CONSERVATION PRACTICE PHYSICAL EFFECTS WORKSHEET

STATE	Nebraska	FIELD OFFICE	Any	DATE	12/27/2011
PRACTICE: Deep Tillage 324		Baseline Setting:			
		Appropriate Land Use(s): Crop			
RESOURCES, CONSIDERATIONS AND CONCERNS		**PHYSICAL EFFECTS**		**RATIONALE**	
SOIL - EROSION					
Sheet and Rill		Neutral		Removing restrictive layers improves infiltration and reduces runoff. Deep Tillage loosens the soil and buries protective residue and live cover making it more prone to water erosion.	
Wind		Slight to Moderate Improvement		If done at critical wind periods, deep tillage may temporarily increase surface roughness reducing saltation. It may also bring non-erodible materials to the surface and reduce wind erosion	
Ephemeral Gully		Neutral		Removing restrictive layers improves infiltration and reduces runoff. Deep tillage refills the voided concentrated flow channels with loose soil where it is prone to being eroded away by the next event.	
Classic Gully		Not Applicable		Not Applicable	
Streambank		Not Applicable		Not Applicable	
Shoreline		Not Applicable		Not applicable.	
Irrigation Induced		Slight Improvement		Improves infiltration and reduces runoff.	
Mass Movement		Slight Worsening		Increased infiltration could exacerbate mass movement during high rainfall.	
Road, Roadsides, and Construction Sites		Slight to Moderate Improvement		Improves infiltration and reduces runoff and removes compaction to prepare sites for re-vegetation.	
SOIL – CONDITION					
Organic Matter Depletion		Moderate to Substantial Worsening		Deep tillage can bury the organic horizon and reduce the organic matter content by diluting it with subsoil materials. The mixing and inversion action of deep moldboard plows, or the lifting and fracturing of deep rippers increases the oxidation of organic matter.	
Rangeland Site Stability		Not Applicable		Not applicable.	
Compaction		Substantial Improvement		Ripping breaks up compaction, improves plant soil moisture, promotes root growth, and soil structure.	
Subsidence		Slight Worsening		Deep tillage causes mixing and	

		aeration. Histosols are subject to subsidence if drained and tilled. Deep tillage will increase oxidation of organic soils.
Contaminants:		
• Salts and other Chemicals	Slight to Moderate Improvement	Improved infiltration and porosity leaches salts. Deep plowing will bury and dilute the contaminant.
• Animal Waste and other Organics - N	Slight to Moderate Improvement	Ripping improves infiltration which increases leaching of mineralized nutrients. Deep plowing will bury and dilute the contaminant.
• Animal Waste and other Organics - P	Slight to Moderate Improvement	Ripping improves infiltration which increases leaching of mineralized nutrients. Deep plowing will bury and dilute the contaminant.
• Animal Waste and other Organics - K	Slight to Moderate Improvement	Ripping improves infiltration which increases leaching of mineralized nutrients. Deep plowing will bury and dilute the contaminant.
• Commercial Fertilizer - N	Slight to Moderate Improvement	Ripping improves infiltration which increases leaching of mineralized nutrients. Deep plowing will bury and dilute the contaminant.
• Commercial Fertilizer – P	Slight to Moderate Improvement	Ripping improves infiltration which increases leaching of mineralized nutrients. Deep plowing will bury and dilute the contaminant.
• Commercial Fertilizer – K	Slight to Moderate Improvement	Ripping improves infiltration which increases leaching of mineralized nutrients. Deep plowing will bury and dilute the contaminant.
• Residual Pesticides	Slight to Moderate Improvement	Ripping mixes the soil and can result in adsorption and deactivation. Deep plowing will bury and dilute the contaminant.
Damage from Sediment Deposition	Slight to Moderate Improvement	Deep plowing and ripping buries or mixes undesirable soil deposits from wind or water erosion or flood overwash.
WATER – QUANTITY		
Rangeland Hydrologic Cycle	Not Applicable	Not applicable.
Excessive Seepage	Slight to Moderate Worsening	Deep tillage may temporarily increase soil water content.
Excessive Runoff, Flooding, or Ponding	Not Applicable	Not Applicable
Excessive Subsurface Water	Slight to Moderate Improvement	Deep ripping a tillage pan or fragipan can remove a perched water table in the root zone.

