SECTION III – D
GUIDANCE DOCUMENTS

2. Examples of Resource Management Systems

Introduction

This section provides examples of **Resource Management Systems (RMS)** that are typically used in Maryland to treat or prevent problems associated with soil, water, air, plant, and animal resources (SWAPA).

An RMS may be prepared for any type of land use. The examples provided in this section focus on land uses commonly associated with agricultural operations. These land uses are:

Cropland

Hayland

Pasture

Woodland

Wildlife Land

Headquarters

Refer to Section V-B of the FOTG for an evaluation of the effects of each example RMS on the SWAPA resources and their associated social, economic, and cultural considerations.

Resource Management Systems (RMS) for Cropland

Example C1 - Existing Condition: Highly erodible cropland fields with classic gully erosion occurring in two areas. The cropping system is continuous corn, conventionally tilled. Fertilizer is applied based on perceived crop needs, without using soil tests to determine soil nutrient levels. A significant amount of Johnsongrass (a noxious weed) is present in several areas. An adjacent downstream landowner is complaining about sediment filling up his pond, which is used by his grandchildren for fishing and swimming.

The following table lists natural resource concerns and associated social, economic, and cultural considerations that have been identified for this planning unit:

RESOURCE	RESOURCE CONSIDERATION	CONCERNS/PROBLEMS
SOIL	Erosion	Sheet and rill Classic gully Soil deposition
	Condition	None identified
WATER	Quantity	None identified
	Quality	Sediment Nutrients
AIR	Quality	None identified
PLANTS	Health and Productivity	Pests (noxious weeds)
ANIMALS	Health and Productivity	Food, cover, and water

OTHER CONSIDERATIONS	CONCERNS/PROBLEMS
Social and Economic Concerns	Long-term productivity High production costs (tillage operations and fertilizer) Use of neighbor's pond impacted by excess sediment (poor quality for fishing and swimming) Aesthetics (water is often muddy)
Cultural Resources	None identified

Typical RMS to Address These Concerns: The rotation will be modified to a no-till corn-soybean rotation, with a winter cover crop planted after corn. The landowner will be taking annual soil tests and applying fertilizer based on a nutrient management plan. Johnsongrass will be controlled based on Maryland Cooperative Extension recommendations. Grassed waterways will be built to replace the existing gullies. A 24-foot filter strip will be installed on the lower end of each field.

Planned Practices:

328 – Conservation Crop Rotation
329 – Residue and Tillage Management - No Till/Strip Till/Direct Seed
340 – Cover Crop
412 – Grassed Waterway
393 – Filter Strip
590 – Nutrient Management
595 – Pest Management

RMS for Cropland (continued)

Example C2 - Existing Condition: Cropland field is relatively flat. A corn-soybean rotation is used. Some areas of the field are poorly drained and adversely affect crop production. During wet seasons, equipment tends to bog down in poorly drained soils. Fertilizer is applied based on perceived crop needs, without using soil tests to determine soil nutrient levels. Pesticide leaching is a concern due to high water tables. Soil texture is predominantly loam.

The following table lists natural resource concerns and associated social, economic, and cultural considerations that have been identified for this planning unit:

RESOURCE	RESOURCE CONSIDERATION	CONCERNS/PROBLEMS
SOIL	Erosion	None identified
	Condition	None identified
WATER	Quantity	Excess subsurface water
	Quality	Sediment
		Nutrients Pesticides
AIR	Quality	None identified
PLANTS	Health and Productivity	Suitability
ANIMALS	Health and Productivity	None identified

OTHER CONSIDERATIONS	CONCERNS/PROBLEMS
Social and Economic Concerns	High production costs (time required to pull equipment out of wet areas, fertilizer costs)
Cultural Resources	None identified

Typical RMS to Address These Concerns: The crop rotation and residue management already meet (and will continue to meet) NRCS conservation practice standards. A nutrient management plan will be developed by Maryland Cooperative Extension to balance crop needs and fertilizer applications. Subsurface drainage will be improved to original design (old system had failed). Pest management will be implemented, including the recommendation that the producer use pesticides with low leaching potential.

