent Wildlife Research Center, Cooperative Park Studies Unit, Virginia Tech/Department of Forestry, Blacksburg, VA 24061-0324 (540/231-6603) email: jmarion@vt.edu.

2 - Photographs illustrating campsite boundaries, boundary flag placement, vegetative ground cover classes, soil exposure, tree damage, and root exposure are part of this manual. High quality reproductions of these photographs, some of which are in color, may be found in: Marion, Jeffrey L. 1991. Developing a natural resource inventory and monitoring program for visitor impacts on recreation sites: A procedural manual. USDI, National Park Service, Natural Resources Report NPS/NRVT/NRR-91/06, pages 46-51.

General Campsite Information

- 1) **Campsite Number:** Each site must have a unique aluminum tag number. Refer to campsite maps and forms from earlier surveys to identify if the site has been previously surveyed. If it has, follow the site remeasurement procedures below. If the site has not been previously surveyed then assign a new number from an aluminum tag and record it on the form. Criteria for locating the permanent reference point are provided in the Variable Radial Transect section of the manual. If it is impossible to bury an aluminum tag (e.g., due to bedrock), the same numbering system as above should be applied as if aluminum tags were used. If a tag is not buried it should be separated and disposed of to avoid confusion at subsequent campsites. If it is a shelter site, bury the tag adjacent to the left front shelter corner post, just under the shelter. Regardless, remarks should be made on the field form indicating whether and/or where a tag was buried.

Site remeasurement - Examine mapped campsite locations and field forms to determine if each campsite was present during the previous survey. Relocate permanent reference points with information from the form and the pin locator and verify campsite numbers by digging up the number tags. If the site has been previously surveyed but you are unable to locate the nail and tag then record the old number (if positively known) with a note that the nail and tag could not be found. If the reference point can be accurately identified from the previous survey form information and photo then do so, noting this on the new form. Use a new campsite tag and number, however, and record both old and new numbers on the form. If the reference point cannot be identified then proceed as if the site had never been surveyed before, recording new reference site information and the old and new tag numbers.

Note – Guidance for odd situations: 1) A satellite use area has become the main site and the previous site is now a satellite site or has recovered. Use the same site number from the earlier survey. Relocate and dig up the nail and tag from the old site. Rebury the nail in the original location, moving the tag along with a new nail to a permanent reference point location on the current site (which was formerly a satellite site). Complete all procedures on the current site. Describe the situation in the comments section. 2) The site was rehabilitated by forest staff or has recovered on it's own. Complete a new form to allow an evaluation of site recovery for any sites that you can find. Take a photo from previous survey photo points.

- 2) **Site Type:** Record the most specific applicable code: **L** - current site, also present in last survey; **N** - new site; **S** - current site, satellite in last survey; **RL** - rehabilitated, present in last survey; **RN** - rehabilitated, new site; **SRE** - site is recovered, rehab work evident; **SRN** - site is recovered, no rehab work evident
- 3) **Location:** Record the location of the campsite, general name for the area, and forest site number.
- 4) **UTM Coordinates:** Record the campsite location using a GPS device
- 5) **Date:** Month, day, and year the campsite was evaluated (e.g. August 1, 2002 = 08/01/02).

Site remeasurement - Due to phenological and campsite use changes which occur over the use season, it is critical that campsites be re-measured as close to the initial assessment month and day as possible, preferably within 1 to 2 weeks if early in the use season, 3 to 4 weeks if later.

- 6) **Inventoried by:** Identify the field personnel responsible for campsite.

Locate/Label Campsite on Topographic Map - Mark the topographic map with a dot precisely indicating the campsite's location and label with its campsite tag number. Be as accurate as possible. At 1/24,000 scale 1/4 inch on map = 500 ft. on ground. Accurate campsite location descriptions are

critical to site relocation. For dense clusters of campsites use 150% copier enlargements so that campsites can be more accurately mapped.

Describe Location - Describe the campsite location using local geographic features (trail intersections, stream crossings, large boulders or trees) and paced (or measured) distances. Record the distance of your pace in parentheses, for example: 18 paces (5.5'), each time you record a paced distance. Conversions will be done in the office. Verify your pace periodically. Use sufficient descriptive detail and additional local area maps as so that someone else years later can relocate the site.