Drifted Snow	Not Applicable	Not applicable.
Inadequate Outlets	Not Applicable	Not Applicable
Inefficient Water use on Irrigated Land	Slight to Moderate Improvement	Increases infiltration and reduces runoff.
Inefficient Water use on Non-Irrigated Land	Slight to Moderate Improvement	Deep tillage increases infiltration and reduces runoff.
Reduced Capacity of Conveyances by Sediment Deposition	Neutral	Increase in infiltration is negated by the increased erosion of the bare and loosened soil conditions that result from deep tillage.
Reduced Storage of Water Bodies by Sediment Accumulation	Neutral	Increase in infiltration is negated by the increased erosion of the bare and loosened soil conditions that result from deep tillage.
Aquifer Overdraft	Not Applicable	Not Applicable
Insufficient Flows in Water Courses	Slight Worsening	Increases infiltration and reduces runoff.
WATER – QUALITY		
In Groundwater:		
• Harmful Levels of Pesticides	Neutral	Depending on the type of deep tillage, infiltration and runoff may be decreased or increased
• Excessive Nutrients and Organics	Slight to Moderate Worsening	Deep ripping increases infiltration resulting in greater leaching potential.
• Excessive Salinity	Not Applicable	Not Applicable
• Harmful Levels of Heavy Metals	Not Applicable	Not applicable.
• Harmful Levels of Pathogens	Not Applicable	Not applicable.
• Harmful Levels of Petroleum	Not Applicable	Not applicable.
In Surface Water:		
• Harmful Levels of Pesticides	Slight to Substantial Improvement	The slight increase in infiltration is negated by the increased erosion of the bare and loosened soil conditions that result.
• Excessive Nutrients and Organics	Slight Improvement	Increase in infiltration may be negated by the increased erosion of the bare and loosened soil conditions that result from the deep tillage method.
• Excessive Suspended Sediment and Turbidity	Neutral	Increase in infiltration may be negated by the increased erosion of the bare and loosened soil conditions that result from the deep tillage method.
• Excessive Salinity	Slight Improvement	Deep ripping increases infiltration, reducing runoff and erosion.
• Harmful Levels of Heavy Metals	Slight Improvement	Increase in infiltration may be negated by the increased erosion of the bare and loosened soil conditions that result from the deep tillage method.
• Harmful Temperatures	Not Applicable	Not applicable.

• Harmful Levels of Pathogens	Neutral	Increase in infiltration may be negated by the increased erosion of the bare and loosened soil conditions that result from the deep tillage method
• Harmful Levels of Petroleum	Neutral	Increase in infiltration may be negated by the increased erosion of the bare and loosened soil conditions that result from the deep tillage method
AIR – QUALITY		
Particulate Matter less than 10 Micrometers in Diameter (PM 10)	Not Applicable	Not applicable.
Particulate Matter less than 2.5 Micrometers in Diameter (PM 2.5)	Not Applicable	Not applicable.
Excessive Ozone	Not Applicable	Not applicable.
Excessive Greenhouse Gas:		
• CO_2 (Carbon Dioxide)	Not Applicable	Not applicable.
• N_20 (Nitrous Oxide)	Not Applicable	Not applicable.
• CH_4 (Methane)	Not Applicable	Not applicable.
Ammonia (NH_3)	Not Applicable	Not Applicable
Chemical Drift	Not Applicable	Not applicable.
Objectionable Odors	Not Applicable	Not applicable.
Reduced Visibility	Not Applicable	Not applicable.
Undesirable Air Movement	Not Applicable	Not applicable.
Adverse Air Temperature	Not Applicable	Not applicable.
PLANTS – SUITABLIITY		
Plants not Adapted or Suited	Not Applicable	Not applicable.
PLANTS - CONDITION		
Productivity, Health, and Vigor	Slight to Substantial Improvement	Enhanced root growth and the reduction of concentrated contaminants improves plant health and vigor.
Threatened or Endangered Plant Species:		
• Plant Species Listed or Proposed for Listing Under the Endangered Species Act	Not Applicable	Not applicable.
• Declining Species, Species of Concern	Not Applicable	Not applicable.
Noxious and Invasive Plants	Not Applicable	Deep tillage that mixes the surface soil may enhance the growth of noxious and invasive plants. Deep tillage that buries plants and seed deep in the subsoil reduces germination.
Forage Quality and Palatability	Slight Improvement	Deep tillage increases rooting depth and vigor.
Wildfire Hazard	Not Applicable	Not applicable.
ANIMALS - FISH AND WILDLIFE		
Inadequate Food	Not Applicable	Not applicable.
Inadequate Cover/Shelter	Not Applicable	Not applicable.
Inadequate Water	Not Applicable	Not applicable.