Planned Practices:

328 – Conservation Crop Rotation
344 – Residue Management, Seasonal
590 – Nutrient Management
606 – Subsurface Drainage
595 – Pest Management

RMS for Cropland (continued)

Example C3 - Existing Condition: Highly erodible cropland fields with ephemeral gullies in some areas. Plants are stunted and stressed where erosion is severe. The cropping system is grain corn, conventionally tilled, with hay in the rotation. Fertilizer is applied based on perceived crop needs, without using soil tests to determine soil nutrient levels. No pest problems or pesticide concerns were noted. In one field, prehistoric artifacts were observed at the top of the slope.

The following table lists natural resource concerns and associated social, economic, and cultural considerations that have been identified for this planning unit:

RESOURCE	RESOURCE CONSIDERATION	CONCERNS/PROBLEMS
SOIL	Erosion	Sheet and rill Ephemeral gully Soil deposition
	Condition	None identified
WATER	Quantity	None identified
	Quality	Sediment Nutrients
AIR	Quality	None identified
PLANTS	Health and Productivity	Suitability Establishment and Management
ANIMALS	Health and Productivity	None identified

OTHER CONSIDERATIONS	CONCERNS/PROBLEMS
Social and Economic Concerns	Long-term productivity High production costs (tillage operations and fertilizer)
Cultural Resources	Degradation or damage of resources

Typical RMS to Address These Concerns: The tillage method will be modified to no-till farming. The rotation will be modified slightly to allow for contour strips to be installed. A diversion with a grassed waterway outlet is installed to control ephemeral erosion. Soils tests will be taken and fertilizer applied based on a nutrient management plan. Scouting for pests will occur to improve efficiency of control methods.

Planned Practices:

328 – Conservation Crop Rotation
329 – Residue and Tillage Management - No Till/Strip Till/Direct Seed
585 – Stripcropping
362 – Diversion
412 – Grassed Waterway
590 – Nutrient Management
595 – Pest Management

Resource Management System (RMS) for Hayland

Example H1 - Existing Condition: Continuous cool-season grass hay field. The stand is thinning and productivity is low. Soil test results indicate high levels of phosphorus in the soil.

The following table lists natural resource concerns and associated social, economic, and cultural considerations that have been identified for this planning unit:

RESOURCE	RESOURCE CONSIDERATION	CONCERNS/PROBLEMS
SOIL	Erosion	Sheet and rill
	Condition	None identified
WATER	Quantity	None identified
	Quality	Sediment Nutrients
AIR	Quality	None identified
PLANTS	Health and Productivity	Nutrients
ANIMALS	Health and Productivity	None identified

OTHER CONSIDERATIONS	CONCERNS/PROBLEMS
Social and Economic Concerns	Low net return (output compared to input) on the field
Cultural Resources	None identified

Typical RMS to Address These Concerns: The operator will reseed the field, and manage it by properly timing the forage harvest. Annual soil tests will be taken, and fertilizers will be applied based on a nutrient management plan.

Planned Practices:

512 – Pasture and Hay Planting
511 – Forage Harvest Management
590 – Nutrient Management
393 – Filter Strip

Resource Management Systems (RMS) for Pasture

Example P1 - Existing Condition: Overgrazed cool-season grass pasture with weedy patches and bare soil in some areas. Livestock have a sufficient water supply and are fenced out of streams.

The following table lists natural resource concerns and associated social, economic, and cultural considerations that have been identified for this planning unit:

RESOURCE	RESOURCE CONSIDERATION	CONCERNS/PROBLEMS
SOIL	Erosion	Sheet and rill
	Condition	None identified
WATER	Quantity	None identified
	Quality	Sediment Nutrients
AIR	Quality	None identified
PLANTS	Health and Productivity	Nutrients Pests (weeds)
ANIMALS	Health and Productivity	Food

OTHER CONSIDERATIONS	CONCERNS/PROBLEMS
Social and Economic Concerns	None identified
Cultural Resources	None identified

Typical RMS to Address These Concerns: Pastures will be reseeded, followed by proper grazing management. Soil tests will be taken and nutrients applied according to a nutrient management plan. Pests will be identified and controlled based on Maryland Cooperative Extension recommendations.

