

## Part 600 – National Planning Procedures Handbook

### Subpart H – Exhibits

#### 600.70 Exhibit 1 – Sample Resource Concern Checklist

Tailor to Meet State, Tribal, Territorial or Local Needs

Note: Items protected by Federal Law, Executive Order, etc., such as threatened and endangered species, cultural resources/historical properties, and other items of like nature must remain on the checklist.

#### Checklist of Resource Concerns – *Examples in Italics*

##### Soil Erosion – Sheet and Rill, Wind, Concentrated Flow, Shoreline, Bank, and Channel

Concern	Extent
<i>Sheet and Rill</i>	<i>Visible rills in 50 percent of the crop fields</i>
<i>Streambank</i>	<i>Tillage operations within 5 feet of Streambank, few random trees</i>

##### Soil Quality/Health – Subsidence, Compaction, Organic Matter Depletion, Salts and Chemicals

Concern	Extent
<i>Organic Matter Depletion</i>	<i>Residue regularly harvested from corn fields for livestock bedding</i>

##### Water Quality – Excess Nutrients, Pesticides, Pathogens, Excess Salt, Petroleum, Heavy Metals, Excess Sediment, Elevated Temperature

Concern	Extent
<i>Elevated Temperature</i>	<i>Trout stream void of shade trees</i>

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**Water Quantity** – Ponding, Flooding, Drifted Snow, Seeps, Inefficient Moisture Management, Inefficient Use of Irrigation Water

Concern	Extent
<i>No evidence of a concern</i>	

**Air Quality** – Particulate Matter, Greenhouse Gases (GHGs), Ozone Precursors, Odors

Concern	Extent
<i>Odors</i>	<i>Client reports neighbors complain when the manure pit is agitated</i>

**Plants** – Plant Productivity and Health, Inadequate Structure and Composition, Excessive Pest, Wildfire Hazard

Concern	Extent
<i>Excessive Pest</i>	<i>Noxious weeds present throughout pasture</i>

**Animals** – Wildlife Habitat Degradation, Inadequate Livestock Feed and Forage, Inadequate Livestock Shelter, Inadequate Livestock Water

Concern	Extent
<i>Inadequate Livestock Feed and Forage</i>	<i>Supplemental livestock feeding begins in June</i>
<i>Wildlife Habitat Degradation</i>	<i>Client interested in improving trout stream habitat</i>

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**Energy** – Equipment and Facilities, Field Operations

<b>Concern</b>	<b>Extent</b>
<i>Field Operations</i>	<i>Client concerned about rising fuel costs, open to reduced tillage alternatives</i>

**Human – Economics** – Land, Labor, Capital, Management Level, Risk, Profitability, Other

<b>Concern</b>	<b>Extent</b>
<i>Risk</i>	<i>Client concerned about nutrient management regulations preventing historic nutrient application levels and timing</i>

**Human – Social** – Cultural Resource or Historic Property, Client Characteristics, Community Characteristics, Other

<b>Concern</b>	<b>Extent</b>
<i>Community Characteristics</i>	<i>Client’s community prohibits participation in financial assistance programs. Limited to technical assistance.</i>

**600.71 Exhibit 2 – Environmental Effects for Conservation Plans and Areawide Conservation Plans**

- A. Form NRCS-CPA-52, instructions and a worksheet can be found on the NRCS National Environmental Compliance Web site.
- B. Copy of the blank form NRCS-CPA-52

U.S. Department of Agriculture Natural Resources Conservation Service		NRCS-CPA-52 6/2010		A. Client Name:		
<b>ENVIRONMENTAL EVALUATION WORKSHEET</b>				B. Conservation Plan ID # (as applicable): Program Authority (optional):		
D. Client's Objective(s) (purpose):			C. Identification # (farm, tract, field #, etc as required):			
E. Need for Action:	G. Alternatives					
	No Action	✓ if RMS	Alternative 1	✓ if RMS	Alternative 2	✓ if RMS
<b>Resource Concerns</b>						
In Section "F" below, analyze, record, and address concerns identified through the Resources Inventory process. (See FOTG Section III - Resource Quality Criteria for guidance).						
F. Resource Concerns and Existing / Benchmark Conditions (Analyze and record the existing/benchmark conditions for each identified concern)	H. Effects of Alternatives					
	No Action	✓ if does NOT meet QC	Alternative 1	✓ if does NOT meet QC	Alternative 2	✓ if does NOT meet QC
	Amount, Status, Description (short and long term)		Amount, Status, Description (short and long term)		Amount, Status, Description (short and long term)	
<b>SOIL</b>		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC
		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC
		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC
<b>WATER</b>		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC
		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC
		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC

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F. Resource Concerns and Existing / Benchmark Conditions (Analyze and record the existing/benchmark conditions for each identified concern)	H. (continued)					
	No Action		Alternative 1		Alternative 2	
	Amount, Status, Description (short and long term)	√ if does NOT meet QC	Amount, Status, Description (short and long term)	√ if does NOT meet QC	Amount, Status, Description (short and long term)	√ if does NOT meet QC
<b>AIR</b>		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC
		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC
		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC
<b>PLANTS</b>		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC
		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC
		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC
<b>ANIMALS</b>		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC
		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC
		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC		NOT meet <input type="checkbox"/> QC
<b>HUMAN - Economic and Social Considerations</b>						

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Special Environmental Concerns: Environmental Laws, Executive Orders, policies, etc.						
In Section "I" complete and attach applicable Environmental Procedures Guide Sheets for documentation. Items with a "•" may require a federal permit or consultation/coordination between the lead agency and another government agency. In these cases, effects may need to be determined in consultation with another agency. Planning and practice implementation may proceed for practices not involved in consultation.						
I. Special Environmental Concerns (Document compliance with Environmental Laws, Executive Orders, policies, etc.)	J. Impacts to Special Environmental Concerns					
	No Action		Alternative 1		Alternative 2	
	Status and progress of compliance. (Complete and attach Guide Sheets as applicable)	√ if needs further action	Status and progress of compliance. (Complete and attach Guide Sheets as applicable)	√ if needs further action	Status and progress of compliance. (Complete and attach Guide Sheets as applicable)	√ if needs further action
•Clean Air Act		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
•Clean Water Act / Waters of the U.S.		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
•Coastal Zone Management		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Coral Reefs		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
•Cultural Resources / Historic Properties		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
•Endangered and Threatened Species		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Environmental Justice		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
•Essential Fish Habitat		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Floodplain Management		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Invasive Species		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
•Migratory Birds/Bald and Golden Eagle Protection Act		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Prime and Unique Farmlands		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Riparian Area		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
•Wetlands		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
•Wild and Scenic Rivers		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
K. Other Agencies and Broad Public Concerns	No Action		Alternative 1		Alternative 2	
Easements, Permissions, Public Review, or Permits Required and Agencies Consulted.						

