RESIDUE MANAGEMENT PLAN

CONSERVATION MANAGEMENT SHEET

AGRONOMY SERIES JULY 1997

Natural Resources Conservation Service

Michigan

Mulch tillage in wheat residue with chisel

What is Residue Management?

Crop residue is a resource providing erosion control and environmental protection. Operators can manage moisture, and residue with various conservation tillage systems such as: No-till, Zone till, Strip till, Mulch till, and Ridge till.

How Residue Management Works

Residue cover that is left on the soil surface provides protection from wind and water erosion. Residue intercepts raindrops and serves as an umbrella to dissipate the energy of rain as it strikes the soil surface. It also intercepts and armors the soil surface against the bouncing and abrading action of wind-blown soil particles, especially sand. Residue cover also keeps the soil cooler and moister.

Where Residue Management Applies

Residue management can be applied on cropland where wind and water erosion are identified as a resource concern or water quality is degraded by sedimentation. Residue management reduces water runoff from a field. Crop residues help protect water quality, improve soil tilth and increase organic matter content.

Where to Get More Assistance

Additional local assistance may be obtained from the local office of a Michigan Conservation District or the USDA Natural Resources Conservation Service (NRCS) office at:

_____

_____

_____

Design Criteria

Date: ______________________________

Tillage System Schedule:

Farm Name:______________________________

Tillage Systems Planned

Assisted by: ______________________________

A. ______________________________

B.______________________________

C. ______________________________

D.______________________________

Field Tillage Number	Crop	Previous Residue	System	Year	Planned Percent Cover after planting	Actual Percent Cover after planting

Note: Prior to tillage, measure residue levels
[*see NRCS Conservation Manaagement sheet "Line Transect Residue and Cover Estimates* "]

Considerations for Design

Harvest until Primary tillage

Landowner Objectives
1- Review tillage schedule and residue goals
2- Improve soil structure/reduce compaction
3- Apply fertilizer/manure according to crop needs and field conditions
4- Make structural improvements prior to planting such as repairing waterways or leveling ruts
5. Control perennial weeds

Residue effects: Mulch till leaving 20% residue cover after planting may reduce erosion as much as 50%; 30% residue cover after planting may reduce erosion as much as 65%. Larger residue pieces are more valuable from an erosion standpoint because they cover more ground, decompose more slowly, don't get buried as easily and are harder to wash or blow away.

Recognize differences in crop residue
Coulters/disks may need to be adjusted for each field. There is a difference between fragile and nonfragile residue. Fragile residue tends to be more brittle, break into smaller pieces easily and decomposes quickly. Non-fragile residue tends to be more durable and remain in larger pieces. If residue is crimped and sized it deteriorates faster. Overwinter decomposition decreases the amount of fragile residue as much as 70-80%; nonfragile residues as much as 80-95%. Examples of fragile and non-fragile residue are as follows:

non-fragile residues:	***fragile residues:***
corn (grain or seed)	*soybeans*
alfalfa or legume hay	*corn silage*
wheat, oats, rye, barley	*dry beans and snap beans*
grasses and pasture	*sugar beets and potatoes*
	fall seeded cover crops
	sorghum silage

Leave fragile residues undisturbed on all soils; leave non-fragile residues undisturbed on well-drained soils to maximize residue levels.

Residue management checklist:
1. Minimize fall tillage and don't till wet soils.
2. Larger pieces of residue are more valuable because they cover more ground, decompose more slowly, don't get buried as easily and are harder to wash or blow away.
3. When harvesting, spread crop residue evenly.
4.Maintain surface residue cover by operating equipment as shallow as possible. Also, use wider shank spacing or wider blade spacing and reduced gang angle.
5. Use low crown sweeps or spikes rather than wide or twisted shovels.
6. Till fields on the contour or across slopes to avoid furrows which channel water down hills.