Planned Practices:

512 – Pasture and Hay Planting
528 – Prescribed Grazing
595 – Pest Management
590 – Nutrient Management

RMS for Pasture (continued)

Example P2 - Existing Condition: Cool-season grass-legume pasture. Some areas of the pasture are heavily grazed and weedy, but cover is generally good. Livestock have unrestricted access to a trout stream, resulting in extensive bank erosion and impaired water quality for fishing. In-stream water quality tests indicate high levels of fecal coliform bacteria.

The following table lists natural resource concerns and associated social, economic, and cultural considerations that have been identified for this planning unit:

RESOURCE	RESOURCE CONSIDERATION	CONCERNS/PROBLEMS
SOIL	Erosion	Sheet and rill
	Condition	None identified
WATER	Quantity	Insufficient water supply
	Quality	Sediment Nutrients and organics Pathogens Aquatic habitat suitability
AIR	Quality	None identified
PLANTS	Health and Productivity	Nutrients Pests (weeds)
ANIMALS	Health and Productivity (Livestock)	Food Water
	Health and Productivity (Fish)	Water

OTHER CONSIDERATIONS	CONCERNS/PROBLEMS
Social and Economic Concerns	Stream use for fishing is impaired
Cultural Resources	None identified

Typical RMS to Address These Concerns: The soils will be tested and nutrients applied based on a nutrient management plan. Better grazing management is planned. Weeds and other pests will be identified and controlled if economically feasible. Animals will be fenced out of the stream, and a spring development and trough will be installed to provide fresh drinking water for livestock. A stream crossing will be installed to provide animals with a stable place to cross the stream. High traffic areas, such as walkways, will be stabilized.

Planned Practices:

528 – Prescribed Grazing
382 – Fence
574 – Spring Development
614 – Watering Facility
578 – Stream Crossing
561 – Heavy Use Area Protection
595 – Pest Management
590 – Nutrient Management

Resource Management Systems (RMS) for Woodland

Example W1 - Existing Condition: An existing woodlot has not been managed. Some valuable trees are present, but there are also invasive species in some areas. No erosion problems or other resource concerns were noted.

The following table lists natural resource concerns and associated social, economic, and cultural considerations that have been identified for this planning unit:

RESOURCE	RESOURCE CONSIDERATION	CONCERNS/PROBLEMS
SOIL	Erosion Condition	None identified
WATER	Quantity Quality	None identified
AIR	Quality	None identified
PLANTS	Health and Productivity	Establishment and management Pests (invasive species)
ANIMALS	Health and Productivity	None identified

OTHER CONSIDERATIONS	CONCERNS/PROBLEMS
Social and Economic Concerns	None identified
Cultural Resources	None identified

Typical RMS to Address These Concerns: A professional forester will be hired to complete a forest stand evaluation and give recommendations for improving the stand. Invasive species will be controlled if economically feasible.

Planned Practices:

666 – Forest Stand Improvement
595 – Pest Management

RMS for Woodland (continued)

Example W2 - Existing Condition: An existing crop field has reduced yields because of shallow soils. It is also becoming difficult to farm because of its location near an expanding urban area. The only access to the field is from a heavily traveled highway.

The following table lists natural resource concerns and associated social, economic, and cultural considerations that have been identified for this planning unit:

RESOURCE	RESOURCE CONSIDERATION	CONCERNS/PROBLEMS
SOIL	Erosion	Sheet and rill
	Condition	None identified
WATER	Quantity	None identified
	Quality	Sediment Nutrients
AIR	Quality	None identified
PLANTS	Health and Productivity	Pests (insects and weeds)
ANIMALS	Health and Productivity	None identified

OTHER CONSIDERATIONS	CONCERNS/PROBLEMS
Social and Economic Concerns	Transporting farm equipment on a heavily used road in an urbanizing area
Cultural Resources	None identified

Typical RMS to Address These Concerns: The existing crop field will be converted to a Christmas tree farm. Grass will be planted prior to tree planting to help control erosion between the rows. Soil will be tested and nutrients applied based on a nutrient management plan. Scouts will assess pest problems and make recommendations for control if economically feasible.