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K. (continued) Other Agencies and Broad Public Concerns		No Action	Alternative 1	Alternative 2
Cumulative Effects Narrative (Describe the cumulative impacts considered, including past, present and known future actions regardless of who performed the actions)				
L. Mitigation				
M. Preferred Alternative	Preferred alternative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Supporting reason			
N. Context (Record context of alternatives analysis)				
The significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality.				
O. Determination of Significance or Extraordinary Circumstances				
Intensity: Refers to the severity of impact. Impacts may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.				
If you answer ANY of the below questions "yes" then contact the State Environmental Liaison as there may be extraordinary circumstances and significance issues to consider and a site specific NEPA analysis may be required.				
Yes	No			
<input type="checkbox"/>	<input type="checkbox"/>	• Is the preferred alternative expected to cause significant effects on public health or safety?		
<input type="checkbox"/>	<input type="checkbox"/>	• Is the preferred alternative expected to significantly effect unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?		
<input type="checkbox"/>	<input type="checkbox"/>	• Are the effects of the preferred alternative on the quality of the human environment likely to be highly controversial?		
<input type="checkbox"/>	<input type="checkbox"/>	• Does the preferred alternative have highly uncertain effects or involve unique or unknown risks on the human environment?		
<input type="checkbox"/>	<input type="checkbox"/>	• Does the preferred alternative establish a precedent for future actions with significant impacts or represent a decision in principle about a future consideration?		
<input type="checkbox"/>	<input type="checkbox"/>	• Is the preferred alternative known or reasonably expected to have potentially significant environment impacts to the quality of the human environment either individually or cumulatively over time?		
<input type="checkbox"/>	<input type="checkbox"/>	• Will the preferred alternative likely have a significant adverse effect on ANY of the special environmental concerns? Use the Evaluation Procedure Guide Sheets to assist in this determination. This includes, but is not limited to, concerns such as cultural or historical resources, endangered and threatened species, environmental justice, wetlands, floodplains, coastal zones, coral reefs, essential fish habitat, wild and scenic rivers, clean air, riparian areas, natural areas, and invasive species.		
<input type="checkbox"/>	<input type="checkbox"/>	• Will the preferred alternative threaten a violation of Federal, State, or local law or requirements for the protection of the environment?		
P. The information recorded above is based on the best available information:				
In the case where a non-NRCS person (i.e. a TSP) assists with planning they are to sign the first signature block and then NRCS is to sign the second block as the responsible federal agency for the planning action.				
<input type="text"/>		<input type="text"/>	<input type="text"/>	<input type="text"/>
Signature (TSP if applicable)		Title	Date	
<input type="text"/>		<input type="text"/>	<input type="text"/>	<input type="text"/>
Signature (NRCS)		Title	Date	

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The following sections are to be completed by the Responsible Federal Official (RFO)		
<b>Q. NEPA Compliance Finding (check one)</b>		
The preferred alternative:		Action required
<input type="checkbox"/>	1) is <b>not a federal action</b> where the agency has control or responsibility.	Document in "R.1" below. No additional analysis is required
<input type="checkbox"/>	2) is a federal action that is <b>categorically excluded</b> from further environmental analysis <b>and</b> there are no <b>extraordinary circumstances</b> .	Document in "R.2" below. No additional analysis is required
<input type="checkbox"/>	3) is a federal action that has been <b>sufficiently analyzed</b> in an existing Agency state, regional, or national NEPA document <b>and</b> there are no predicted <b>significant adverse environmental effects or extraordinary circumstances</b> .	Document in "R.1" below. No additional analysis is required.
<input type="checkbox"/>	4) is a federal action that has been sufficiently analyzed in another Federal agency's NEPA document (EA or EIS) that addresses the proposed NRCS action and its' effects <b>and has been formally adopted by NRCS</b> . NRCS is required to prepare and publish the agency's own Finding of No Significant Impact for an EA or Record of Decision for an EIS when adopting another agency's EA or EIS document. <b>Note: This box is not applicable to FSA.</b>	Contact the State Environmental Liaison for list of NEPA documents formally adopted and available for tiering. Document in "R.1" below. No additional analysis is required
<input type="checkbox"/>	5) is a federal action that has <b>NOT</b> been sufficiently analyzed or may involve predicted significant adverse environmental effects or extraordinary circumstances and may require an EA or EIS.	Contact the State Environmental Liaison. Further NEPA analysis required.
<b>R. Rationale Supporting the Finding</b>		
<b>R.1</b> Findings Documentation		
<b>R.2</b> Applicable Categorical Exclusion(s) (more than one may apply)		
<i>I have considered the effects of the alternatives on the Resource Concerns, Economic and Social Considerations, Special Environmental Concerns, and Extraordinary Circumstances as defined by Agency regulation and policy.</i>		
<b>S. Signature of Responsible Federal Official:</b>		
<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>
Signature	Title	Date
<b>Additional notes</b>		

C. List of Special Environmental Concerns

**Clean Air Act, Criteria Pollutants**  
**Clean Air Act, Regional Visibility Degradation**  
**Clean Water Act**  
**Coastal Zone Management Areas**  
**Coral Reefs**  
**Cultural Resources**  
**Endangered and Threatened Species**  
**Environmental Justice**  
**Essential Fish Habitat**  
**Floodplain Management**  
**Invasive Species**  
**Migratory Birds**  
**Prime and Unique Farmlands**  
**Riparian Areas**  
**Wetlands**  
**Wild and Scenic Rivers**



## Special Environmental Concerns

# Clean Air Act Criteria Pollutants

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

Clean Water Act

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### CLEAN AIR ACT - Criteria Pollutants

“Criteria pollutants” for agriculture are excessive concentrations of particulate matter and ozone in the atmosphere that may adversely impact human health.

#### What is it?

Criteria pollutants are those contaminants in the atmosphere for which U.S. EPA has used health-based criteria to establish National Ambient Air Quality Standards (NAAQS). The U.S. EPA has currently promulgated NAAQS for six criteria air pollutants, but the primary criteria pollutants of concern for agriculture are particulate matter and ozone.

#### Why is it important?

The NAAQS are intended to represent the maximum concentration of a particular pollutant in the ambient air that will not adversely impact public health or welfare, which includes aesthetic, economic, and other non-health effects. Areas that are designated as nonattainment, meaning that concentrations of a criteria pollutant are not in compliance with the NAAQS, are subject to greater regulatory scrutiny than areas that are in compliance with the NAAQS (i.e., attainment areas). Sources that are considered to contribute to an area’s nonattainment status will be subject to more stringent control and permitting requirements. Requirements for each nonattainment area vary and are tailored to the specific needs of the nonattainment area.

