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Tech Note
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Using GPS Measurements to Estimate Damage
Part of the WS Damage Assessment Series

Materials Needed:
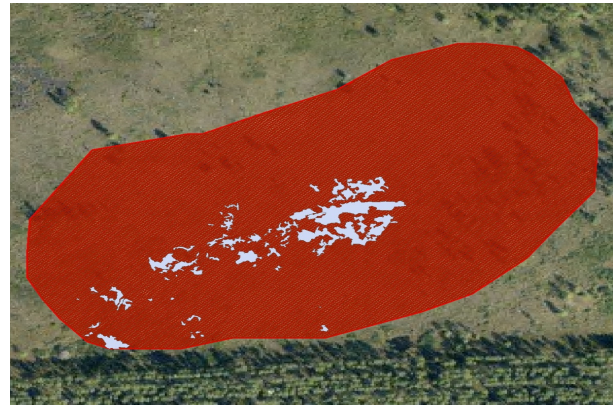Global Positioning System with sub-meter accuracy

This Tech Note provides a practical, in-field, global positioning system (GPS) measurement method for gathering highly accurate (i.e., near-exact) damage estimates for resources with continuous ground cover. Example resources that are appropriate for this method include sensitive or endangered plant communities, pastures, and high-value crops that completely cover the ground (i.e., crop rows are missing or indistinguishable).

The method requires the use of a high-precision GPS unit that achieves sub-meter accuracy through differential correction (i.e., using real-time differential GPS or post-processing software).

Other, less labor-intensive measurement methods are available, but may not be as precise.

Global positioning systems (GPS) can be used to calculate highly accurate damage assessments.

Gathering Damage Polygons Using GPS

1. Select the field or habitat to be sampled for damage.

2. Assign the field or habitat a unique identification number or name.

3. Estimate the total area of the field or habitat to be sampled by walking the perimeter of the field or habitat and logging your position continuously using a hand-held GPS unit. Be sure to log your position at an appropriate interval (i.e., every meter or less) to ensure the perimeter is accurately represented. Then, convert the information to a Geographic Information System (GIS) compatible file and use the GIS software to calculate the area. Alternatively, Google Earth or high-resolution

digital images may be used to trace the field perimeter and calculate the area using GIS software.

4. Locate individual patches of damage within the field or habitat's perimeter by systematically walking the site on parallel transects, typically 20 to 30 meters (65 to 100 feet) apart. This transect spacing should allow the observer to detect all damaged patches within the site. If not, modify the spacing between transects to ensure damage can be seen. *Note: Navigation and mapping functions in the GPS unit can be used to maintain parallel transects over uneven terrain.*

5. When a patch of damage is encountered, walk its perimeter using the GPS unit to log your position continuously at an appropriate interval (i.e., every meter or less).

Enabling the GPS unit to make an audible sound when positions are logged can facilitate this task. If the GPS unit has a pause button, use it when stopping or taking extra time to negotiate difficult terrain. Stopping or lingering will cause the unit to collect too many GPS positions at one point. *Note: If too few GPS positions are logged, the resulting polygon may not accurately reflect the overall patch of damage.*

6. In some cases, damage patches may include remnants of unaltered vegetation. To avoid over-estimating the amount of damage, visually estimate the percentage/proportion of each patch that is damaged. If the GPS unit is able to use a data dictionary or electronic form to collect feature attributes, use this tool to record the percentage of disturbed vegetation as an attribute of each damage patch.

7. Export the damage data file(s) from the GPS unit to a GIS-compatible file. Depending on the type of GPS unit you may need to first process your data through unit-specific software and then export to a compatible format (i.e., shapefile). GIS software is then used to calculate the area of the damage patch. Damage patch area and attribute data can be exported to an Excel format where additional calculations can be made.

Calculating Total Damage

1. For the damage patches that included undisturbed vegetation, multiply the calculated area of each damage patch by its proportion damaged.

DAMAGE AMOUNT for each patch = PATCH AREA x PROPORTION DAMAGED

2. The total amount of damage for the field or habitat is calculated by adding together all of the DAMAGE AMOUNTS for all of the damage patches.

TOTAL DAMAGE AMOUNT = sum of all DAMAGE AMOUNTS over all damage patches

3. To convert the TOTAL DAMAGE AMOUNT to the proportion of field or habitat that is damaged, divide the the TOTAL DAMAGE AMOUNT by the TOTAL AREA OF THE FIELD OR HABITAT.

$$\text{PROPORTION DAMAGED} = \frac{\text{TOTAL DAMAGE AMOUNT}}{\text{TOTAL FIELD/HABITAT AREA}}$$

Additional Information

For more information on estimating damage using a GPS, please contact:

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