Inventory Indicators

- 7) **Distance to Nearest Other Campsite:** Record the appropriate category for campsite distance (campsite boundary to campsite boundary) to the nearest other campsite or shelter.
(1 = <10 yds 2 = 11-20 yds 3 = 21-40 yds 4 = 41-60 yds 5 = >60 yds)
- 8) **Distance to Formal Trail:** Record the appropriate category for campsite distance (closest outer boundary) to the nearest formal (designated) trail.
(1 = <10 yds 2 = 11-20 yds 3 = 21-40 yds 4 = 41-60 yds 5 = >60 yds)
- 9) **Other Campsites Visible:** Record the number of other shelters or campsites, which if occupied, would be visible from the campsite. This is a social variable to assess intervisibility.
- 10) **Site Visibility from Formal Trail:** Record whether the **campsite, if it were occupied, would be visible** from any of the formal (designated) trail (not informal visitor-created trails). Y or N
- 11) **Site Expansion Potential:** P = Poor expansion potential - off-site areas are completely unsuitable for any expansion due to steep slopes, rockiness, dense vegetation, and/or poor drainage, M = Moderate expansion potential - off-site areas moderately unsuitable for expansion due to the factors listed above, and G = Good expansion potential - off-site areas are suitable for campsite expansion, features listed above provide no effective resistance to campsite expansion.
- 12) **Site Slope:** Record the campsite slope category (F = <5% M = 5-10% S = >10%)
- 13) **Tree Canopy Cover:** Imagine that the sun is directly overhead and estimate the percentage of the campsite that is shaded by the tree canopy cover. Note: use category 5 for nearly full to full tree canopy cover over the site; use category 6 only if the cover is fairly dense or thick.
(1 = 0-5% 2 = 6-25% 3 = 26-50% 4 = 51-75% 5 = 76-95% 6 = 96-100%)

Impact Indicators

The first step is to establish the campsites' boundaries and measure its size. The following procedures describe the use of the **Variable Radial Transect Method** for determining the sizes of campsites. This is accomplished by measuring the lengths of linear transects radiating from a permanently defined reference point to the campsite boundary. **If the campsite has previously been assessed with the Variable Radial Transect Method, then skip to the Site Remeasurement procedures below.**

Step 1. Identify Campsite Boundaries and Flag Transect Endpoints. Walk the campsite boundary and place flagged wire pins at locations which, when connected with straight lines, will define a polygon whose area approximates the campsite area. Include the shelter within site boundaries. Use as few pins as necessary, typical campsites can be adequately flagged with 10-15 pins. Look both directions along campsite boundaries as you place the flags and try to balance areas of the campsite

that fall outside the lines with off-site (undisturbed) areas which fall inside the lines. Pins do not have to be placed on campsite boundaries, as demonstrated in the diagram in Figure 1. Project campsite boundaries straight across areas where trails enter the campsite. Identify campsite boundaries by pronounced changes in vegetation cover, vegetation height/disturbance, vegetation composition, surface organic litter, and topography (refer to photographs following these procedures). Many campsites with dense forest overstories will have very little vegetation and it will be necessary to identify boundaries by examining changes in organic litter, i.e. leaves which are untrampled and intact vs. leaves which are pulverized or absent. In defining the campsite boundaries be careful to include only those areas that appear to have been disturbed from human trampling. Natural factors such as dense shade can create areas lacking vegetative cover. Do not include these areas if they appear "natural" to you. When in doubt, it may also be helpful to speculate on which areas typical visitors might use based on factors such as slope or rockiness. If you cannot discern trampling-related disturbance boundaries for most of the site then skip this procedure, record a 0 for campsite area (#28) and move on to #14.

Step 2. Establish Campsite Reference Point. Select a campsite reference point which is preferably: a) visible from all the campsite boundary pins, b) close to and easily referenced by distinctive permanent features such as boulders or trees, c) at least 6 ft away from fire grates or other steel that would affect compass readings, and d) in a spot permitting the burial of the reference point nail and campsite tag. Reference this point to at least three relatively permanent and distinctive features. If trees are used select ones that are healthy and unique to the campsite area, such as an uncommon species or with unique physical characteristics (forked trunk or large size). Try to select reference features in three opposing directions, as this will enable future workers to triangulate the reference point location. Also take the reference point photograph(s) and reference the photopoint(s) as described at the end of this manual.

For each reference feature, take a compass bearing (nearest degree) and measure the distance (nearest 1/10th foot) from the feature (center of trees or the highest point of boulders) to the campsite reference point. Also measure the approximate diameter of reference trees at 4.5 ft above ground (dbh). Be extremely careful in taking these bearings and measurements as they are critical to relocating the reference point in the future. Record this information on the back of the form.