#### What can be done about it?

Ozone is not typically emitted directly from air pollutant emission sources. Rather, it is formed in the atmosphere by chemical reactions. As such, emissions of oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOCs) are regulated as precursors to ozone formation instead. Particulate matter may be either emitted directly, such as dust or smoke, or formed in the atmosphere from other pollutants, such as ammonia, NO<sub>x</sub>, VOCs, and sulfur dioxide (SO<sub>2</sub>). Agriculture does not produce significant amounts of SO<sub>2</sub>, so reducing emissions of directly-emitted particulate matter, NO<sub>x</sub>, ammonia, and VOCs from agricultural sources will help to mitigate agriculture’s contribution to concentrations of particulate matter and ozone in the ambient air.

### Clean Air Act - Criteria Pollutants at a Glance

Problems / Indicators - Nonattainment area for ozone and/or particulate matter	
Causes	Solutions
<ul style="list-style-type: none"> <li>Dust emissions</li> <li>Poor smoke management</li> <li>Wind erosion</li> <li>Ammonia release</li> <li>VOC emissions</li> <li>NO<sub>x</sub> emissions</li> </ul>	<ul style="list-style-type: none"> <li>Dust control, windbreaks</li> <li>Proper smoke management</li> <li>Maintain surface residue/cover</li> <li>Proper manure management</li> <li>Proper nutrient management</li> <li>Follow state/local permitting guidance and procedures</li> </ul>



## Special Environmental Concerns

# Clean Air Act

## Regional Visibility Degradation

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

Clean Water Act

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Environmental  
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### CLEAN AIR ACT - Regional Visibility Degradation

The Clean Air Act recognizes the issue of “regional visibility degradation” as excessive concentrations of particulate matter and other pollutants in the atmosphere that degrade visibility in national parks and other “Class I areas”.

#### What is it?

Regional visibility degradation occurs when concentrations of particulate matter, oxides of nitrogen (NO<sub>x</sub>), and sulfur dioxide (SO<sub>2</sub>) in the atmosphere hinder the ability to view distant objects or vistas. Of these, the primary visibility-degrading pollutants of concern for agriculture are particulate matter and NO<sub>x</sub>.

#### Why is it important?

Class I areas are areas of national or regional natural, scenic, recreational, or historic value that are given special protection under the Clean Air Act. One of these special protections is preservation of the visibility of scenic vistas within the Class I areas. EPA has developed the Regional Haze Rule that directs states to establish goals for improving visibility in national parks and wilderness areas. States are required to develop long-term strategies for reducing emissions of air pollutants that cause visibility impairment. The goals and requirements vary by state and by Class I area.

#### What can be done about it?

Reducing agricultural emissions that contribute to increased concentrations of particulate matter and NO<sub>x</sub> in the air, especially from sources near a Class I area, will help mitigate agriculture’s contribution to regional haze issues. These emissions include directly-emitted particulate matter, such as dust and smoke, and NO<sub>x</sub>. Additionally, emissions of ammonia and volatile organic compounds (VOCs), as well as NO<sub>x</sub>, can contribute to fine particulate matter formation in the atmosphere. Many common NRCS practices can be used address agriculture’s contribution to regional visibility degradation by reducing emissions of these pollutants.

### Clean Air Act - Regional Visibility Degradation at a Glance

Problems / Indicators - Regional haze and poor visibility of scenic areas	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Dust emissions</li> <li>• Poor smoke management</li> <li>• Wind erosion</li> <li>• NO<sub>x</sub> emissions</li> <li>• Ammonia emissions</li> <li>• VOC emissions</li> </ul>	<ul style="list-style-type: none"> <li>• Dust control, windbreaks</li> <li>• Proper smoke management</li> <li>• Maintain surface residue/cover</li> <li>• Proper maintenance and operation of combustion sources</li> <li>• Proper nutrient and manure management</li> <li>• Reductions in pesticide use</li> </ul>



## Special Environmental Concerns

# Clean Water Act

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

Clean Water Act

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### CLEAN WATER ACT AND WATERS OF THE U.S.

The Federal Water Pollution Control Act of 1972 is today known as the Clean Water Act (CWA). The U.S. Army Corps of Engineers (Corps) and the States administer the various sections of the CWA with the oversight of the Environmental Protection Agency (EPA).

#### What is it?

The CWA established several programs to regulate and reduce discharges of pollutants into waters of the United States (including wetlands). Although the list of pollutants is long, those most frequently associated with the term include fill material, sediment, excess nutrients, and harmful bacteria. Although the landowner is responsible for obtaining appropriate permits prior to project implementation, NRCS often assists to expedite the coordination process.

#### Why is it important?

Section 404 of the CWA is the section that most often affects NRCS activities, although consideration must also be given to Sections 401, 402, and 303. Close coordination throughout the planning process can prevent significant delays in processing the permit application.

**Section 404:** Established a permit program to regulate the discharge of dredged and fill material into waters of the U.S. Discharge of dredged or fill material into waters of the U.S. is prohibited unless the action is exempted or is authorized by a permit issue by the Corps or by the State.

**Section 401:** Requires that before a 404 permit can be issued for an activity, the State (or Tribe) in which the activity will occur must certify that the activity will not violate State water quality standards (Section 401 State Water Quality Certification)

**Section 402:** Establishes the National Pollutant Discharge Elimination System (NPDES) Program, which the States also administer. This requires a permit for sewer discharges and storm water discharges from developments, construction sites, or other areas of soil disturbance.

**Section 303:** Requires States, territories, and Tribes to identify “impaired waters” and to establish total maximum daily loads (TMDLs).

#### What can be done about it?

To effectively fulfill our Section 404 responsibilities to the CWA and to prevent project delays, coordination with the Corps, EPA and/or appropriate State agencies is essential. Along with ensuring that the landowner obtains appropriate permits, NRCS should also consider impacts of proposed actions on streams included on States’ 303(d) lists and plan accordingly.

### Clean Water Act and Waters of the U.S. at a Glance

Problems / Indicators - Potential discharges of pollutants into waters of the U.S.	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Ground disturbing activities near U.S. Waters</li> <li>• Riparian activities</li> <li>• In-stream/aquatic activities</li> <li>• Wetland conversions/alterations/land clearing</li> <li>• Water or waste discharges</li> </ul>	<ul style="list-style-type: none"> <li>• Maintaining adequate surface cover/residue</li> <li>• Follow permitting guidance and procedures</li> <li>• Consultation with USFWS and/or NMFS</li> <li>• Proper nutrient and pest management</li> <li>• Incorporate mitigation measures in conservation plan</li> </ul>



## Special Environmental Concerns

# Coastal Zone Management Areas

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

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### COASTAL ZONE MANAGEMENT AREAS

Coastal zone management areas (CZMAs) are areas located within or near the officially designated “coastal zone” of a State. The National Oceanic and Atmospheric Administration’s (NOAA’s) Office of Coastal Zone Management approves coastal programs, and not all coastal States have a CZMA.