Agronomic Considerations

1-Soil test and plan fertility programs.
2-Make application of manure, fertilizer, lime and some herbicides prior to planting and secondary tillage.
3-Alleviate compaction, level ruts/ridges and leave as much residue as possible.
4. Control perennial weeds

Fertilizer management can be more challenging because...
-soil moisture is increased
-soil temperature is decreased
-stratification of fertilizer can occur, especially with insoluble materials like P and K
-surface applications are more prone to loss/tie-up, especially with nitrogen
-perrenial weeds are tough to control

1. Where P and K are low, consider pimary tillage to help mix fertilizer into the soil profile.

2. Applying fall/early spring fertilizer needs with primary tillage has the following benefits:
-incorporation is better
-planting time workload is reduced
-compaction is less due to drier/firmer soils

3. Manure must be incorporated to capture the full fertility value because as much as 85% of manure nitrogen can be lost when surface applied. And phophorus incorporation reduces runoff loss.

4. Management options for better utilization of manure to prevent volatilization and loss via runoff include:
-injecting
-broadcasting prior to tillage
-enriching manure with anhydrous, if necessary, and using nitrogen stabilizer
-putting heavy applications of manure on for more than one crop in the rotation

5. Weed management is critical.
To prevent buildup of perennial weed populations, spot treat with Roundup or use Roundup resistant crop varieties. Make sure field is level (no mild

ridges or ruts) to allow uniform herbicide applications on first spring tillage pass

6. Prevent Soil Compaction.
Don't drive on wet fields and minimize trips by prioritizing and combining operations. Eliminate unnecessary traffic and use wide tires, duals or tracks to spread weight across a greater surface area.

Equipment Considerations

Combining field operation to get an even residue layer is critical to good residue management. Two main options exist for spreading residue: straw spreaders or straw choppers.

Straw spreaders work best with grain heads under 15 feet and when tillage can be used to further spread residue. Spreaders leave residue intact.

Straw choppers are better for heads over 15 feet or when residue will plug tillage or planting equipment. Choppers will break residue into smaller pieces that can deteriorate more quickly.

Consider adding a chaff spreader to improve seed-soil contact, especially after high residue crops (wheat) are followed with a no-till system.. Chaff can also cause alellopathic seedling problems.

Even residue distribution:
-promotes even drying and warm-up in the spring for timely seedbed preparation.
-exposes more weed seeds to herbicide and improves residual herbicide activity.
-prevents tie-up of fertilizer in heavy residue mats
-minimizes residue bunching which can plug tillage machines.
-reduces alellopathic effect

Primary tillage tools

Primary tillage is from 3" up to 20" deep and is generally performed after harvest in the fall or early spring.

Disks- invert soil,: size and mix residue, level rough surfaces, incorporate chemicals and nutrients evenly into soil.
Operating tips: Operate in moist to dry soils. Use scrapers in heavier soils. Slower speeds bury *less* residue. Deeper tillage buries *more* residue. Best performance is achieved with speeds of 5-5 1/2 MPH
Attachments: Coil tine harrow provide stirring and leveling action. Spike tooth harrow breaks clods and provides some stirring and leveling action, spreads residue.

Residue management adjustments: Four factors determine residue levels: blade spacing, gang angle, speed and depth.
Blade spacing: Wider blade spacing (11") leaves more residue than narrow blade spacing (9").
Gang angle: Less angle (20 degrees or less) leaves more residue .
Speed: lower speeds (5 1/2 MPH) or less leave more residue.
Depth: Shallower depth (3" or less -finger length) leaves more residue than 3-6" depth.
Concave shape of disk: more concave disks throw more soil and residue
V-Rippers- shatter soil of tillage/plow pan up to 20 inches deep for aeration and moisture infiltration. Coulters can be used in heavy residue to minimize plugging. Narrow points will disturb the soil surface less, leave more residue and require less horsepower than wider points. Shanks are usually set on 20 inch spacing.
Operating tips: Determine tillage/plow pan depth when soil is moist with a penetrometer, shovel, soil auger or post hole digger to a depth of 2 feet. Set depth in soil 1 inch below pan to maximize shattering. Under ideal conditions each shank will shatter the soil at a 45 degree angle, (i.e. for each 1 inch of depth, shatter should be 2 inches wide). For example, a shank set 1 foot deep should shatter the surface 1 foot in each direction from the shank. O*n hilly land, operate on the contour in the fall, to prevent water erosion down the shank path.*