Examples:

- 1) Red Maple, 2.9 ft. dbh, 8.9 ft. at 195° (largest tree on campsite)
- 2) Boulder, 7.9 ft. at 312°, (distance and bearing to highest point)
- 3) Sycamore, 1.8 ft. dbh, 8.4 ft. at 78°, (only Sycamore in the area)

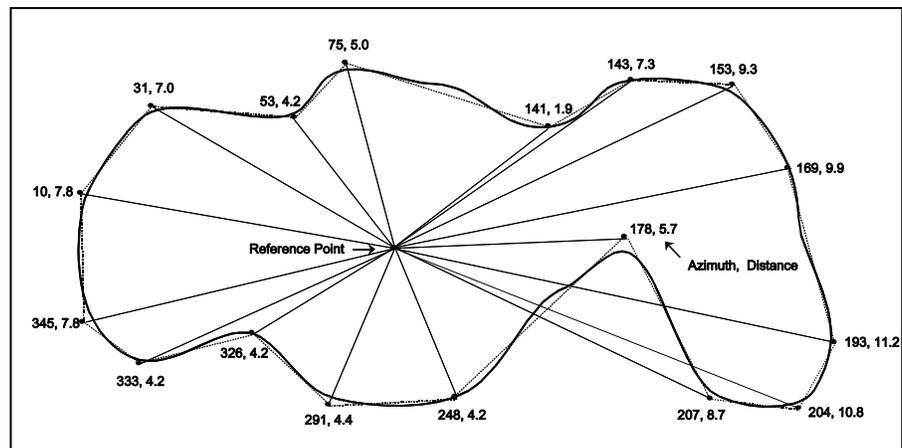


Figure 1. Variable radial transect method.

Options: Some campsites may lack the necessary permanent reference features enabling the point to be accurately relocated. If only one or two permanent reference features are available, use these and take additional photographs from several angles. If you are unable to bury a nail and tag (e.g. bedrock) then select a permanent feature (e.g., some obvious bedrock feature) and use it as a reference point. Complete procedures to reference its location, including photographs. Note your actions regarding use of these options in the Comments section.

Step 3. Record Transect Azimuths and Lengths. Standing directly over the reference point, identify and record the compass bearing (azimuth) and distance to each campsite boundary pin working in a clockwise fashion (in the exact order you would encounter them if you were walking the campsite boundary). Be careful not to miss any pins hidden behind vegetation or trees. Be extremely careful in identifying the correct compass bearings to these pins as error in these bearings will bias current and future measurements of campsite size. If a tape measure is used, anchor the end to the large steel reference point stake and route it via the shortest distance around trees or other obstructions. Record the length of each transect (nearest 1/10th foot), starting with the same boundary pin and in the same clockwise order as before. Be absolutely certain that the appropriate pin distances are recorded adjacent to their respective compass bearings. Leave boundary pins in place until you finish all other campsite measurements.

Step 4. Measure Island and Satellite Areas. Identify any undisturbed "islands" of vegetation (\exists 3x3 feet) inside campsite boundaries (often due to clumps of trees or shrubs) and disturbed "satellite" use areas (\exists 3x3 feet) outside campsite boundaries (often due to tent sites or cooking sites). Use campsite boundary definitions for determining the boundaries of these areas. Use the **Geographic Figure Method** to determine the areas of these islands and satellites (refer to the Figure 3 diagrams at the end of the manual). This method involves superimposing one or more imaginary geometric figures (rectangles, circles, or right triangles) on island or satellite boundaries and measuring appropriate dimensions to calculate their areas. Record the types of figures used and their dimensions on the back of the form; the sizes of these areas should be computed in the office with a calculator. Also, record the compass bearing and distance from the center of each island or satellite site to the campsite reference point. Remove the reference point stake. Place a 4 inch long galvanized steel nail through the hole in the campsite number tag and bury at the reference point so that the tag is 3 inches deep.

Site Remeasurement - Relocate the reference point using point references, photos, and a magnetic pin locator. Typically the photo will get you in the right area and the pin locator will allow you to pinpoint the buried nail and tag. If you cannot find it then search for the three reference features, go to each and shoot the back azimuth (small number scale in the peep hole compass viewfinder). Use the tape measure to determine the correct distance and draw an arc on the ground. If the pin locator still does not register then repeat procedure from the other reference features and reestablish the reference point with a new tag and nail (note new campsite number on form and in database). Insert the large steel stake at the reference point location and reestablish all former campsite boundary pins using the previous transect data compass bearings and distances. Place wire flags on a single color at each the transect endpoints. Next, reassess these previous boundary locations using the following procedures (illustrated in Figure 2). Place wire flags of a different color at the end of each reassessed transect, both pre-existing and new (including transects whose length has not changed).

