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Tech Note

April 2018

Estimating Feral Swine Damage to Low-growing Row Crops at Harvest

Part of the WS Damage Assessment Series



Materials Needed:

Global Positioning System
Measuring Wheel or Tape Measure
Data Sheet

This Tech Note provides practical in-field measurement methods for estimating wildlife damage just before harvest to low-growing row crops, such as peanuts and sugar beets. The methods are suitable for estimating damage to row crops caused by a variety of wildlife species, including feral swine.

Feral swine damage to low-growing row crops before harvest can be assessed using the following information gathered from each agricultural field:

1. field size (area),
2. distance between rows,
3. total combined lengths of all rows sampled, and
4. total combined lengths of segments of damage across all rows sampled.

The method below describes how to obtain these numbers from each field.

A 2015 survey of feral swine damage to crops in 11 states showed peanut crops (followed by corn) experience the highest losses as a percentage of total production.



Sampling for Damage

For the best estimate of damage, sample as close to harvest as possible. This requires coordination with the producer. The example data sheet at the end of this Tech Note can be used to record damage observations.

1. Select fields to be sampled for damage.
2. Assign each field a unique identification number or name.
3. On the data sheet, note whether a) any feral swine management has occurred on or near the property within the last year, b) if the field is irrigated, and c) if damage has already occurred to the crop since planting. Also include any known replanting costs due to feral swine damage.
4. Obtain the area of the field to be sampled for damage. The perimeter of the field can be defined using a Global Positioning System (GPS), and

the area can be calculated using the GPS or Geographic Information System (GIS) software. Alternatively, Google Earth may be used to trace the field perimeter and calculate the area.

Note: For some fields, it may be obvious that large portions are unlikely to be damaged by feral swine (e.g., portions paralleling a highway or without natural access points for swine). To reduce labor, use a GPS to measure the area of the portion of the field that is unlikely to have feral swine damage. This value will be used in damage calculations. Do not sample this area.

5. Measure the distance between adjacent rows, making sure this distance is representative of the average distance between all adjacent rows.

- Identify rows to serve as transects. Select and position transects for accurately sampling the field. The number of rows between transects will impact the amount of labor involved. Ideally, leave approximately 20 rows between each transect. For example, a field with 100 crop rows would require sampling along 4 to 5 transects. For consistency among sampled fields, place the first transect between the 5th and 6th rows in from the field edge.

Note: The number of rows (or spacing) between transects in a field impacts the precision of the damage estimate and the amount of labor involved. To reduce labor costs associated with sampling large fields, transects may be spaced 25 to 30 rows apart.

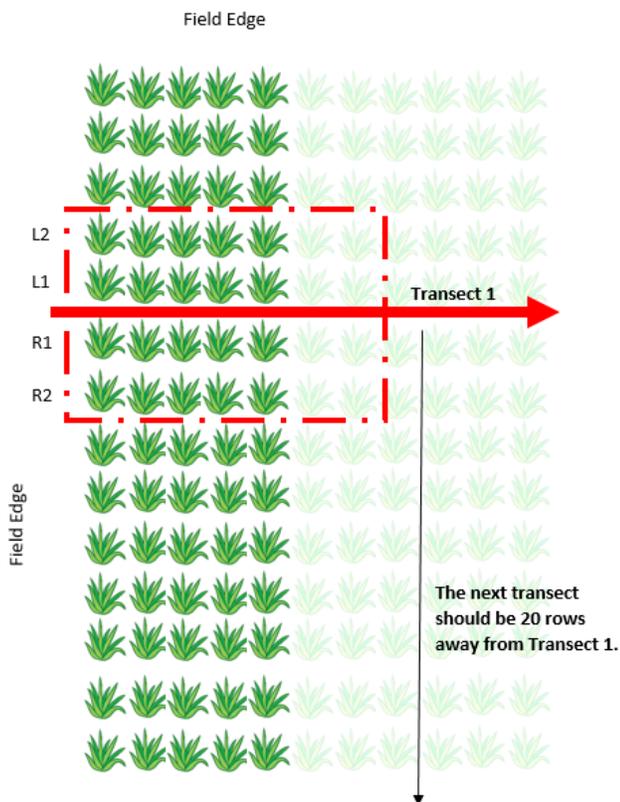


Figure 1. Locate and measure feral swine damage in the two crop rows immediately parallel to and on each side of each transect.

- Measure and record the total length of each transect from one end of the field to the other. This is most easily done using a GPS to record the transect's starting and ending points.
- In low-lying crop fields, feral swine damage can be estimated for up to 4 rows at a time per transect. While walking each transect, locate, measure and record each segment of feral swine damage or suspected feral swine damage seen in the 4 crop rows being sampled (2 rows on each side of the transect) (See Figure 1). Use a measuring wheel (recommended), tape measure or GPS to measure the length of each damage segment. On the data sheet, the measurements can be recorded under L1 (left 1), L2 (left 2), R1 (right 1) and R2 (right 2).

Note: If a single plant is missing due to feral swine damage, it is recommended that a standardized measurement of 1 foot or 0.3 meters be recorded rather than attempting to measure the short distance.

- Missing plants within a row may be the result of feral swine damage or something else, such as a lack of water or disease. On the data sheet, note whether the cause of the damage is known. Mark "certain" if it is known feral swine damage or "unknown" if you are unsure as to the cause.