Disk Rippers or combination deep tillage tools- size residue, mix organic matter into the soil, shatter the plow/till pan up to 15 inches and leave a level, but rough, surface profile. *They are generally recommended on level soils that have low erosion potential and apt to be shallow compacted by wheel traffic and excessive tillage*. Lesser gang angle, lesser disk depth, narrower points and slower operating speed leaves more residue and requires less horsepower.
Operating tips: Determine till/pan plow depth, as with V-rippers above. Adjust disk gang depth for desired tillage depth and residue level needed to reduce erosion.
Attachments: Levelers may be needed to level out ridges and valleys left from primary tillage.

Chisel Plows provide deeper tillage than disks and with less horsepower; till and mix soil up to 10" deep, leave a rough surface, and handle most residue at the wider shank spacing, 12-16" is the normal spacing. Spikes, points, and shovels penetrate better and give more action than sweeps, but bury more

residue. Sweeps undercut perennial weeds and leave more residue.

Operating tips: Low crown sweeps leave more residue. Twisted shovels bury the most residue and provide the best mixing. Slower speeds leave more residue. Use narrow chisel points to penetrate hard ground. Chiseling when soil is wet creates clods. *Residue flow in heavy residue can often be improved by operating at a 10 degree angle to the harvest operation or planted row.*

Attachments: Levelers, such as S-tine levelers, may be needed to level out ridges and valleys left from primary tillage. Leveling during primary tillage is important for one pass preplant herbicide applications to insure uniform incorporation to the proper depth.

Disk Chisels (Mulch tillers)- till up to 12"deep with coulters in front cut and bury residue, leave surface rough and when equipped with sweeps saves up to 80% of initial residue. Coulters size residue for better flow with very little burial. Hydraulic coulters give flexibility to retract on-the -go when not needed. Sweeps lift and shatter soil but do very little inversion. Shovels, points, and spikes invert the soil for better working action, but leave less residue.

Operating tips: Use coulters only when residue sizing is needed to improve residue flow

Attachments: S-tine levelers level soil profile by reducing ridges and valleys. Disk levelers level soil profile by reducing ridges and valleys.

Seedbed Preparation

Landowner Objectives

1- provide a uniform seedbed
2- maintain surface residue
3- incorporate fertilizer, pesticides or manure
4- mechanically control weeds

Residue Effects

Most soil erosion takes place during spring and early summer. On sloping land it's critical that tillage systems maximize surface cover. Spring is a good time for establishing contour lines, contour strip cropping, waterways, field borders, filter strips, buffer strips and other conservation practices. Seedbed preparation is a critical time to manage crop residue. However, even the best plans may need to be modified or fine-tuned if weather conditions, crop rotation needs , weeds or other factors have made the plan less practical.

Residue Management Checklist

Remember: every pass with tillage equipment, fertilizer injectors or planters buries residue. Once it's buried, residue is generally hard to recover.

1. Choose the sweeps, shanks, coulters, and attachments, that best maintain surface residue.
2. Make sure equipment operation is level to avoid running too deeply.
3. Use wider gang spacing to allow easier residue flow and minimize burial.
4. Dont till any deeper than necessary. Deep tillage with disks causes more sizing of residue and deeper blade compaction. Shank implements moves more soil to bury residue.
5. Operate equipment at recommended speeds.
6. Avoid tilling wet soils.

Secondary tillage tools

Disks-Handles a wide range of residues in secondary tillage. Disks are marginal for one-pass herbicide incorporation. Disk blades size residue and invert soil, which can bury a lot of residue. Disks with narrower spacing (9 inches or less) and higher gang angles tend to bury more residue and leave larger soil aggregates. Disk blades generally outlast sweeps and shovels.