Planned Practices:

612 – Tree/Shrub Establishment
327 – Conservation Cover *(establish grass between the rows)*
590 – Nutrient Management
595 – Pest Management

Example WL1 - Existing Condition: Area is a 3-acre lawn consisting of frequently mowed cool-season grasses. The landowner wants to establish and maintain native warm-season grasses and wildflowers for upland wildlife habitat. Existing turf is dense and is fertilized several times during the growing season based on turf color. No soil tests have been used to determine soil nutrient levels. Insecticides are periodically applied for "preventive" purposes, regardless of whether or not insect pests are actually present.

The following table lists natural resource concerns and associated social, economic, and cultural considerations that have been identified for this planning unit:

RESOURCE	RESOURCE CONSIDERATION	CONCERNS/PROBLEMS
SOIL	Erosion Condition	None identified
WATER	Quantity	None identified
	Quality	Nutrients Pesticides
AIR	Quality	None identified
PLANTS	Health and Productivity	Pests (weeds)
ANIMALS	Health and Productivity	Food and cover

OTHER CONSIDERATIONS	CONCERNS/PROBLEMS
Social and Economic Concerns	Excess fertilizer and insecticide costs
Cultural Resources	None identified

Typical RMS to Address These Concerns: The area will be established to native warm-season grasses beneficial to wildlife. The area will be managed for wildlife habitat. Soil tests will be done before establishment and nutrients will be applied if needed based on test results. Pests will be monitored and controlled if necessary.

Planned Practices:

327 – Conservation Cover
590 – Nutrient Management
595 – Pest Management
645 – Upland Wildlife Habitat Management

RMS for Wildlife Land (continued)

Example WL2 - Existing Condition: A small field of continuous soybeans is gently sloping to a low area at one end of the field. The landowner wants to convert the entire field into a shallow water area (with herbaceous buffer) to provide wetland wildlife habitat. A site investigation revealed the presence of prehistoric artifacts at the high end of the field.

The following table lists natural resource concerns and associated social, economic, and cultural considerations that have been identified for this planning unit:

RESOURCE	RESOURCE CONSIDERATION	CONCERNS/PROBLEMS
SOIL	Erosion	Sheet and rill
	Condition	None identified
WATER	Quantity	None identified
	Quality	Nutrients and organics
AIR	Quality	None identified
PLANTS	Health and Productivity	Pests (weeds)
ANIMALS	Health and Productivity	Food, cover, and water

OTHER CONSIDERATIONS	CONCERNS/PROBLEMS
Social and Economic Concerns	None identified
Cultural Resources	Degradation or damage of resources

Typical RMS to Address These Concerns: The low area of the field will be converted into a shallow water area for wildlife. A small earthen berm will be constructed outside of the area of cultural resources concern. The berm and buffer (including the cultural resources site) will be planted to native warm season grasses and wildflowers. The area will be managed for wildlife. Weeds will be controlled during establishment according to practice recommendations. Pests will be monitored and controlled if necessary based on Maryland Cooperative Extension recommendations.

Planned Practices:

646 – Shallow Water Development and Management
644 – Wetland Wildlife Habitat Management
595 – Pest Management

Resource Management Systems (RMS) for Headquarters

Example HQ1 - Existing Condition: Headquarters at a poultry operation consists of three chicken houses, with the landowner's house nearby. Adjacent neighbors have complained about particulates blown by tunnel fans, and excessive odors. Dead poultry are placed in open area behind the houses, and are usually buried a few days later. Manure/litter from house cleanout is stacked on bare ground where soils have a seasonal high water table. It is periodically hauled off-site for use elsewhere.

The following table lists natural resource concerns and associated social, economic, and cultural considerations that have been identified for this planning unit:

RESOURCE	RESOURCE CONSIDERATION	CONCERNS/PROBLEMS
SOIL	Erosion	Sheet and rill
	Condition	None identified
WATER	Quantity	None identified
	Quality	Nutrients and organics Pathogens
AIR	Quality	Airborne particulates Airborne odors
PLANTS	Health and Productivity	None identified
ANIMALS	Health and Productivity	None identified

OTHER CONSIDERATIONS	CONCERNS/PROBLEMS
Social and Economic Concerns	Quality of life for neighbors
Cultural Resources	None identified

Typical RMS to Address These Concerns: The landowner will install a waste storage structure to store the waste after cleanout, and a composting facility to take care of normal mortality. A windbreak will be established to help control particulates and odors from the tunnel fans.

Planned Practices:

561 - Heavy Use Area Protection
313 - Waste Storage Facility
316 – Animal Mortality Facility
590 - Nutrient Management
633 - Waste Utilization
380 - Windbreak/Shelterbelt Establishment

Note: Use 590 - Nutrient Management and 633 - Waste Utilization on cropland and other land uses where animal waste will be applied.

RMS for Headquarters (continued)

Example HQ2 - Existing Condition: Headquarters at a dairy operation that is milking 200 head. Livestock walkways and loafing areas are very muddy in wet weather, and it is difficult to remove accumulated manure. A significant amount of time is spent preparing cows for milking. Although livestock are fenced out of a stream adjacent to the loafing area, the stream is heavily contaminated with manure runoff from the barnyard. Manure is hauled and spread frequently, usually on a daily basis. Neighbors have complained about odors.

The following table lists natural resource concerns and associated social, economic, and cultural considerations that have been identified for this planning unit:

RESOURCE	RESOURCE CONSIDERATION	CONCERNS/PROBLEMS
SOIL	Erosion	Sheet and rill
	Condition	None identified
WATER	Quantity	None identified
	Quality	Nutrients and organics Pathogens
AIR	Quality	Airborne odors
PLANTS	Health and Productivity	None identified
ANIMALS	Health and Productivity	Growth, reproduction, and condition

OTHER CONSIDERATIONS	CONCERNS/PROBLEMS
Social and Economic Concerns	Quality of life for neighbors Inefficient use of time, labor, and equipment (daily haul, preparing cows for milking)
Cultural Resources	None identified

Typical RMS to Address These Concerns: A stable base material will be installed on livestock walkways and loafing areas. Roof gutters will be installed to divert clean water away from the contaminated barnyard. A waste storage structure will be built to store manure and wastewater. A wastewater treatment strip will be installed downslope from the barnyard to reduce contaminated runoff entering the stream.

Planned Practices:

561 – Heavy Use Area Protection
313 – Waste Storage Facility
558 – Roof Runoff Structure
635 – Wastewater Treatment Strip
590 – Nutrient Management
633 – Waste Utilization

Note: Use 590 - Nutrient Management and 633 - Waste Utilization on cropland and other land uses where animal waste will be applied.

RMS for Headquarters (continued)

Example HQ3 - Existing Condition: Farmstead with no livestock. Heavily used areas around the house and equipment sheds were previously planted to grass, but cover is now sparse and some erosion is occurring. The farm lane is rough and uneven in some spots. Access is difficult in wet weather.

The following table lists natural resource concerns and associated social, economic, and cultural considerations that have been identified for this planning unit:

RESOURCE	RESOURCE CONSIDERATION	CONCERNS/PROBLEMS
SOIL	Erosion	Sheet and rill
	Condition	None identified
WATER	Quantity	None identified
	Quality	Sediment
AIR	Quality	None identified
PLANTS	Health and Productivity	Suitability
ANIMALS	Health and Productivity	None identified

OTHER CONSIDERATIONS	CONCERNS/PROBLEMS
Social and Economic Concerns	Aesthetics (bare areas near the farmstead, rutted lane)
Cultural Resources	None identified

Typical RMS to Address These Concerns: The farm lane will be improved by leveling some areas and diverting water from the lane. Grass species appropriate for the soil type will be planted on areas that are sparse.

Planned Practices:

342 – Critical Area Planting
560 – Access Road