- a) Keep the same transect length if that length still seems appropriate, i.e. there is no compelling reason to alter the initial boundary determination.
- b) Record a new transect length if the prior length is inappropriate, i.e. there is compelling evidence that the present boundary does not coincide with the pin and the pin should be relocated either closer to or further from the reference point along the prescribed compass bearing.
- c) Repeat earlier Steps 1 and 3 to establish additional transects where necessary to accommodate any changes in the shape of campsite boundaries. Also repeat Step 4 to account for changes in island and satellite sites. If satellite areas are no longer disturbed, i.e. condition class 0, then note this in the Comments and do not remeasure their size.
- d) Take and record new distances and compass bearings for transects that have changed in length and for new transects using the flags denoting current campsite boundaries. For transects that have not changed in length, copy the old transect data to the new forms (reassessing these would introduce measurement error). Record all transect data on the new form in the exact order you would encounter each transect if you walked the campsite boundary in a clockwise direction.

These procedures are designed to eliminate much of the measurement error associated with different individuals making subjective judgments on those campsites or portions of campsites where boundaries are not pronounced. These procedures may only be used for campsites whose reference points can be relocated.

- 14) **Condition Class:** Record a campsite Condition Class using the descriptions below. If a campsite is underlain entirely by bedrock record "-1" for this item and items 15 - 17 as they are not applicable for bedrock campsites. Include an explanation in the field form under Comments.

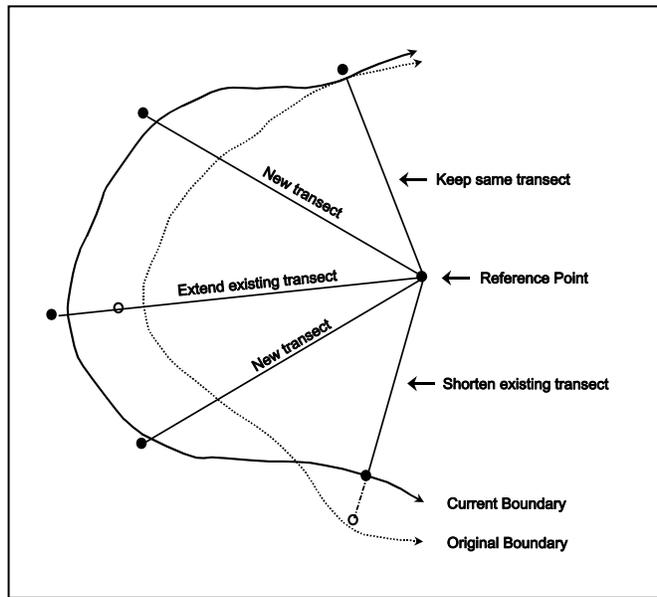


Figure 2. Transect site remeasurement procedures.

<p>Class 0: Campsite barely distinguishable; no or minimal disturbance of vegetation and /or organic litter. Often an old campsite that has not seen recent use.</p> <p>Class 1: Campsite barely distinguishable; slight loss of vegetation cover and /or minimal disturbance of organic litter.</p> <p>Class 2: Campsite obvious; vegetation cover lost and/or organic litter pulverized in primary use areas.</p> <p>Class 3: Vegetation cover lost and/or organic litter pulverized on much of the site, some bare soil exposed in primary use areas.</p> <p>Class 4: Nearly complete or total loss of vegetation cover and organic litter, bare soil widespread.</p> <p>Class 5: Soil erosion obvious, as indicated by exposed tree roots and rocks and/or gulying.</p>

- 15) **Vegetative Ground Cover On-Site:** An estimate of the percentage of live non-woody vegetative ground cover (including herbs, grasses, and mosses and excluding tree seedlings, saplings, and shrubs) within the flagged campsite boundaries using the coded categories listed below (refer to photographs following these procedures). Include any disturbed "satellite" use areas and exclude undisturbed "islands" of vegetation. For this and the following two indicators, it is often helpful to narrow your decision to two categories and concentrate on the boundary that separates them. For example, if the vegetation cover is either category 2 (6-25%) or category 3 (26-50%), you can simplify your decision by focusing on whether vegetative cover is greater than 25%.

	1 = 0-5%	2 = 6-25%	3 = 26-50%	4 = 51-75%	5 = 76-95%	6 = 96-100%
Midpoints:	2.5	15.5	38	63	85.5	98

Site remeasurement - Also evaluate vegetative ground cover within the campsite boundaries identified during the last measurement period.