Operating tips: Operate only deep enough to incorporate chemicals. *This is generally twice the recommended chemical incorporation depth.* Disks perform best at 5 to 5 1/2 MPH. Best incorporation is achieved when the disk is level fore-to-aft and side-to -side. Use minimum gang angle to retain residue.

*Attachments: Coil tine harrow*s provides stirring and leveling action. *Spike tooth harrow* breaks clods and provides some stirring and leveling. *Spray attachments* can be mounted in front of gangs for immediate incorporation of fertilizer and chemicals.

Mulch Finishers are 3-element combination tools with disk gangs, field cultivator shanks, and tine or spike tooth harrows, that handle a wide range of residue, surface, and soil conditions. Mulch finishers can save up to 90% of pre-tillage residue. *Disk gangs* size residue to improve flow but can be raised to leave more residue or lowered for heavier soils *Shanks* on 8 inch spacing can be equipped with spikes or sweeps. *Spikes* break up clods whereas sweeps incorporate. *Tine tooth harrows* substituted for shanks stir soil for better incorporation and leveling also, handle high residue.better. *Rolling baskets* provide good leveling, incorporation and soil firming.

Operating tips: Mount spray attachments in front of shanks in rough fields and high residue/weed level; mount in front of disk gangs in less weedy fields. Operate 5-7 MPH with shank depth at 2X required chemical incorporation depth.

Field Cultivators handle moderate residue (50-60%) and save up to 90% of pre-tillage residue, and are

marginally effective for one-pass incorporation. For shank choices there are two designs: *C-shank or S/K tines*.
C-shanks give rigid action to cut weeds, mix soil, hold depth and shed residue in clay soils. *S/K tines* vibrate for mixing action, to uproot weeds, level soil, and create a seedbed in lighter soils. Use narrow sweeps/shovels for crusted hard soils; wide sweeps/shovels for up rooting weeds, retaining residue and mixing of chemicals/fertilizers.
Operating Tips: Set deep enough to incorporate chemicals (2X required chemical incorporation) @ 6-7MPH.
Field cultivator attachments include: Tine tooth harrow, spike tooth harrow or rolling basket.
Tine tooth harrow stirs/levels soil and handle moderate residue. *Spike tooth harrow* breaks clods, stirs and levels some, and handles moderate residue. *Rolling baskets* are good for leveling and firming seedbed, but not recommended in rocky, high residue or wet conditions.

Planter Attachments
Use a coulter to cut residue and till a narrow zone of soil. Various blade options available include: bubble blades, fluted coulters, and multiple coulter options.
-*bubble blades* cut residue with minimum tillage.
-*1"-8 flute blades* will maximize tillage at faster planting speeds (5 1/2MPH).
-*3/4"-13 flute blades* will do zone tillage with less slabbing.
-*2/3" 25 flute blades* will do slightly narrower zone tillage.

Conservation disk furrowers and row cleaners clear the planting zone of residue and clods for faster soil warming and uniform seed placement. Unit-mounted row cleaners sweep residue to the side and give the opener system a smoother path down the row. They also increase soil warm-up, reduce hair-pinning of residue in the seed furrow and remove decaying, toxic residue away from the seed zone..

Coulter and row cleaner combinations give zone tillage with residue removal for more aggressive action in high residue conditions. These should be set to move residue, not soil, and are not recommended where preplant or surface herbicides are applied. However, *triple coulter arrangements* have been used to incorporate PPI herbicides successfully. And when combined with row crop cultivation and band application successful weed control has resulted.

Rubber closing wheels can close and firm the seed trench in most conditions; use cast iron wheels in tougher conditions.

Heavy duty down pressure springs can keep planting units from bouncing on rough seedbeds and improve planter penetration in trash and hard soil conditions.