Inadequate Space	Not Applicable	Not applicable.
Habitat Fragmentation	Not Applicable	Not applicable.
Imbalance Among and Within Populations	Not Applicable	Not applicable.
Threatened and Endangered Fish and Wildlife Species:		
• Fish and Wildlife Species Listed or Proposed for Listing Under the Endangered Species Act	Neutral	Activities are designed, installed, and mitigated to an extent to maintain or enhance species of concern.
• Declining Species, Species of Concern	Neutral	Activities are designed, installed, and mitigated to an extent to maintain or enhance species of concern.
ANIMALS – DOMESTIC		
Inadequate Quantities and Quality of Feed and Forage	Slight to Moderate Improvement	Forage production may be enhanced by increasing rooting depth and vigor.
Inadequate Shelter	Not Applicable	Not applicable.
Inadequate Stock Water	Not Applicable	Not applicable.
Stress and Mortality	Not Applicable	Not applicable.
HUMAN – ECONOMICS		
Land - Change in Land Use	Not applicable.	Not applicable.
Land – Land in Production	Not applicable	Not applicable.
Capital – Change in Equipment	Moderate increase.	
Capital - Total Investment Cost	Not applicable.	
Capital – Annual Cost	Slight to moderate increase.	
Capital – Credit and Farm Program Eligibility	Situational.	
Labor - Labor	Slight to moderate increase	Slight to moderate increase for performing tillage operations.
Labor – Change in Management Level	Negligible	
Risk - Yield	Slight Decrease	Slight decrease due to improved infiltration and root penetration.
Risk - Flexibility	Slight Decrease	Slight decrease due to more conductive growing conditions.
Risk - Timing	Moderate Increase	Moderate increase - practice should be implemented prior to planting.
Risk – Cash Flow	Slight Increase	Negligible to slight increase due to trips over the field.
Profitability – Change in Profitability	Slight to moderate increase.	
HUMAN - CULTURAL		
Cultural Resources and/or Historic Properties Present or Suspected to be PRESENT	Slight to Substantial Increase	Historic properties below existing plow zone can be adversely effected.
HUMAN – ENERGY		
Depletion of Fossil Fuel Resources	Slight to Moderate Increase	The amount of energy expended depends on depth and frequency of tillage
Underutilization of Non-Fossil Energy Resources	Not Applicable	Not applicable.

Human Considerations Explanation

Considerations	Physical effects indicate:
Land - Change in Land Use	The degree to which implementing the conservation practice is expected to cause a change from one land use to another.
Land - Land in Production	The degree to which implementing the conservation practice is expected to cause an increase or decrease in the amount of land in production.
Capital - Change in Equipment	The degree to which implementing the conservation practice is expected to cause an increase or decrease in the amount of capital equipment required for farm or ranch operations.
Capital - Total Investment Cost	A qualitative measure of the increase in total investment dollars required in order to implement the conservation practice.
Capital - Annual Cost	A qualitative measure of the expected change in annual capital costs required in order to operate and maintain the conservation practice.
Capital - Credit & Farm Program Eligibility	Included to make conservation planners aware of the potential availability of funding for implementing conservation practices.
Labor – Labor	The degree to which implementing the conservation practice is likely to cause an increase or decrease in the total amount of overall farm or ranch labor required for operations.
Labor - Change in Management Level	The degree to which implementing the conservation practice is likely to cause an increase or decrease in the total amount of required active management on a farm or ranch.
Risk – Yield	The degree to which risk, as related to crop or livestock yields, is expected to increase or decrease as a result of implementing the conservation practice.
Risk – Flexibility	The degree to which risk, as related to the flexibility of farm or ranch operations, is expected to increase or decrease as a result of implementing the conservation practice. For example, converting from flood irrigation to a sprinkler system gives a farmer an increase in flexibility of irrigation, which results in a decrease in the level of risk associated with inflexibility of operations.
Risk – Timing	The degree to which risk, as related to the timing of farm or ranch operations, is expected to increase or decrease as a result of implementing the conservation practice.
Risk - Cash Flow	The degree to which risk, as related to cash flow in farm or ranch operations, is expected to increase or decrease as a result of implementing the conservation practice.
Profitability - Change in Profitability	The degree to which farm or ranch profitability is expected to increase or decrease as a result of implementing the conservation practice.
Cultural Resources and/or Historic Properties Present or Suspected to be Present	The degree to which implementation of the conservation practice is expected to increase or decrease the risk of cultural resource disturbance, degradation, or loss.
Depletion of Fossil Fuel Resources	Inefficient use of fossil-originated energy sources (diesel, gasoline, propane, natural gas, coal), lubricants, and other materials.
Underutilization of Non-Fossil Energy Sources	Available and cost-effective alternative energy sources (solar, wind, biofuel, hydroelectric, geothermal) are not being used or are being used inefficiently.