- 16) **Vegetative Ground Cover Off-Site:** An estimate of the percentage of live non-woody vegetative ground cover (including herbs, grasses, and mosses and excluding tree seedlings, saplings, and shrubs) in an adjacent but largely undisturbed "control" area. Use the categories listed above. The control site should be similar to the campsite in slope, tree canopy cover (extent of sunlight penetration), and other environmental conditions. The intent is to locate an area which would closely resemble the campsite area had the site never been used. In instances where you cannot decide between two categories, select the category with less vegetative cover. The rationale for this is simply that the first visitors would have selected a campsite with the least amount of vegetation.

Site remeasurement - Start by reexamining the off-site vegetative cover estimate from the last measurement period. Use this value only if it remains an appropriate estimate.

- 17) **Exposed Soil:** An estimate of the percentage of exposed soil, defined as ground with very little or no organic litter (partially decomposed leaf, needle, or twig litter) or vegetation cover, within the campsite boundaries and satellite use areas (refer to the photographs following these procedures). Dark organic soil, the decomposed product of organic litter, should be assessed as bare soil when its consistency resembles peat moss. Assessments of exposed soil may be difficult when organic litter forms a patchwork with areas of bare soil. If patches of organic material are relatively thin and few in number, the entire area should be assessed as bare soil. Otherwise, the patches of organic litter should be mentally combined and excluded from assessments. Soil covered by a shelter should be counted as exposed soil. Code as for vegetative cover above.

Site remeasurement - Also evaluate exposed soil within the campsite boundaries identified during the last measurement period.

- 18-20) **Tree Damage:** Tally each live tree (>1 in. diameter at 4.5 ft.) within or on campsite boundaries to one of the tree damage rating classes described below (refer to the photographs following these procedures). Include trees within undisturbed "islands" and exclude trees in disturbed "satellite" areas. Assessments are restricted to all trees within the flagged campsite boundaries in order to ensure consistency with future measurements. Multiple tree stems from the same species that are joined at or above ground level should be counted as one tree when assessing damage to any of its stems. Assess a cut stem on a multiple-stemmed tree as tree damage, not as a stump. Do not count tree stumps as tree damage. Take into account tree size. For example, damage for a small tree would be considerably less in size than damage for a large tree. Where obvious, assess trees with scars from natural causes (e.g., lightning strikes) as None/Slight.

None/Slight No or slight damage such as broken or cut smaller branches, one nail, or a few superficial trunk scars.

Moderate..... Numerous small trunk scars and/or nails or one moderate-sized scar.

Severe Trunk scars numerous with many that are large and have penetrated to the inner wood; any complete girdling of tree (cutting through tree bark all the way around tree).

Site remeasurement - begin by assessing tree damage on all trees within the site boundaries identified in the last measurement period. Place boxes around each tally for trees in areas where boundaries have moved closer to the reference point, i.e., former site areas which are not currently judged to be part of the site. Next, assess tree damage in areas where boundaries have moved further from the reference point, i.e., expanded site areas that are newly impacted since the last measurement period. Circle these tallies. These additional procedures are necessary in order to accurately analyze changes in tree damage over time.

- 21-23) **Root Exposure:** Tally each live tree (>1 in. diameter at 4.5 ft.) within or on campsite boundaries to one of the root exposure rating classes described below. Include trees within undisturbed "islands" and exclude trees in disturbed "satellite" areas. Assessments are restricted to all trees within the flagged campsite boundaries in order to ensure consistency with future measurements. Where obvious, assess trees with roots exposed by natural causes (e.g., stream/river flooding) as None/Slight.

None/Slight No or slight root exposure such as is typical in adjacent offsite areas.

Moderate..... Top half of many major roots exposed more than one foot from base of tree.

Severe Three-quarters or more of major roots exposed more than one foot from base of tree; soil erosion obvious.

Site remeasurement - Begin by assessing root exposure on all trees within the site boundaries identified in the last measurement period. Place boxes around each tally for trees in areas where boundaries have moved closer to the reference point, i.e., former site areas which are not currently judged to be part of

the site. Next, assess root exposure in areas where boundaries have moved further from the reference point, i.e., expanded site areas that are newly impacted since the last measurement period. Circle these tallies. These additional procedures are necessary in order to accurately analyze changes in root exposure over time.

- 24) **Number of Tree Stumps:** A count of the number of tree stumps (> 1 in. diameter at ground and less than 4.5 feet tall) within or on campsite boundaries. **Include trees within undisturbed "islands" and exclude trees in disturbed "satellite" areas.** Do not include windthrown trees with their trunks still attached or cut stems from a multiple-stemmed tree.

Site remeasurement - begin by assessing stumps within the site boundaries identified in the last measurement period. Place boxes around each tally for stumps in areas where boundaries have moved closer to the reference point, i.e., former site areas which are not currently judged to be part of the site. Next, assess stumps in areas where boundaries have moved further from the reference point, i.e., expanded site areas that are newly impacted since the last measurement period. Circle these tallies. These additional procedures are necessary in order to accurately analyze changes in stumps over time.