#### What is it?

CZMAs are: 1) coastal waters and adjacent shorelines, including the lands or waters inside and under those zones, and 2) areas that strongly influence adjacent coastal zones of the 35 States that have coastal zone management programs. Examples include “transitional” and intertidal areas, such as salt marshes, freshwater wetlands, and beaches, and also connecting waters, harbors, and estuarine areas, such as bays, shallows, and marshes, as well as those waters adjacent to the shorelines, including but not limited to sounds, bays, lagoons, bayous, ponds, and the estuaries themselves. CZMAs can extend seaward to the outer limit of the United States territorial sea (generally 200 miles). Inland, the coastal area extends only to the extent necessary to control land uses that have a direct and significant impact (effect) on coastal waters.

#### Why is it important?

Section 307 of the Coastal Zone Management Act specifies that actions or activities within the coastal zone done by a Federal agency or on behalf of or through a Federal agency must be consistent with the State’s coastal zone management plan. Therefore, NRCS planning must be consistent with the State’s coastal plan and be in concert with the goals, tenets, and objectives of that plan. On March 9, 1993, a letter was jointly signed by the Soil Conservation Service, the Agricultural Stabilization and Conservation Service, and the Extension Service setting forth the policies for enforcement and adoption of science- and technology-based land-management measures that eliminate or control nonpoint sources of pollution.

#### What can be done about it?

A current registry of CZMAs in each state should be kept in the Technical Guide. Guidance on nonpoint source pollution matters in the coastal zone is contained in EPA’s “Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters” (EPA 840-B-92-002), issued in response to the Coastal Zone Act Reauthorization Amendments (CZARA) of 1990.

### Coastal Zone Management Areas at a Glance

Problems / Indicators - Proposed action is inconsistent with State’s coastal zone management plan	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Soil Erosion (short and/or long term)</li> <li>• CAFO contaminates (or other point sources)</li> <li>• Improper nutrient and/or pesticide application</li> <li>• Improper livestock grazing management</li> <li>• Improper irrigation water management</li> <li>• Other point and non-point source pollution</li> </ul>	<ul style="list-style-type: none"> <li>• Residue Management</li> <li>• Cover Crops</li> <li>• Comprehensive Nutrient Management Plan</li> <li>• NPDES permit</li> <li>• Irrigation Water Management</li> <li>• Prescribed Grazing</li> </ul>



## Special Environmental Concerns

# Coral Reefs

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### CORAL REEFS

The term “Coral reefs” is defined as the species, habitats, and other natural resources associated with coral reefs in all maritime areas and zones subject to the jurisdiction or control of the United States (e.g., Federal, State, territorial, or commonwealth waters), including reef systems in the South Atlantic, Caribbean, Gulf of Mexico, and Pacific Ocean. Coral reefs are also waters of the U.S. as defined in the Clean Water Act and are subject to Section 404 permit requirements.

#### What is it?

Coral reefs are among the most diverse and valuable ecosystems on Earth. They are extremely vulnerable to harmful environmental changes, particularly those resulting from human activities. One of the primary threats to U.S. coral reefs is pollution from land-based sources, including runoff of nutrients and sediments from watersheds adjacent to near-shore coral reef ecosystems. Present estimates are that 10 percent of all coral reefs are degraded beyond recovery; 30 percent are in critical condition and may die within 10 to 20 years, and if current conditions continue unabated another 30 percent may perish completely by 2050.

#### Why is it important?

Executive Order (E.O.) 13089, Coral Reef Protection, was issued in 1998 in recognition of the importance of conserving coral reef ecosystems. The E.O. created a Coral Reef Task Force whose membership is comprised of 11 Federal agencies, including the Secretary of Agriculture. The E.O. policy states that agencies will utilize their programs and authorities to protect and enhance the conditions of coral reef ecosystems and, to the extent permitted by law, ensure that any actions authorized, funded, or carried out by the agency will not degrade these ecosystems.

#### What can be done about it?

Maintaining current information regarding Local Action Strategies (LASs) that identify priority actions needed to reduce key threats to valuable coral reef resources is very helpful. Florida, Hawaii, Guam, the U.S. Virgin Islands, American Samoa, Puerto Rico, and the Commonwealth of the Northern Mariana Islands created specific local action strategies for select locally relevant threats. NRCS should ensure that proposed actions consider impacts to coral reefs and, as appropriate, include conservation considerations that would enhance this valuable resource.

### Coral Reefs at a Glance

Problems / Indicators - Nutrient and sediment runoff from near-shore watersheds	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Soil Erosion (short and/or long term)</li> <li>• CAFO contaminants (or other point sources)</li> <li>• Improper nutrient and/or pesticide application</li> <li>• Improper livestock grazing management</li> <li>• Improper irrigation water management</li> <li>• Other point and non-point source pollution</li> </ul>	<ul style="list-style-type: none"> <li>• Residue Management</li> <li>• Cover Crops</li> <li>• Comprehensive Nutrient Management Plan</li> <li>• NPDES permit</li> <li>• Irrigation Water Management</li> <li>• Prescribed Grazing</li> </ul>



## Special Environmental Concerns

# Cultural Resources

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

Clean Water Act

Coastal Zone  
Management  
Areas

Coral Reefs

Cultural  
Resources

Endangered  
and Threatened  
Species

Environmental  
Justice

Essential Fish  
Habitat

Floodplain  
Management

Invasive  
Species

Migratory Birds

Prime and  
Unique  
Farmlands

Riparian Areas

Wetlands

Wild and Scenic  
Rivers

### CULTURAL RESOURCES

In 1966, Congress passed the National Historic Preservation Act (NHPA) and directed all Federal agencies to establish a historic preservation program. NRCS has established policy, procedural references and guidance to comply with NHPA and several related authorities, including the American Indian Religious Freedom Act (42 U.S.C. Section 1996); Native American Graves Protection and Repatriation Act (25 U.S.C. Sections 3001-3013); Executive Order (EO) 13175, Consultation and Coordination with Indian Tribal Governments (2000); EO 13007, Indian Sacred Sites (1996); and a range of Executive Orders, Presidential memoranda, and secretarial memoranda.

#### What is it?

The term “cultural resources” as used by NRCS is considered equivalent to “historic properties” as defined by the NHPA (16 U.S.C. Section 470 et seq.) and regulations for compliance with section 106 of the NHPA (36 CFR Part 800). They include any prehistoric or historic district, site, building, structure, or object listed in or eligible for listing in the National Register of Historic Places (NRHP) maintained by the Secretary of the Interior. They also include all records, artifacts, and physical remains associated with the NRHP-eligible historic properties. The term also includes properties of traditional cultural and religious importance to an Indian Tribe or Native Hawaiian organization that meet national register criteria. They may consist of the traces of the past activities and accomplishments of people.