Operating tips:
-Set coulters, row cleaners or furrowers on planters and drills in high residue situations to clean row for planting without burying extra residue.
-Limit the use of residue attachments in moderate residue levels.
-Avoid furrowers in hilly situations to prevent creation of water carrying channels.
-Reduce down pressure and weights when planting in moist soils to prevent side-wall compaction of the seed furrow.
-Consider narrow row planting or drilling to accelerate and maximize crop canopy.
-Maximize surface residue remaining from operation like row crop cultivation, by using fewer shanks and low crown sweeps.

Considerations

A number of effects to environmental conditions will occur from cultural operations used on fields where residue management is applied. A consideration of these effects will allow for incorporation of companion planning elements to achieve an ecosystem-wide conservation plan for the area in which the plant residue and/or ground cover is established. Effects which may be considered include: sheet and rill erosion - RUSLE, wind erosion - WEQ, ephemeral gully (tons/ac/yr.), soil tilth, crusting, infiltration,. organic matter maintenance, soil compaction, plant productivity, plant health and vigor, nutrient and pesticide runoff.

Where air quality can be diminished from spray drift, consider impregnating broadcast fertilizer with insecticides or herbicides and spreading prior to secondary tillage. This is an important consideration in residential areas and where rural roads have been impacted by strip development. It also can eliminate an operation during secondary tillage and keep weeds from emerging prior to planting.

Natural Resource area(s) expected to be addressed by the use/application of this conservation sheet:

[x] Soil, [x] Water, [x] Air, [x] Plants,
[x] Animals, [x] Human Socio-economics.

Maintenance

1. Where residue accumulates greater than 2 inches deep due to runoff or flooding, consider one of the following operations prior to planting:
-extra tillage to bury the residue
-baling the residue or chopping
-loading the residue into a manure spreader and spreading it over a larger area
-spot burning
-raking into windrows
2. Try to maintain even amounts of residue on driveways, headlands, loading areas, and where possible avoid spreading on grassed waterways, field strips and filter strips.
3. Partial removal of residue by baling or grazing shall be limited to retain the amount needed according to the residue management plan.
4.Cover crops such as small grains may be required to meet the planned residue objectives, especially after fragile (low) residue producing crops.
5. A contact herbicide may be needed prior to secondary tillage if emerged weeds get too big to control with planned tillage. Or are difficult to control with the planned crop rotation.
6. Drilling soybeans, using narrow rows in corn and selecting tall bean or corn varieties can aid in achieving planned residue objectives. All can provide a quicker and more complete canopy for better erosion and weed control.

Insect pressure will change under high residue management conditions. Use of Integrated Pest Management scouting techniques for insect pests such as: black cutworm, armyworm, stalkborer, wireworm, seed corn maggot and slugs may increase under cool , wet soil conditions that delay crop emergence or weedy conditions that encourage insect development.

Weed problems may change under residue management systems. More weed seeds are left near the surface and if allowed to germinate weed problems can intensify. High residue levels result in cooler and wetter soil in early spring. This may influence weed seed germination, delaying germination of warm-temperature weeds like pigweed, crabgrass or barnyardgrass. Annual grasses such as giant foxtail or foxtails favor less tillage conditions. Early planting of soybeans ahead of perennial emergence can prevent use of Roundup to provide season long weed control. Use of Roundup Ready varieties will improve perennial weed control where early planting is used. Winter annual weeds often infesting no-till fields include marestail or horseweed, purselane, speedwell, field pennycress, daisy fleabane, and shepherds purse. Non-selective herbicides such as Gramoxone or Roundup control most of these weeds. Also, 2, 4-D applied before planting has provided excellent control.