Calculating the Damage

- Add the lengths of all transects together and multiply by 4 (4 crop rows per transect) to get the TOTAL TRANSECT LENGTH.
- Add the lengths of all the "certain" feral swine damage segments together to get the CERTAIN DAMAGE TOTAL. Also add the lengths of all the "suspected" feral swine damage segments together to get the SUSPECTED DAMAGE TOTAL.
- Calculate the proportion of the sampled area of the field with "certain" feral swine damage by dividing CERTAIN DAMAGE TOTAL by TOTAL TRANSECT LENGTH. This equals the PROPORTION CERTAIN DAMAGE.

4. Calculate the MAXIMUM DAMAGE TOTAL by adding CERTAIN DAMAGE TOTAL to SUSPECTED DAMAGE TOTAL.
5. Calculate the maximum proportion of the sampled area of the field damaged by feral swine by dividing MAXIMUM DAMAGE TOTAL by TOTAL TRANSECT LENGTH. This equals the PROPORTION MAXIMUM DAMAGE.
6. If the entire field was subjected to sampling, then the PROPORTION CERTAIN DAMAGE (step 3) and the PROPORTION MAXIMUM DAMAGE (step 5) provide the minimum and maximum estimates of feral swine damage to the field.

If a portion of the field was not sampled, then you must adjust your calculations to account for the non-sampled portion of the field. See Steps 7-10.

7. If necessary, convert the size of the field to square feet (or square meters) to get the FIELD AREA. Also convert the size of the non-sampled portion of the field to square feet (or square meters) to get the NON-SAMPLED AREA.
8. Calculate the SAMPLED AREA by subtracting the non-sampled area from FIELD AREA. SAMPLED AREA = FIELD AREA - NON-SAMPLED AREA.
9. Convert the SAMPLED AREA to a proportion/percentage of the field by dividing the SAMPLED AREA by FIELD AREA. This equals the PROPORTION SAMPLED.
10. To determine the certain and maximum amounts of feral swine damage to a field that includes non-sampled areas, multiply the PROPORTION SAMPLED (step 9) by the PROPORTION CERTAIN

DAMAGE (step 2). This equals the ADJUSTED PROPORTION CERTAIN DAMAGE. Also multiply the PROPORTION SAMPLED by the PROPORTION MAXIMUM DAMAGE (step 5) to calculate the ADJUSTED PROPORTION MAXIMUM DAMAGE.

If yield for the field is known and expressed as amount per acre or hectare, the damage proportions can be used to calculate certain and maximum crop losses. Calculate CERTAIN CROP LOSS and MAXIMUM CROP LOSS using the following, respectively:

$$\frac{\text{HARVESTED CROP}}{(1-\text{PROPORTION CERTAIN DAMAGE})} - \text{HARVESTED CROP}$$

$$\frac{\text{HARVESTED CROP}}{(1-\text{PROPORTION MAXIMUM DAMAGE})} - \text{HARVESTED CROP}$$

Note: If there are parts of the field not sampled because damage is unlikely, replace PROPORTION CERTAIN DAMAGE and PROPORTION MAXIMUM DAMAGE with ADJUSTED PROPORTION CERTAIN DAMAGE and ADJUSTED PROPORTION MAXIMUM DAMAGE.

Additional Information

For more information on estimating feral swine damage, please contact one of these Wildlife Services experts:

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Note: This procedure is based on Thomas, J., Engeman R.M., Tillman, E.A., Fischer, J.W., Orzell, S.L., Glueck, D.H., Felix, R.K. Jr., and Avery, M.L. 2013. Optimizing line intercept sampling and estimation for feral swine damage levels in ecologically sensitive wetland plant communities. Environmental Science and Pollution Research.



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Estimating Feral Swine Damage to Row Crops at Harvest
(Example Data Sheet)

Date: _____ Observer: _____ Field ID#: _____ Crop: _____

Distance between rows: _____ Field Area: _____ Days until harvest: _____

Is the field irrigated? Yes No Partial

Has this field been replanted (all or in part) due to feral swine damage? Yes No

Has the area received WS operations control for feral swine? Yes No If yes, when? _____

Damage measurement units: Feet Meters

TO BE RECORDED LATER:
Yield (recorded post-harvest): _____ [accurate or estimate (circle one)]

Directions: Using a GPS, record the beginning and ending waypoints of each transect under the Waypoint column. This information will be used to calculate the length of each transect. The first transect should start on the 5th row of each field. While walking each transect, observe and record the length of damage in feet or meters. Circle "FS" for damage associated with feral swine or "?" for damage from an unknown source. If one plant is damaged, record 1 ft (or 0.3 m) for damage distance.

Waypoint	L2		L1		R1		R2	
Begin:	FS	?	FS	?	FS	?	FS	?
End:								
Begin:	FS	?	FS	?	FS	?	FS	?
End:								
Begin:	FS	?	FS	?	FS	?	FS	?
End:								
Begin:	FS	?	FS	?	FS	?	FS	?
End:								
Begin:	FS	?	FS	?	FS	?	FS	?
End:								
Begin:	FS	?	FS	?	FS	?	FS	?
End:								
Begin:	FS	?	FS	?	FS	?	FS	?
End:								
Comments:								