#### Why is it important?

NRCS is required to consider the effects of our actions and undertakings on NRHP eligible cultural resources and historic properties in consultation with specific parties. Consultation with State historic preservation officers (SHPO), Tribal historic preservation officers (THPO) and Federally recognized Tribes, including Native Hawaiians, as appropriate, as well as other interested parties, is required when an agency action may alter the characteristics that qualify a historic property for inclusion in the NRHP. NRCS is also required to mitigate potential adverse impacts, for example through avoidance or minimization, as appropriate.

#### What can be done about it?

When protected cultural resources, such as contemporary cultural properties, traditional cultural values, landscapes, or features having religious importance, may be impacted, NRCS must consult with concerned parties to ensure that historic preservation issues and the views of the public are fully considered during project planning. The outcomes of consultation are documented according to the statutes and authorities under which the cultural resources are considered.

### Cultural Resources at a Glance

Problems / Indicators - Potential impacts to cultural resources and/or historic properties (“Undertakings”)	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Ground disturbing practices</li> <li>• Watershed/Area-Wide/Complex projects</li> <li>• Proposed land-use changes/conversions</li> <li>• Construction discoveries</li> </ul>	<ul style="list-style-type: none"> <li>• Complete cultural resources investigation for site</li> <li>• Initiate EARLY consultation with appropriate State/Tribal entity, as needed</li> <li>• Incorporate mitigation measures, as needed, in project design and specifications</li> </ul>



## Special Environmental Concerns

# Endangered & Threatened Species

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

Clean Water Act

Coastal Zone  
Management  
Areas

Coral Reefs

Cultural  
Resources

Endangered  
and Threatened  
Species

Environmental  
Justice

Essential Fish  
Habitat

Floodplain  
Management

Invasive  
Species

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Riparian Areas

Wetlands

Wild and Scenic  
Rivers

### ENDANGERED & THREATENED SPECIES & STATE/TRIBAL SPECIES OF CONCERN

Consistent with legal requirement of the Endangered Species Act of 1973 and NRCS policy regarding State and Tribal Species of concern, NRCS is fully committed to supporting the conservation of formally designated Federal (including “candidate” and “proposed” species), State and Tribal species of concern.

#### What is it?

When Congress enacted the ESA in 1973, it made several findings regarding the disappearance of various plant and animal species of the United States, the importance of these species to the Nation and its people, and the obligation of the Federal Government to conserve to the extent practicable the various species of fish, wildlife, and plants facing extinction. NRCS policy (190-GM, Part 410) also requires consideration of impacts to species protected by State or Tribal laws or regulations.

#### Why is it important?

Section 7(a) of ESA requires NRCS, in consultation with and with the assistance of the US Fish and Wildlife Service (USFWS) and/or NOAA National Marine Fisheries Service (NMFS), to advance the purposes of the Act by implementing programs for the conservation of endangered and threatened species, and to ensure that its actions and activities do not jeopardize the continued existence of threatened and endangered species or result in the destruction or adverse modification of the species’ critical habitat. NRCS must also consult with State and/or Tribal entities when considering impacts to species of concern protected by State or Tribal laws or regulations.

#### What can be done about it?

In working with landowners, NRCS planners should identify and recommend alternative actions to avoid or minimize adverse impacts to at-risk species that are present or may be present within the project area and to benefit these species whenever possible. NRCS must make an initial effects determination for any endangered or threatened species, designated critical habitats, proposed species or habitats, candidate species, or State or Tribal species of concern protected by State or Tribal law or regulation. Once the effects determination has been completed, there may be a need to initiate consultation with the USFWS or NOAA-NMFS that would result in the development of negotiated “reasonable and prudent measures” (RPMs) to mitigate potential negative impacts.

### Endangered & Threatened Species & State/Tribal Species of Concern at a Glance

Problems / Indicators - Potential negative impacts to Federal, State, and Tribal Species of Concern	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Land use changes/conversions</li> <li>• In-stream and upland restoration projects</li> <li>• Ground disturbing practices</li> <li>• Timing of project implementation</li> <li>• Management activities in occupied habitat</li> </ul>	<ul style="list-style-type: none"> <li>• Mitigation to eliminate potential impacts during planning process</li> <li>• Consultation with USFWS and/or NMFS</li> <li>• Incorporate RPMs and conservation measures into project specifications</li> <li>• Establish monitoring protocols</li> </ul>



## Special Environmental Concerns

# Environmental Justice

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

Clean Water Act

Coastal Zone  
Management  
Areas

Coral Reefs

Cultural  
Resources

Endangered  
and Threatened  
Species

Environmental  
Justice

Essential Fish  
Habitat

Floodplain  
Management

Invasive  
Species

Migratory Birds

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Unique  
Farmlands

Riparian Areas

Wetlands

Wild and Scenic  
Rivers

### ENVIRONMENTAL JUSTICE

Executive Order 12898, issued February 11, 1994, requires each Federal agency to make environmental justice a part of its mission. Agencies must identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations, low-income populations, and Indian Tribes.

#### What is it?

The term “environmental justice” means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on proposed Federal actions. Furthermore, the principles of environmental justice require that populations are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by government programs and activities affecting human health or the environment.

#### Why is it important?

Environmental justice must be addressed throughout the U.S., its territories and possessions, the District of Columbia, and the Commonwealths of Puerto Rico and the Mariana Islands. These issues encompass a broad range of impacts covered by NEPA, including impacts on the natural or physical environment and related social, cultural, and economic impacts.

#### What can be done about it?

The primary means to attain compliance with environmental justice considerations are: 1) assessing the presence of environmental justice communities in a project area that may experience disproportionately high and adverse human health or environmental effects, and 2) the inclusion of low-income, minority, Tribal, or other specified populations in the planning process. There may be a need to develop separate Government to Government consultations to address any environmental justice issues for Tribal Governments (contact your State American Indian Emphasis Program manager). The USDA Departmental Regulation (DR) 5600-002, Environmental Justice, provides detailed determination procedures for NEPA and non-NEPA activities and suggests social and economic effects to consider when assessing whether there are disproportionately high and adverse human health or environmental effects to environmental justice communities in a project area.