This Conservation Information Sheet

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Reference/File Indexes

Topic Application:
[ ] Construction
[X] Design
[X] Fact
[ ] Information
[ ] Management
[ ] _____

Resource Series:
[X] Agronomy
[ ] Biology
[ ] Engineering
[ ] Forestry
[ ] Hayland
[ ] Livestock
[ ] Pastureland
[ ] Recreation
[ ] _____

FOCS (MI) Reference Number:
CS _____

References:
Conservation Cropping Systems Mulch-Till Farming for the 90's and Beyond Dow Elanco, Deere & Company and USDA SCS
Weed Problems May Change In Conservation Tillage Dr. Richard Fawcett. *Farm Chemicals, Feb. 1985*
USDA-ARS Ag Handbook 703
USDA-NRCS RUSLE Manual

USDA NRCS (MI) Conservation Practice Associations:
(327) Conservation Cover
(329A) Residue Mgt. No-till and Strip Till
(329B/C) Residue Mgt. Mulch Till/Ridge Till
(340) Cover cropss

USDA NRCS (MI) Associated Conservation Sheets:
Line Transect Residue and Cover Estimates

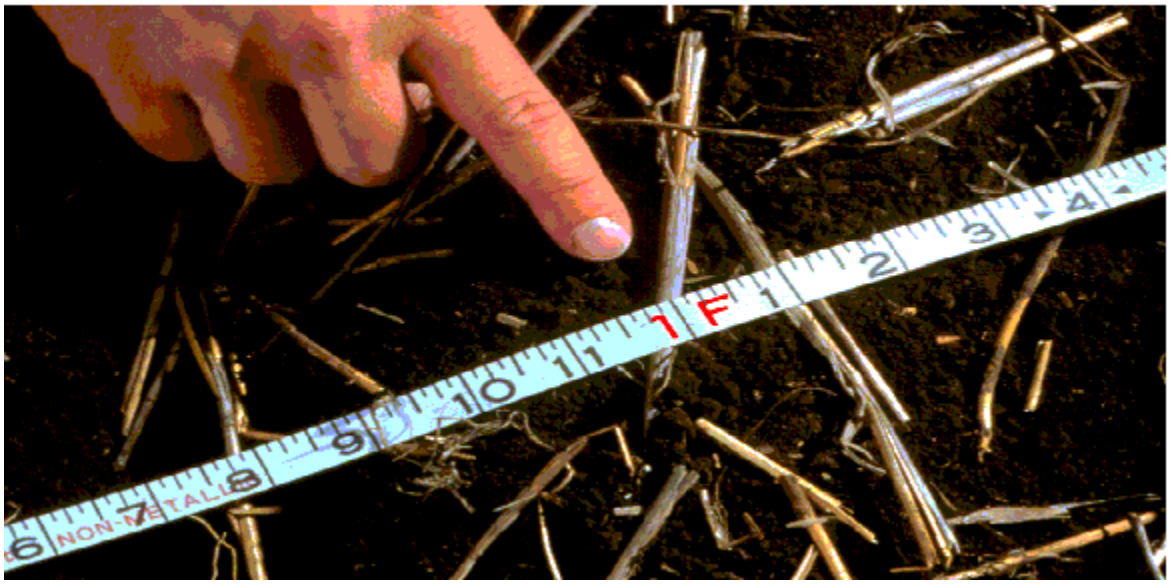
LINE TRANSECT
RESIDUE AND COVER ESTIMATES

CONSERVATION MANAGEMENT SHEET

AGRONOMY SERIES May 1997

Natural Resources Conservation Service

Michigan



Line Transect showing method for estimating ground cover

What is a Line Transect?

A Line Transect is a field measurement technique that has been proven effective in estimating the percent of ground surface covered by plant residue. It is most accurate when the residue is lying flat on the soil surface and is evenly distributed across the field. Also, it may be used to estimate crop residue, live plant cover and other ground cover at any time.

How a Line Transect Works

A marked cable, line, or tape measure is placed across the surface of a field for which an estimate of the percentage of ground cover is desired. Careful observation of the number of marks which occur above various types of ground residue and/or cover may be counted and extrapolated into an estimate of protective cover for the entire field. This is then used
to predict the impact on sheet and rill erosion.

Where a Line Transect Applies

A Line Transect method of estimating the amount of plant residue, or ground cover, remaining on the surface of a field may be used at any time it is necessary, or desirable to know the amount of residues and cover on that field. Typically, it is applied to agricultural fields shortly after a field has been planted into an annual small grain or row crop, usually before crop emergence.