- 25) **Number of Fire Sites:** A count of each fire site within campsite boundaries, including satellite areas. Include old inactive fire sites as exhibited by blackened rocks, charcoal, or ashes. Do not include locations where charcoal or ashes have been dumped. However, if it is not clear whether a fire was built on the site, always count questionable sites that are within site boundaries and exclude those that are outside site boundaries.

- 26) **Access Trails:** A count of all trails leading away from the outer campsite boundaries. For trails that branch apart or merge together just beyond campsite boundaries, count the number of separate trails at a distance of 10 ft. from campsite boundaries. Do not count extremely faint trails that have untrampled tall herbs in their tread.

- 27) **Human Waste:** Follow all trails connected to the campsite to conduct a quick search of likely "toilet" areas, typically areas just out of sight of the campsite. Count and record the number of individual human waste sites, defined as separate locations with human feces present. The intent is to identify the extent to which improperly disposed human feces is a problem.

- 28) **Total Campsite Area:** Using a computer program (contact Jeff Marion), compute the campsite size using the transect data. Using a calculator, compute and sum the area of each island and satellite site (see the *Geometric Figure Method* sheet for procedures and formulas). Record these values in the spaces provided on the back of the form and calculate the Total Campsite Area. Record this value on the front of the form to facilitate computer data entry.

Comments: An informal list of comments concerning the campsite: note any assessments that you felt were particularly difficult or subjective, problems with monitoring procedures or their application to this particular campsite, suggestions for clarifying monitoring procedures, descriptions of particularly significant impacts beyond campsite boundaries (quantify if possible), excessive litter, human waste, or any other comments you feel may be useful.

Campsite/Reference Point Photographs: If the campsite has been previously surveyed, relocate the photo point and use it again. Frame your photo and adjust zoom lens to include the same area depicted in the earlier photo(s). If the site has expanded to areas that are not visible in the viewfinder then turn the camera to capture these areas or move back if necessary (and remeasure photo point distance). If the site has not been previously surveyed, select a vantage point that provides the best view of the campsite and reference point location. Try to select a location that clearly shows the reference point location in relation to nearby trees or boulders. It is best to have a person stand at the reference point with no one else in the photo. Also take a separate reference point photograph from a closer position that clearly identifies this point in relation to permanent site features. Place the tape measure or some other object against the reference point stake so that it is clearly visible in the camera viewfinder. For

both photos leave the camera lens set at a 35-38mm focal length. Take photos with the camera pointed camera down to include as much of the campsite groundcover as possible. If a camera with a date/time recorder is used (preferred), record the date/time on the field form. ***Photo description procedures:*** Use the photo description space to record the film roll and photo numbers and to write something unique about the photo that will allow someone to recognize and label the photo for this campsite. Label film rolls with your initials followed by a unique roll number.

Record the compass bearing and distance from the permanent reference point to the campsite photopoint (you may be able to use one of the campsite boundary flags as the photopoint). The intent is to obtain a photograph that includes as much of the campsite as possible to provide a photographic record of campsite conditions. The photo will also allow future workers to make a positive identification of the campsite and assist in relocating the permanent reference point. The location of the reference point photo does not need to be measured or recorded. At the earliest possible time, label the backs of 3x5 prints with the campsite number, date, film roll number, photograph number, bearing, and distance. Also, label and store the negatives. Store the photographs separately from the survey forms. An opaque plastic box should be used for long-term photo and negative storage.

- * **Bury reference point nail and tag about 3 inches deep, compact soil with foot. Collect all campsite boundary pins, the reference point stake, and all other equipment.**

Equipment Use Procedures

Use of Peep Hole Compasses: Hold the compass level with the viewfinder close to your eye and away from any metal objects. The top of the white floating scale should be centered in the viewfinder. With your chin over the reference point, align the object with the vertical black line in the viewfinder. Hold the compass very steady, allowing the compass scale to come to a rest. Read and record the bearing to the nearest degree. Be careful in reading the bearing from the scale, use large numbers (small numbers are the back azimuth) and note that scale values decrease from left to right. Large-scale interval is 5 degrees, smallest interval is 1 degree. Practice and periodically compare compass readings with your partner to verify their accuracy. (Cost: \$42)