### Environmental Justice at a Glance

Problems / Indicators - Disproportionately high or adverse impacts to specific populations	
Causes	Solutions
<ul style="list-style-type: none"> <li>Land use changes/conversions</li> <li>Area-wide/watershed/complex projects</li> <li>Projects involving broad scope of impacts – local/regional/national</li> <li>Controversial projects</li> <li>Human health or environmental effects that may be disproportionately high or adverse</li> </ul>	<ul style="list-style-type: none"> <li>Collect demographic data from EPA, Census Bureau, other sources</li> <li>Initiate early government-to-government consultation with Tribes, as necessary</li> <li>Conduct public meeting(s)</li> <li>Conduct specific outreach to EJ communities</li> <li>Create Agreements, as needed</li> </ul>



## Special Environmental Concerns

# Essential Fish Habitat

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

Clean Water Act

Coastal Zone  
Management  
Areas

Coral Reefs

Cultural  
Resources

Endangered  
and Threatened  
Species

Environmental  
Justice

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### ESSENTIAL FISH HABITAT

The Magnuson-Stevens Act was originally enacted in 1976 and amended several times, the latest of which was 2006. It is the primary law governing marine fisheries management in the U.S. In 1996, the Act was amended to incorporate essential fish habitat (EFH) and rules were published in the Federal Register. It calls for heightened consideration of fish habitat in resource management decisions and direct action to stop or reverse the continued loss of fish habitats. The National Marine Fisheries Service (NMFS) implements and enforces the management measures through fisheries management plans.

#### What is it?

Essential fish habitats (EFHs) are areas identified as being vital for sustaining marine or anadromous fish populations. They include the waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. As amended in 1986, the Magnuson Act requires regional fisheries management councils to evaluate the effects of habitat loss or degradation on their fishery stocks and take actions to mitigate such damage.

#### Why is it important?

The act requires cooperation among NMFS, the councils, fishing interests, Federal and State agencies, and others in achieving the EFH goals of habitat protection, conservation, and enhancement. NRCS must consult with NMFS regarding any action or proposed action that may adversely affect an EFH.

#### What can be done about it?

Information of all EFH areas in each applicable state is located in Section II of the FOTG. NRCS must first assess whether a proposed action or alternative will result in short or long-term disruptions or alterations that may result in an "adverse effect" to EFH. If yes, NRCS may first consider if and how the action or alternative can be modified to mitigate potential adverse effects. If that is not possible, NRCS will have to consult with NMFS to determine measures to conserve such habitat. Following consultation, NRCS is responsible for detailing the measures that will be taken to mitigate any adverse effects to EFH and explain reasons for any actions inconsistent with the NMFS EFH recommendations.

### Essential Fish Habitat at a Glance

Problems / Indicators - Potential negative impacts to essential fish habitat	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Land use changes/conversions</li> <li>• In-stream and upland restoration projects</li> <li>• Ground disturbing practices</li> <li>• In-stream work/practices</li> <li>• Timing of project implementation</li> </ul>	<ul style="list-style-type: none"> <li>• Mitigation to eliminate potential impacts during planning process</li> <li>• Consultation with NMFS</li> <li>• Incorporate conservation measures into project specifications</li> <li>• Establish monitoring protocols</li> </ul>



## Special Environmental Concerns

# Floodplain Management

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

Clean Water Act

Coastal Zone  
Management  
Areas

Coral Reefs

Cultural  
Resources

Endangered  
and Threatened  
Species

Environmental  
Justice

Essential Fish  
Habitat

Floodplain  
Management

Invasive  
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Rivers

### FLOODPLAIN MANAGEMENT

Executive Order (E.O.) 11988, Floodplain Management, was signed by President Jimmy Carter on May 24, 1977. NRCS policy on floodplains (190-GM, Part 410, Subpart B, Section 410.25) reflects the requirement of the E.O. that decisions by Federal agencies must recognize that floodplains have unique and significant public values.

#### What is it?

Floodplains are defined as lowlands or relatively flat areas adjoining inland or coastal waters, including at a minimum areas subject to a chance of flooding of 1 percent or greater in any given year. The “base” floodplain is set equal to the “100-year” floodplain (the so-called “1-percent chance floodplain”). The “critical action” floodplain is defined as the 500-year floodplain (the “0.2-percent chance floodplain”) where certain facilities are present, such as a school, hospital, nursing home, utility, or a facility producing volatile, toxic, or water-reactive materials. Floodplains may be shown on maps produced by the Federal Emergency Management Agency (FEMA) and on NRCS watershed plans and floodplain management studies.

#### Why is it important?

The objectives of E.O. 11988 are to avoid, to the extent possible, the long- and short-term adverse impacts associated with occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development where there is a practical alternative.

#### What can be done about it?

Through proper planning, floodplains can be managed to reduce the threat to human life, health and property in ways that are environmentally sensitive. Most floodplains contain areas with valuable assets that sustain and enhance human existence. Some of these assets are agricultural and forest lands, food and fiber, fish and wildlife, temporary floodwater storage, parks and recreation, and environmental values. NRCS provides leadership and takes actions where practicable to conserve, preserve, and restore existing natural and beneficial functions and values in base (100-year) floodplains as part of the technical and financial assistance program that it administers.

### Floodplain Management at a Glance

Problems / Indicators - Potential negative impacts to floodplains	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Land use changes/conversions in floodplain</li> <li>• Ground-disturbing project within floodplain</li> <li>• Infrastructure development in floodplain</li> <li>• Activities requiring a NPDES permit</li> <li>• Construction of flood walls, dikes, etc., for purpose of flood control</li> </ul>	<ul style="list-style-type: none"> <li>• Consult HUD/FEMA flood insurance maps and/or other available floodplain data</li> <li>• Mitigation to eliminate potential impacts during planning process</li> <li>• Incorporate conservation/mitigation measures into project specifications, as needed</li> <li>• Establish monitoring protocols</li> </ul>



## Special Environmental Concerns

# Invasive Species

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

Clean Water Act

Coastal Zone  
Management  
Areas

Coral Reefs

Cultural  
Resources

Endangered  
and Threatened  
Species

Environmental  
Justice

Essential Fish  
Habitat

Floodplain  
Management

Invasive  
Species

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### INVASIVE SPECIES

Executive Order (E.O.) 13112, Invasive Species (February 3, 1999) directs Federal agencies to “prevent the introduction of invasive species, provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species cause.” NRCS policy (190-GM, Part 414) is consistent with this E.O. and also requires that no action be authorized, funded, or carried out that is believed or likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere.

#### What is it?

The National Invasive Species Council (NISC) and Invasive Species Advisory Committee (ISAC) were formed to define how the objectives of the E.O. will be carried out. As defined in E.O. 13112, invasive species are species, not native to a particular ecosystem, whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive species may include all terrestrial and aquatic life forms, including plants, animals, fungi, and microbial organisms. NRCS policy further defines a plant species as “invasive” only when it occurs on the Federal or State-specific noxious weed list or a list developed by the State-specific Department of Agriculture with their partners and approved by the State Technical Committee which prohibits or cautions its use due to invasive qualities.

#### Why is it important?

Invasive species are reducing the economic productivity and ecological integrity of our Nation’s lands and waters. The rate of introduction of such species has risen markedly in recent years with costs to society growing commensurately. Invasive species harm native species and their habitats, degrade renewable resources, and diminish productive capacity of agricultural lands including cropland, forestlands, rangelands, and pasturelands. They negatively impact a wide variety of human activities and needs.