Where to Get More Assistance

Additional local assistance may be obtained from the local office of a Michigan Conservation District or the USDA Natural Resources Conservation Service (NRCS) office at:

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_____

_____

Design Criteria

Design Elements:

1. A commercially available 50- or 100-foot-long cable, line, or tape measure with 100 equally spaced beads, knots, or other graduations over which to sight may be used.

2. The cable, line, or tape measure will be tautly stretched across the surface of a representative portion of the field on which an estimate of plant residue and ground cover is being made. The line may be perpendicular to the row direction or in a direction at least 45 degrees off the row direction. End rows, field borders, and parts of the field that are not representative of the entire field should be avoided. Measurement location should be randomly selected. The cable, line, or tape measure must not be moved during the following procedure.

3. Walk along the cable, line, or tape measure stopping at each mark. sight directly down across the edge of a single, selected point on the mark (i.e., a small portion of the mark about the size of a needle point-corner, top edge, etc. of the mark). **Use the same reference point on each mark**.

Considerations for Design

1. Count all of the marks along the cable, line, or tape measure (100 total) for which only the selected reference portion of the e mark (not any other part of the mark) is directly above plant residue, living or dead , or *other surface cover*.
NOTE: Surface cover is defined as any material in contact with the soil surface that might intercept raindrops and slow surface runoff. Surface cover includes rock fragments, live vegetation, and particles of plant (or other) residue. Crop residue must be attached to the surface or be of sufficient size that it will intercept raindrops and not be removed by runoff. [RULE OF THUMB: Count only surface cover particles that are 3/32 inch in diameter, or larger.] The number of possible marks counted (out of 100 total) equals the percent of ground covered by plant residue and/or other ground cover.

2. Repeat the Transect 3-5 times in a single field and average the results for and estimate of plant residue and/ or ground cover on the field. Five transacts are recommended on each field.

NOTE: Three transects will provide an estimate accurate to within +/-32 percent of the mean. Five transects will provide an estimate to within +/-15 percent of the mean. (Example: an averaged estimate of five measurements which suggest a plant residue and/ or ground cover of 50% on a field can be expected to actually be estimated between 42.5% and 57..5% at the 95% confidence level.

Other Considerations

A number of effects to environmental conditions will occur from cultural operations used on fields where a Line Transect field measurement technique is used to estimate the percent of plant residue and/or ground cover that is there. A consideration of these effects will allow for incorporation of companion planning elements to achieve an ecosystem-wide conservation plan for .the area in which the plant residue and/or ground cover estimates are made. Effects which may be considered include: sheet and rill erosion wind erosion ephemeral gully(tons/ac/yr.), tilth, crusting, infiltration. organic matter maintenance , :soil compaction, plant productivity, plant heath and vigor, etc.

Natural Resource area(s) expected to be addressed by the use/application of this conservation sheet:

[x] Soil, [x] Water, [x] Air, [x] Plants,
[ ] Animals, [x] Human Socio-economics.

Maintenance

The cable, line or tape measure used must be kept repaired. All marks must be present and visible.

For More Information

Additional information about the application and use of the Line Transect method to estimate the percent of plant residue and/or ground cover on a field may be obtained from the world wide web
(http: //www.minrcs.usda.gov).

Field Residue Estimates

Date:____/____/____
Assisted by:_____

Client and Location: County_____
Client Name:_____
Township :_____
Farm name_____
Field No._____ Tract No._____

1. Field Number:_____ Field Crop:_____.
Field Condition: [ ] Idle, [ ] Fallow, [ ] No-tilled,
. [ ] Plowed, [ ] Disked, [ ] Dragged, [ ] Planted
[ ] Cultivated, [ ] Manure, [ ] Other_____

Marks counted (each transect)

_____,_____,_____,_____,_____ = _____ / 5 =
Estimated plant residue and/or ground cover_____%.

.....

