A. SOIL

A.1. Erosion

A.1.a, A.1.b, and A.1.f. Sheet and Rill, Wind and Irrigation Induced

DEFINITION: The movement of soil from wind and water forces. Irrigation-induced includes erosion that is caused by excessive amounts and/or velocities of water in row, furrow, and sprinkler activities or by water conveyances and tracks from center pivots and traveling guns. On lands supporting native vegetation, soil erosion can be exacerbated by loss of native or desirable plant cover and/or soil micro-biotic crusts. Permanent alteration of native or desirable plant communities can be attributed to loss of the soil surface horizon.

Erosion Field Application Indicator Tools	RMS Quality Criteria Level-Quantitative	RMS Quality Criteria Level-Qualitative
RUSLE+WEQ	<= T for the planned rotation (Tons/Acre/Year)	The composite erosion rate for sheet and rill, wind, and irrigation-induced erosion will be at a rate that is agronomically feasible and sustains the soil resource.

A.1.c. Ephemeral Gully/Concentrated Flow

DEFINITION: Concentrated flow channels along depressional watercourses that begin where overland flows, including rills, converge. Concentrated flow channels can usually be obscured by tillage operations. Channels that cannot be repaired with normal tillage operations are classic gullies.

TARGET: ***Cropland;*** **No excessive erosion.**

INDICATORS:

Ephemeral Gully/Concentrated Flow Cropland Field Application Indicator Tools	RMS Quality Criteria Level-Quantitative	RMS Quality Criteria Level-Qualitative
Visual inspection		Tools and observation indicate the absence of concentrated flow channels. Alternatively, tools and observation indicate potential concentrated flow channels do not require tillage or maintenance more extensive than on the remaining treatment unit. Tools and observation identify concentrated flow concern areas. Treatment provides control of excessive concentrated flow erosion. No recent formation of rills is observed. Old rills have blunted or muted features.
Client interview		
Aerial photograph interpretation		
Allowable Velocity Procedure (see Chapter 7, Engineering Field Manual)	Actual **"V" <= 2.5 fps** for the runoff from a 2 year-24 hour event	

TARGET: ***All Other Land;*** **No discernable erosion.**

Ephemeral Gully/Concentrated Flow Field Application Indicator Tools	RMS Quality Criteria Level-Quantitative	RMS Quality Criteria Level-Qualitative

Visual inspection	No recent formation of rills; old rills have blunted or muted features.	*All other lands* No discernable erosion. Tools and observation indicate the absence of active concentrated flow channels on the site. Tools and observation identify any concentrated flow concerns and erosion is controlled by treatment methods selected.
Client interview	No recent formation of rills; old rills have blunted or muted features.	

A.1.d. Classic Gully

DEFINITION: Gullies are channels that may grow or enlarge from year to year by headcutting, channel degradation, and lateral widening. Gullies are too deep to be erased by normal tillage operations.

Classic Gully Field Application Indicator Tools	RMS Quality Criteria Level-Quantitative	RMS Quality Criteria Level-Qualitative
Visual inspection		*Cropland* Tools and observation will use storm events with greater than a ten-year, 24-hour frequency. Tools and observation identify gully erosion areas and gully erosion is controlled by treatment methods selected. Head cutting is stopped, gully side slopes are stabilized, and no active erosion occurs in the channel bottom.
Geologic investigation		
TR20 (storm event Q-runoff)		
Aerial photo interpretation		
Direct Volume Method		
Client interview		

A.1.e. Streambank

DEFINITION: Collapse or mass failure of banks caused by channel constriction, unstable soils, flow obstructions (ice, debris, structures, etc.), or unstable channel bottom.

Streambank Erosion Field Application Indicator Tools	RMS Quality Criteria Level-Quantitative	RMS Quality Criteria Level-Qualitative
Visual inspection		*All Land Uses* Streambanks are stable and not subject to accelerated erosion. Tools and observation will consider bankful discharges, as well as storm events with a greater than ten-year frequency. Tools and observations identify streambank erosion hazard areas and streambank erosion is controlled by the treatment methods selected.
Client interview		
Direct Volume Method		
Aerial photo interpretation		
Geologic investigation, including stream geomorphology		
Lateral Recession Rate Procedure	Index of <=5	These procedures are applicable to most land uses. They require specialized training to get consistent results. The planner is responsible for selecting the appropriate method, and being familiar with the technique.
Bank Height Ratios	BHR <=1.1	
Bank Erodibility Hazard Rating Guide-BEHI	Very Low or Low Rating	
Channel Stability Evaluation	Reach Score of Medium Good to Excellent	
(Factors contributing to unacceptable conditions must be outside the control of the manager)		

A.1.g. Soil Mass Movement

DEFINITION: Soil slippage, landslides, or slope failure, normally on hillsides, in deep cuts or through unstable soil on sloping land that creates a large volume of soil movement.

Soil Mass Movement Field Application Indicator Tools	RMS Quality Criteria Level-Quantitative	RMS Quality Criteria Level-Qualitative
Soil Survey		The land and water management systems shall provide treatment to prevent or minimize soil mass movement. Tools and observations indicate that human inputs and activities do not undercut toe slopes or overload the tops of slopes. This applies to all areas with slopes >15%.
Geologic investigation		
Visual inspection		

A.1.h. Roadbanks, Construction Sites, and Scoured Areas

DEFINITION: The erosion as identified is causing problems and damage, both onsite and offsite.