#### What can be done about it?

Recognizing and addressing the presence of invasive species is an integral part of the conservation planning process and implementing NRCS policy and any existing county, State, or Federal regulations concerning noxious and/or invasive species. At a minimum, the conservation plan includes: 1) an inventory of invasive species; 2) a map outlining the affected areas; 3) identification of control/ restoration strategies; and 4) analysis of their impacts.

#### Invasive Species at a Glance

Problems / Indicators - Presence of invasive species	
Causes	Solutions
<ul style="list-style-type: none"> <li>Land use changes/conversions without appropriate vegetative cover plan</li> <li>Ground-disturbing projects</li> <li>Improper livestock grazing management</li> <li>Restoration projects (upland and aquatic) without appropriate measures to ensure vegetative cover</li> <li>Accidental transport and introduction via equipment</li> </ul>	<ul style="list-style-type: none"> <li>Critical Area Planting</li> <li>Pasture and Hayland Planting</li> <li>Prescribed Grazing</li> <li>Streambank &amp; Shoreline Protection</li> <li>Restoration &amp; Management of Rare &amp; Declining Habitats</li> <li>Integrated Pest management</li> <li>Establish monitoring protocols</li> </ul>



## Special Environmental Concerns

# Migratory Birds

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

Clean Water Act

Coastal Zone  
Management  
Areas

Coral Reefs

Cultural  
Resources

Endangered  
and Threatened  
Species

Environmental  
Justice

Essential Fish  
Habitat

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Rivers

### MIGRATORY BIRDS

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, is the domestic law that affirms, or implements, the United States' commitment to four international conventions (with Canada, Japan, Mexico, and Russia) for the protection of a shared migratory bird resource. Executive Order (E.O.) 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, requires NRCS to consider the impacts of planned actions on migratory bird populations and habitats for all planning activities. The Bald and Golden Eagle Protection Act of 1940, as amended, also prohibits the take of bald and golden eagles and their nests.

#### What is it?

Migratory birds are essentially all wild birds found in the United States, except the house sparrow, starling, feral pigeon, and resident game birds, such as pheasant, grouse, quail, and wild turkeys. Resident game birds are managed separately by each State. A list of migratory birds is found in 50 CFR Part 10. There are also other requirements protecting certain migratory birds. The Bald and Golden Eagle Protection Act (BGEPA) provides protection to all Bald and Golden Eagles by prohibiting all commercial activities and some noncommercial activities involving bald or golden eagles, including their feathers or parts.

#### Why is it important?

The MBTA fully protects all migratory birds and their parts (including eggs, nests, and feathers). Thus, the act makes it unlawful, unless permitted by regulation, for anyone to kill, capture, collect, possess, buy, sell, trade, ship, import, or export any migratory bird, including feathers, parts, nests, or eggs. This prohibition applies to Federal agencies as well as private individuals. Also, under the BGEPA, the "taking" of bald and golden eagles and their nests is prohibited. The definition of "take" under this law includes disturbance.

#### What can be done about it?

MBTA, BGEPA, and E.O. 13186 require NRCS to consider the impacts of planned actions on migratory bird populations and habitats for all planning activities. This may require cooperation with the U.S. Fish and Wildlife Service if the action will result in a measurable negative effect on migratory bird populations. If, for example, a proposed action can potentially kill or injure a migratory bird resulting in an intentional or unintentional "take" to the birds, nests, or eggs, or disturbance of eagles or their nests will occur, conservation measures must be considered to mitigate adverse impacts.

### Migratory Birds at a Glance

Problems / Indicators - Proposed action may adversely impact migratory birds	
Causes	Solutions
<ul style="list-style-type: none"> <li>Land use changes/conversions</li> <li>Ground-disturbing projects</li> <li>Vegetation management during the nesting season</li> <li>Land clearing or obstruction removal</li> <li>Sod-busting</li> <li>Forest harvest activities</li> </ul>	<ul style="list-style-type: none"> <li>Timing of practice installation/harvest</li> <li>Prescribed Grazing/timing of grazing</li> <li>Cooperation with USFWS to establish conservation measures</li> <li>Restoration &amp; Management of Rare &amp; Declining Habitats</li> <li>Establish monitoring protocols</li> <li>Avoidance of specific areas/setbacks</li> </ul>



## Special Environmental Concerns

# Prime and Unique Farmlands

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

Clean Water Act

Coastal Zone  
Management  
Areas

Coral Reefs

Cultural  
Resources

Endangered  
and Threatened  
Species

Environmental  
Justice

Essential Fish  
Habitat

Floodplain  
Management

Invasive  
Species

Migratory Birds

Prime and  
Unique  
Farmlands

Riparian Areas

Wetlands

Wild and Scenic  
Rivers

### PRIME AND UNIQUE FARMLANDS

The Farmland Protection Policy Act (FPPA) was passed by Congress as part of the Agriculture and Food Act of 1981 (Public law 97-98). The FPPA is intended to minimize the impact Federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance.

#### What is it?

**Prime farmland** is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion, as determined by the Secretary of Agriculture. It may include lands currently used to produce livestock and/or timber. **Unique farmland** is land other than prime farmland that is used for production of specific high-value food and fiber crops, as determined by the Secretary. Examples of such crops include citrus, tree nuts, olives, cranberries, fruits, and vegetables. **Farmland that is of statewide or local importance other than prime or unique farmland** is used for the production of food, feed, fiber, forage, or oilseed crops, as determined by the appropriate State or unit of local government agency or agencies, with the approval of the Secretary of Agriculture.

#### Why is it important?

Projects are subject to FPPA requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a Federal agency or with assistance from a Federal agency, including NRCS.

#### What can be done about it?

NRCS must use the criteria provided in regulations found at 7 CFR Section 658.5 to identify and take into account the adverse effects of Federal programs on the protection of farmland. As well as evaluating the effects of our own actions upon farmland, NRCS must assist Federal agencies to consider alternative actions, as appropriate, that could lessen such adverse effects on farmland conversion to nonagricultural uses. NRCS uses a land evaluation and site assessment (LESA) system to establish a farmland conversion impact rating scores. This score is used as an indicator for the project sponsor to consider alternative sites if the potential adverse impacts on the farmland exceed the recommended allowable level.