2. Field Number:_____ Field Crop:_____.
Field Condition: [ ] Idle, [ ] Fallow, [ ] No-tilled,
. [ ] Plowed, [ ] Disked, [ ] Dragged, [ ] Planted
[ ] Cultivated, [ ] Manure, [ ] Other_____

Marks counted (each transect)

_____,_____,_____,_____,_____ = _____ / 5 =
Estimated plant residue and/or ground cover_____%.

.....

3. Field Number:_____ Field Crop:_____.
Field Condition: [ ] Idle, [ ] Fallow, [ ] No-tilled,
. [ ] Plowed, [ ] Disked, [ ] Dragged, [ ] Planted
[ ] Cultivated, [ ] Manure, [ ] Other_____

Marks counted (each transect)

_____,_____,_____,_____,_____ = _____ / 5 =
Estimated plant residue and/or ground cover_____%.

.....

4. Field Number:_____ Field Crop:_____.
Field Condition: [ ] Idle, [ ] Fallow, [ ] No-tilled,
. [ ] Plowed, [ ] Disked, [ ] Dragged, [ ] Planted
[ ] Cultivated, [ ] Manure, [ ] Other_____

Marks counted (each transect)

_____,_____,_____,_____,_____ = _____ / 5 =
Estimated plant residue and/or ground cover_____%.

.....

5. Field Number:_____ Field Crop:_____.
Field Condition: [ ] Idle, [ ] Fallow, [ ] No-tilled,
. [ ] Plowed, [ ] Disked, [ ] Dragged, [ ] Planted
[ ] Cultivated, [ ] Manure, [ ] Other_____

Marks counted (each transect)

_____,_____,_____,_____,_____ = _____ / 5 =
Estimated plant residue and/or ground cover_____%.

.....

6. Field Number:_____ Field Crop:_____.
Field Condition: [ ] Idle, [ ] Fallow, [ ] No-tilled,
. [ ] Plowed, [ ] Disked, [ ] Dragged, [ ] Planted
[ ] Cultivated, [ ] Manure, [ ] Other_____

Marks counted (each transect)

_____,_____,_____,_____,_____ = _____ / 5 =
Estimated plant residue and/or ground cover_____%.

.....

7 Field Number:_____ Field Crop:_____.
Field Condition: [ ] Idle, [ ] Fallow, [ ] No-tilled,
. [ ] Plowed, [ ] Disked, [ ] Dragged, [ ] Planted
[ ] Cultivated, [ ] Manure, [ ] Other_____

Marks counted (each transect)

_____,_____,_____,_____,_____ = _____ / 5 =
Estimated plant residue and/or ground cover_____%.

.....

8. Field Number:_____ Field Crop:_____.
Field Condition: [ ] Idle, [ ] Fallow, [ ] No-tilled,
. [ ] Plowed, [ ] Disked, [ ] Dragged, [ ] Planted
[ ] Cultivated, [ ] Manure, [ ] Other_____

Marks counted (each transect)

_____,_____,_____,_____,_____ = _____ / 5 =
Estimated plant residue and/or ground cover_____%.

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This Conservation Information Sheet

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Reference/File Indexes

Topic Application:

[ ] Construction
[X] Design
[ ] Fact
[ ] Information
[ ] Management
[ ] _____

Resource Series:

[X] Agronomy
[ ] Biology
[ ] Engineering
[ ] Forestry
[ ] Hayland
[ ] Livestock
[ ] Pastureland
[ ] Recreation
[ ] _____

FOCS (MI) Reference Number:
CS _____

References:

USDA NRCS Ag Handbook 703
USDA-NRCS National Agronomy Manual
USDA-NRCS RUSLE Handbook

USDA NRCS (MI) Conservation Practice Associations:

327 Conservation Cover
329A Residue Mgt. No-till and Strip Till
#329B Residue Mgt. Mulch Till
#329C Residue Mgt. Ridge Till

USDA NRCS (MI) Associated Conservation Sheets: