CONSERVATION PRACTICE PHYSICAL EFFECTS WORKSHEET

STATE	Pennsylvania	FIELD OFFICE	Any	DATE	
PRACTICE: Conservation Crop Rotation 328		Baseline Setting:			
		Appropriate Land Use(s): Crop, Hay			

RESOURCES, CONSIDERATIONS AND CONCERNS	**PHYSICAL EFFECTS**	**RATIONALE**
SOIL - EROSION		
Sheet and Rill	Moderate to Substantial Improvement	Maintaining sufficient canopy and residue cover reduces soil detachment by water.
Wind	Moderate to Substantial Improvement	Maintaining sufficient canopy and residue cover reduces soil detachment by wind.
Ephemeral Gully	Slight to Moderate Improvement	Grass and legumes, and high residue crops will reduce soil detachment by concentrated flow.
Classic Gully	Slight Improvement	Rotations with grass and legumes and high residue crops will reduce erosion and runoff.
Streambank	Not Applicable	Not applicable.
Shoreline	Not Applicable	Not applicable.
Irrigation Induced	Slight to Substantial Improvement	Depends on crop rotation, water requirements, cover, and residue production.
Mass Movement	Not Applicable	Not applicable..
Road, Roadsides, and Construction Sites	Not Applicable	Not applicable.
SOIL – CONDITION		
Organic Matter Depletion	Moderate to Substantial Improvement	High residue crops can lead to increased root development and increased soil organic carbon.
Rangeland Site Stability	Not Applicable	Not applicable.
Compaction	Slight to Moderate Improvement	High residue crops and increased rooting depth and development can improve soil structure and penetrate compacted layers.
Subsidence	Neutral	If it affects drainage the practice can have an impact on subsidence.
Contaminants:		
• Salts and other Chemicals	Slight to Moderate Improvement	Salt tolerant crops with high transpiration rates can increase salt uptake and reduce salt content in the root zone.
• Animal Waste and other Organics - N	Moderate to Substantial Improvement	Rotation of crops improves N utilization. Effect is greater if above ground biomass is removed at harvest (e.g., corn silage).
• Animal Waste and other Organics	Moderate to Substantial	Rotation of crops improves P

- P	Improvement	utilization. Effect is greater if above ground biomass is removed at harvest (e.g., corn silage).
• Animal Waste and other Organics - K	Moderate to Substantial Improvement	Rotation of crops improves K utilization. Effect is greater if above ground biomass is removed at harvest (e.g., corn silage).
• Commercial Fertilizer - N	Moderate to Substantial Improvement	Rotation of crops improves N utilization. Effect is greater if above ground biomass is removed at harvest (e.g., corn silage).
• Commercial Fertilizer – P	Moderate to Substantial Improvement	Rotation of crops improves P utilization. Effect is greater if above ground biomass is removed at harvest (e.g., corn silage).
• Commercial Fertilizer – K	Moderate to Substantial Improvement	Rotation of crops improves K utilization. Effect is greater if above ground biomass is removed at harvest (e.g., corn silage).
• Residual Pesticides	Slight to Substantial Improvement	Pesticide use may be reduced due to crop sequence grown.
Damage from Sediment Deposition	Slight to Substantial Improvement	crops that provide more canopy and residue cover will reduce erosion.
WATER – QUANTITY		
Rangeland Hydrologic Cycle	Not Applicable	Not applicable.
Excessive Seepage	Slight Improvement	Improved plant uptake reduces excessive seepage.
Excessive Runoff, Flooding, or Ponding	Slight to Moderate Improvement	Rotations with grass and legumes and high residue crops will reduce erosion and runoff.
Excessive Subsurface Water	Slight Improvement	Rotations with grass and legumes and high residue crops will reduce erosion and runoff.
Drifted Snow	Not Applicable	Not applicable.
Inadequate Outlets	Not Applicable	Not applicable.
Inefficient Water use on Irrigated Land	Slight to Moderate Improvement	Crop rotation balances available water with crop needs.
Inefficient Water use on Non-Irrigated Land	Slight to Moderate Improvement	Crop rotation balances available water with crop needs.
Reduced Capacity of Conveyances by Sediment Deposition	Slight to Substantial Improvement	Rotations with grass and legumes and high residue crops will reduce erosion and runoff.
Reduced Storage of Water Bodies by Sediment Accumulation	Slight to Substantial Improvement	Rotations with grass and legumes and high residue crops will reduce erosion and runoff.
Aquifer Overdraft	Slight Improvement	Increased infiltration may improve aquifer recharge depending on crop rotation

		rooting pattern and biomass production.
Insufficient Flows in Water Courses	Not Applicable	Not applicable.
WATER – QUALITY		
In Groundwater:		
• Harmful Levels of Pesticides	Slight to Moderate Improvement	The action reduces the need for pesticide use by breaking pest lifecycles.
• Excessive Nutrients and Organics	Slight to Moderate Improvement	Nitrogen demanding or deep rooted crops can remove excess nitrogen. Legume in rotation will provide slow release nitrogen and reduce need for additional nitrogen.
• Excessive Salinity	Slight to Moderate Improvement	Suitable crops can take up salts, the amount depending on crop rotation and rooting pattern,
• Harmful Levels of Heavy Metals	Slight Improvement	Suitable crops can take up metals.
• Harmful Levels of Pathogens	Slight to Moderate Improvement	Selected crops increase organic matter, promoting microbial activity which competes with pathogens.
• Harmful Levels of Petroleum	Not Applicable	Not applicable.
In Surface Water:		
• Harmful Levels of Pesticides	Slight to Moderate Improvement	The action reduces the need for pesticide use by breaking pest lifecycles.
• Excessive Nutrients and Organics	Slight to Moderate Improvement	Nitrogen demanding or deep rooted crops can remove excess nitrogen. Legume in rotation will provide slow release nitrogen and reduce need for additional nitrogen.
• Excessive Suspended Sediment and Turbidity	Slight to Moderate Improvement	Depending on crop rotation and biomass produced, crop rotation reduces erosion and runoff which reduces transport of sediment.
• Excessive Salinity	Slight Improvement	The action can reduce erosion and runoff which reduces transport of salts. Some crops may accumulate salts.
• Harmful Levels of Heavy Metals	Slight Improvement	Crop rotation reduces erosion and runoff which reduces transport of heavy metals. Some crops may accumulate heavy metals.
• Harmful Temperatures	Not Applicable	Not applicable.
• Harmful Levels of Pathogens	Slight Improvement	Depending on crop rotation, less erosion and runoff reduces delivery of pathogens.
• Harmful Levels of Petroleum	Not Applicable	Not applicable.
AIR – QUALITY		

Particulate Matter less than 10 Micrometers in Diameter (PM 10)	Slight to Moderate Improvement	The proper selection of crops in the rotation can reduce the generation of fugitive dust.
Particulate Matter less than 2.5 Micrometers in Diameter (PM 2.5)	Slight to Moderate Improvement	The proper selection of crops in the rotation can reduce the generation of fugitive dust.
Excessive Ozone	Neutral	There is a minimal reduction of ozone precursors through reduced surface temperatures offered by shade or ground cover, and minimal biofiltering of ozone concentrations due to interception by vegetation.
Excessive Greenhouse Gas:		
• CO_2 (Carbon Dioxide)	Slight Improvement	Vegetation removes CO2 from the air and stores it in the form of carbon in the plants and soil.
• N_20 (Nitrous Oxide)	Not Applicable	Not applicable.
• CH_4 (Methane)	Not Applicable	Not applicable.
Ammonia (NH_3)	Slight Improvement	Improves nutrient balance in soils
Chemical Drift	Slight to Moderate Improvement	Crop selection may reduce the need for pesticide applications.
Objectionable Odors	Not Applicable	Not applicable.
Reduced Visibility	Slight Improvement	Reduce fugitive dust emissions
Undesirable Air Movement	Not Applicable	Not applicable.
Adverse Air Temperature	Not Applicable	Not applicable.
PLANTS – SUITABLIITY		
Plants not Adapted or Suited	Moderate to Substantial Improvement	Crop selection will be modified to include species better suited to soils and climate.
PLANTS - CONDITION		
Productivity, Health, and Vigor	Moderate to Substantial Improvement	Plants are selected and managed to maintain optimal productivity and health.
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	Slight to Substantial Improvement	Depending on crop rotation, crop rotation creates diversity that may reduce weed pressures, break weed life cycles, and provide competition that would slow the spread of noxious plants.
Forage Quality and Palatability	Not Applicable	Not applicable.
Wildfire Hazard	Not Applicable	Not applicable.
ANIMALS - FISH AND WILDLIFE		
Inadequate Food	Slight to Moderate Improvement	Selected crops and suitable

		rotations may provide more food for wildlife.
Inadequate Cover/Shelter	Slight to Moderate Improvement	Selected crops and suitable rotations may provide more food and cover for wildlife.
Inadequate Water	Not Applicable	Not applicable.
Inadequate Space	Slight to Moderate Improvement	Increased cover will increase space for wildlife. May be used to connect other cover areas.
Habitat Fragmentation	Slight to Moderate Improvement	Increased cover will increase space for wildlife. May be used to connect other cover areas.
Imbalance Among and Within Populations	Slight to Moderate Improvement	Diversifying crops throughout the rotation will diversify habitat.
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 Substantial Improvement	Crop rotation may be designed to add forage crops.
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	Moderate	Moderate, conservation crop added to the crop rotation.
Land – Land in Production	Not applicable	Not applicable
Capital – Change in Equipment	Negligible	
Capital - Total Investment Cost	Not applicable.	
Capital – Annual Cost	Negligible to moderate increase	Negligible to moderate increase, offset by improved soil quality & water holding capacity.
Capital – Credit and Farm Program Eligibility	Situational.	
Labor - Labor	Slight to moderate decrease	Slight to moderate decrease with land taken out of production.
Labor – Change in Management Level	Negligible	
Risk - Yield	Moderate Decrease	Moderate decrease due to improved soil quality, fertility and moisture holding capacity.
Risk - Flexibility	Slight Increase	Slight increase due to required crops in rotation.
Risk - Timing	Substantial Increase	Substantial increase crops should be grown in a planned, recurring sequence.
Risk – Cash Flow	Moderate Increase	Moderate increase to moderate

		increase from changes in yields and costs.
Profitability – Change in Profitability	Situational	Slight increase to moderate decrease.
HUMAN - CULTURAL		
Cultural Resources and/or Historic Properties Present or Suspected to be PRESENT	Not applicable.	Not applicable.
HUMAN – ENERGY		
Depletion of Fossil Fuel Resources	Slight to Substantial Decrease	Depending on the purpose of the practice, a substantial amount of material inputs (eg., fertilizers and pesticides) and/or fossil fuels for harvesting and planting can be saved.
Underutilization of Non-Fossil Energy Resources	No Effect	Biomass crops could be included in the rotation.

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.