Use of KVH Datascope: Read Datascope manual. We will only use the compass bearing function (the distance function is intended only for estimates of long distances). Remove and safely store both lens caps. Hold the datascope approximately level (though it is gimbaled for tilt angles up to $\nabla 20^{\circ}$) and away from metal objects. Focus on target by turning rubber eyecup. Turn unit on by pressing any button (it shuts off automatically after 2 minutes of inactivity). If necessary, press the white Amode@ button until you see the ABearing@ mode inside viewfinder. Push both green and black buttons so that the word ABearing@ begins flashing, it is now in continuous scanning and averaging mode. Sighting through the unit, superimpose the vertical line on your target, hold the unit very steady. Read and record the compass bearing to the nearest 2 of a degree. Replace lens caps and store in protective case following use. Accuracy is $\nabla 0.5^{\circ}$, *if used correctly*. The Datascope is waterproof and shockproof but lets not do any product testing - be careful! **Batteries:** Carry spare batteries (3 3-volt #2025 lithium). Unit must be recalibrated each time batteries are replaced or used in a location where the magnetic field is widely different from where it was last calibrated - see manual for procedures. (Cost: \$470)

Use of Sonin Combo Pro: Read the Sonin manual. We will only use it in the target or dual unit mode. Turn main Areceiver@ unit on by pressing switch up to the double icons, turn Atarget@ unit on and slide the protector shield up. The units power down automatically after 4 minutes of inactivity. Position units at opposite ends of segment to be measured, pointing the receiver sensors in a perpendicular orientation towards the target sensors. **Note:** The measurement is calculated from the base of the receiver and the back of the target, position units accordingly so that you measure precisely the distance your intended. Press and hold down the button with the line over the triangle symbol. The receiver will continue to take and display measurements as long as you depress the button. Wait until you achieve a consistent measurement, then release the button to freeze the measurement. Measures initially appear in feet/inches. To obtain conversions, press and hold the AC@ button until the measure is converted to the units you want (tenths of a foot). Turn both devices off and store in protective case following use. Unit range is supposed to be 250 ft.; be careful and take multiple measures for distances over 100 ft. Under optimal conditions accuracy is within 4 in. at 60 ft. Device can be affected by temperature, altitude and barometric pressure, and noise (even strong wind). The units are not waterproof. **Batteries:** Carry spare batteries (2 9-volt alkaline). (Cost: \$185)

Geometric Figure Method

This method for determining the area of campsites, disturbed "satellite" sites, and interior undisturbed "island" sites is relatively rapid and can be quite accurate if applied with good judgment. Begin by carefully studying the campsite's shape, as if you were looking down from above. Mentally superimpose and arrange one or more simple geometric figures to closely match the campsite boundaries. Any combination and orientation of these figures is permissible, see the examples below. Measure (nearest 1/10th foot) the dimensions necessary for computing the area of each geometric figure. It is best to complete area computations in the office with a calculator to reduce field time and minimize errors.

Good judgment is required in making the necessary measurements of each geometric figure. As boundaries will never perfectly match the shapes of geometric figures, you will have to mentally balance disturbed and undisturbed areas included and excluded from the geometric figures used. For example, in measuring an oval campsite with a rectangular figure, you would have to exclude some of the disturbed area along each side in order to balance out some of the undisturbed area included at each of the four corners. It may help, at least initially, to place plastic tape or wire flags at the corners of each geometric figure used. In addition, be sure that the opposite sides of rectangles or squares are the same length.