Roadbanks and Construction Sites Erosion Field Application Indicator Tools	RMS Quality Criteria Level-Quantitative	RMS Quality Criteria Level-Qualitative
Visual inspection	Tools and observation result in treatment that meets the air and water quality resource concern quality criteria.	Roadbanks show no visible erosion and banks are stable. Construction sites are stabilized with vegetative or other materials as needed, so that no discernable sediment is leaving the site. Areas subject to wind and/or water scour erosion more frequently than one year in ten shall be adequately protected or stabilized. Tools and observation identify areas of excessive erosion or areas with high erosion potential. Erosion is controlled by the treatment methods selected.
Erosion Prediction Tools: RUSLE- WEQ, WEPP		
Client interview		

A.1.i. Tillage

DEFINITION: The downslope displacement of soil through the action of tillage operations (preparation of ground for planting via mechanical means).

Tillage Erosion Field Application Indicator Tools	RMS Quality Criteria Level-Quantitative	RMS Quality Criteria Level-Qualitative
Gross Erosion Technique		The land and water systems shall provide treatment to prevent or minimize downslope movement of soil. Tools and observation identify areas of excessive erosion or areas with high erosion potential. Erosion is controlled by the treatment methods selected.
Direct Volume Method		

A.2. Condition

A.2.a. Soil Tilth, Crusting, Water Infiltration, Organic Matter

DEFINITION: Unsuitable soil tilth. Soil tilth is the condition of the soil based on suitable combinations of mineral, air, water, and organic mater, resulting in a proper medium in which microbial activity and chemical reactions can occur.

Soil Condition-Soil Tilth, Crusting, Water Infiltration, & Organic Matter Field Application Indicator Tools	RMS Quality Criteria Level-Quantitative	RMS Quality Criteria Level-Qualitative
Guideline for Soil Quality Assessment in Conservation Planning. http://www.statlab.iastate.edu/survey/SQI/pdf/Assess.pdf		Soil organic matter trends will be stable or increasing.
Soil Test Field Observation	Soil organic matter levels will not decline more than 1%	

A.2.b. Compaction

DEFINITION: Compaction is excessive compressing of soil particles and aggregates by machine, livestock and natural consolidation, thereby affecting plant-soil-moisture-air relationships.

Soil Compaction Field Application Indicator Tools	RMS Quality Criteria Level-Quantitative	RMS Quality Criteria Level-Qualitative
Penetrometer	Tools and observations will indicate that compaction layers are infrequent (<=20% of the areas inspected), thin (< 1 inch thick) and weakly restrictive to water movement and root penetration (Pans will exhibit some penetration by the roots of the existing plant cover).	The soil will have no adverse tillage-pan or compaction-pan pressure, which reduces water infiltration or restricts rooting depth for plants.
Shovel		
Visual inspection		
Bulk density measurement		
Auger		

A.2.c, A.2.d, A.2.e and A.2.f. Soil Contaminants: Excess Chemicals, Animal Waste and other Organics, Fertilizer, Pesticides.

DEFINITION: Soil contamination is excess chemical content, salinity, selenium, boron, and heavy metals that restrict the desired use of the soil. Contaminants include desirable and undesirable chemical elements in either organic or inorganic forms.

Soil Contaminants Field Application Indicator Tools	RMS Quality Criteria Level-Quantitative	RMS Quality Criteria Level-Qualitative
Soil test		Soil contaminants are absent, or present at levels that do not adversely affect other resources. Application of all organics and chemicals will be in adherence to all federal, state, and local laws. Tools and observation indicate the desired land use does not require management or maintenance more extensive than those on similar soils do. Plant production is not limited by excessive soil contaminants.
Visual inspection		
Leaching Index		
Phosphorus Index		
Screening Tool-Farm-A-Syst		
Pesticide Screening tool-NAPRA		
Soil test (Electrical Conductivity-Ec)		
Pesticide Screening tool-WIN-PST		
Plant response		

A.3. Deposition

A.3.a, A.3.b, A.3.c, and A.3.d Damage Onsite and Offsite; Safety Onsite and Offsite

DEFINITION:
A.3.a: Deposition is the eroded material that has been moved and redeposited to another site. Need to rework ground because of sediment thickness and distribution; crops destroyed; and infertile deposition, especially for coarse textured sediment.
A.3.b: Same as onsite damage (A.3.a). Offsite practice effects are presently less than onsite because of increased distance from source problem.
A.3.c: Deposition on roads and railroads that cause accidents, loss of life, and loss of access for emergency vehicles.
A.3.d: Same as onsite safety (A.3.c). Offsite practice effects are presently less than onsite because of increased distance from source problem.

Deposition Damage and Safety Field Application Indicator Tools	RMS Quality Criteria Level-Quantitative	RMS Quality Criteria Level-Qualitative
Visual inspection		No visual or measurable damage to property, crops, land, or water is apparent. Safety hazards are minimized. Tools and observation identify depositional/damage areas and sources. Excessive deposition/damage is controlled by the treatment methods selected.
Client interview		
Sediment loss from field		