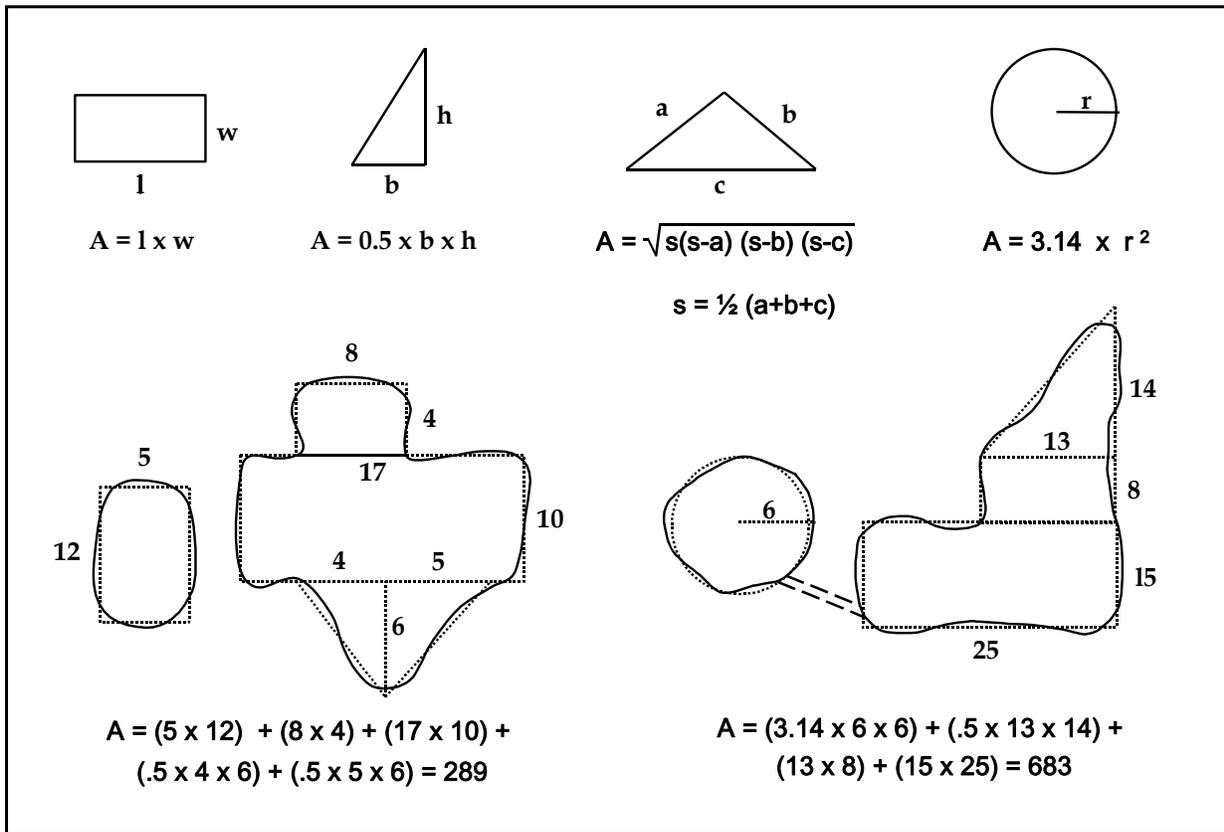


Figure 3. Geometric figure method for assessing campsite sizes.

Daniel Boone National Forest Campsite Monitoring Form

ver. 6/30/04

General Campsite Information

- 1) Campsite Tag No. ___ ___ ___ ___ 2) Site Type _____ 3) Location _____
4) UTM Coordinates _____
5) Date ___ / ___ / ___ 6) Inventoried by: _____ Locate/Label Site on Map

Describe Location: _____

Inventory Indicators

- 7) Distance to Nearest Other Campsite (1=<10 yds 2=11-20 yds 3=21-40 yds 4=41-60 yds 5=>60 yds) _____
8) Distance to Formal Trail (1=<10 yds 2=11-20 yds 3=21-40 yds 4=41-60 yds 5=>60 yds) _____
9) Other Campsites Visible (#) _____
10) Site Visibility from Formal Trail Y / N _____
11) Site Expansion Potential: P M G _____
12) Site Slope: (F = <5% M = 5-10% S = >10%) _____
13) Tree Canopy Cover (1=0-5% 2=6-25% 3=26-50% 4=51-75% 5=76-95% 6=96-100%) _____

Impact Indicators -- Apply Variable Radial Transect Method --

- 14) Condition Class (0 to 5) _____ **Previous B.**
15) Vegetative Ground Cover On-Site (Use categories below) _____
(1=0-5% 2=6-25% 3=26-50% 4=51-75% 5=76-95% 6=96-100%)
Midpoints: 2.5 15.5 38 63 85.5 98
16) Vegetative Ground Cover Off-Site (Use categories above) _____
17) Exposed Soil (Use categories above) _____
18-20) Tree Damage None/Slight _____ Moderate _____ Severe _____
21-23) Root Exposure None/Slight _____ Moderate _____ Severe _____
24) Tree Stumps (#) _____
25) Fire Sites (#) _____
26) Access Trails (#) _____
27) Human Waste (#) _____
28) Total Campsite Area (Office) _____ ft²

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Comments/Recommendations: _____

Campsite Photo: Roll # ____ Photo # ____ Bearing ____ Distance ____ ft Date/time: _____

Description: _____

Ref. Pt. Photo #: ____ Description _____

Campsite Reference Point Information

- 1)
- 2)
- 3)
- Bury Nail/Tag ____

Satellite Site Dimensions

Bearing Distance

Island Site Dimensions

Bearing Distance

Transect Data

Bearing Distance (ft)

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)
- 11)
- 12)
- 13)
- 14)
- 15)
- 16)
- 17)
- 18)
- 19)
- 20)
- 21)
- 22)
- 23)
- 24)
- 25)

Area from computer program _____
+ Satellite Area _____
! Island Area _____
= Total Campsite Area _____ ft²