### Prime and Unique Farmlands at a Glance

Problems / Indicators - Proposed farmland conversion	
Causes	Solutions
<ul style="list-style-type: none"> <li>Proposed land use changes/conversion of agricultural lands</li> <li>Ground disturbing/land clearing activities</li> <li>Construction of infrastructure projects</li> <li>Exurban development</li> </ul>	<ul style="list-style-type: none"> <li>Conduct LESA for conversion impact score</li> <li>Share result with cooperating Federal agency proposing action (normally for NEPA analysis)</li> <li>Offer alternatives (relocation) for consideration if adverse impacts to prime, unique, or locally important agricultural lands</li> </ul>



## Special Environmental Concerns

# Riparian Areas

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

Clean Water Act

Coastal Zone  
Management  
Areas

Coral Reefs

Cultural  
Resources

Endangered  
and Threatened  
Species

Environmental  
Justice

Essential Fish  
Habitat

Floodplain  
Management

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Species

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Wetlands

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Rivers

### RIPARIAN AREAS

NRCS policy (190-GM, Part 411) requires NRCS to integrate riparian area management into all plans and alternatives. Although Federal law does not specifically regulate riparian areas, portions of riparian areas, such as wetlands and other waters of the U.S. may be subject to Federal regulation under provisions of the Food Security Act, Clean Water Act, NEPA, and State, Tribal, and local legislation.

#### What is it?

Riparian areas are ecotones that occur along streams, rivers, lakes, ponds, and wetlands. They are distinctively different from the surrounding lands because of unique soil and vegetative characteristics that are strongly influenced by free or unbound water in the soil. Riparian ecosystems occupy the transitional area between the terrestrial and aquatic ecosystems. Typical examples include floodplains, stream banks, and lakeshores. Riparian areas may exist within all land uses, such as cropland, hay land, pastureland, rangeland, and forestland.

#### Why is it important?

Although riparian areas constitute only a fraction of the total land area, they are generally more productive in terms of plant and animal species, diversity, and biomass. Riparian areas are vital components of the ecosystems in which they occur and are extremely important for flood attenuation, hydrologic function (water quantity, quality, and timing), and fish and wildlife diversity. NRCS policy requires conservation plans to maintain or improve water quality/quantity as well as fish and wildlife benefits. It also requires the development of alternatives when the client's objectives conflict with the conservation of these areas.

#### What can be done about it?

Conservation planning in riparian areas requires special considerations. A resource problem within the riparian area may be the manifestation of upland management decisions. Planners working with riparian areas should consider soils, the present plant community, the site potential, geomorphology of both stream and the watershed, hydrologic regime, fish and wildlife needs, the management of the upland areas of the watershed, and the producer's objectives. For supplemental guidance relating to riparian areas, see *NRCS/RCA Issue Brief 11 (USDA-NRCS. August 1996)*.

#### Riparian Areas at a Glance

Problems / Indicators - Degraded riparian area	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Improper livestock grazing management</li> <li>• Presence of invasive species</li> <li>• Stream channel modifications</li> <li>• Stream channel aggradation or degradation</li> <li>• Structural modifications (e.g., diversions, ditches, dam, etc.)</li> <li>• Land use/vegetation changes</li> </ul>	<ul style="list-style-type: none"> <li>• Streambank and Shoreline Protection</li> <li>• Stream Crossing</li> <li>• Riparian Forest Buffers and/or Herbaceous Cover</li> <li>• Critical Area Planting</li> <li>• Fence/access control</li> <li>• Prescribed Grazing</li> <li>• Integrated Pest Management</li> </ul>



## Special Environmental Concerns

# Wetlands

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

Clean Water Act

Coastal Zone  
Management  
Areas

Coral Reefs

Cultural  
Resources

Endangered  
and Threatened  
Species

Environmental  
Justice

Essential Fish  
Habitat

Floodplain  
Management

Invasive  
Species

Migratory Birds

Prime and  
Unique  
Farmlands

Riparian Areas

Wetlands

Wild and Scenic  
Rivers

### WETLANDS

Executive Order (E.O.) 11990 requires that Federal agencies take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the beneficial functions of wetlands when “providing federally undertaken, financed or assisted construction and improvements.” NRCS policy for implementing the E.O. can be found at 190-GM, Part 410, Subpart B, Section 410.26. In addition, activities that impact wetlands often require a Clean Water Act, Section 404 permit from the Corps. Activities in wetlands that occur in the 100 or 500-yr floodplain are also subject to review under NRCS floodplain management policy (190-GM Section 510.25).

#### What is it?

Wetlands are defined differently within various Federal and State programs and for identification, delineation, and classification purposes. NRCS wetland protection policy defines wetlands as areas, natural or artificial, that have hydric soil, hydrophytic vegetation, and indicators of wetland hydrology. Generally, wetlands include swamps, marshes, bogs, many bottomland hardwood areas and similar areas.

#### Why is it important?

It is the policy of the NRCS to protect and promote wetland functions and values in all NRCS planning and application assistance. NRCS activities must comply with E.O. 11990, Protection of Wetlands, and with NRCS policy for protection of wetlands. Wetlands serve a variety of significant biological functions important to the food chain, general habitat, and nesting, spawning, and rearing sites.

#### What can be done about it?

Since wetlands are highly variable and can be dry for most of the year, wetland delineation training is important. If wetlands will be impacted by a proposed activity, NRCS will identify whether practicable alternatives exist that either enhance wetland functions and values, or avoid or minimize harm to wetlands. If such alternatives exist, the client will be given the opportunity to select one of those alternatives. If the client selects a practicable alternative, the NRCS may continue technical assistance for the conversion activity as well as the development of the mitigation plan. If a practicable alternative is not selected, NRCS may assist with the development of an acceptable mitigation plan, but no further financial or technical assistance for the wetland conversion activity may be provided.

### Wetlands at a Glance

Problems / Indicators - Wetlands with impaired functions	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Past or current draining</li> <li>• Removal of native vegetation</li> <li>• Presence of invasive species</li> <li>• Changes in local hydrology</li> <li>• Dredge and fill activities</li> <li>• Adjacent stream channel modifications</li> <li>• Pollution from point sources (e.g., CAFO)</li> </ul>	<ul style="list-style-type: none"> <li>• Wetland Restoration</li> <li>• Tree/Shrub Establishment</li> <li>• Riparian Forest Buffers and/or Herbaceous Cover</li> <li>• Shallow Water Development and Management</li> <li>• Fish Passage</li> <li>• Incorporate 404 Permit conservation measures into planning design</li> </ul>



## Special Environmental Concerns

# Wild and Scenic Rivers

Clean Air Act  
Criteria Pollutants

Clean Air Act  
Regional Visibility  
Degradation

Clean Water Act

Coastal Zone  
Management  
Areas

Coral Reefs

Cultural  
Resources

Endangered  
and Threatened  
Species

Environmental  
Justice

Essential Fish  
Habitat

Floodplain  
Management

Invasive  
Species

Migratory Birds

Prime and  
Unique  
Farmlands

Riparian Areas

Wetlands

Wild and Scenic  
Rivers

### WILD AND SCENIC RIVERS

The National Wild and Scenic Rivers Act of 1968 (Public Law 90-542) was created by Congress to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. A listing of designated streams and stream segments can be found on the National Park Service's Wild and Scenic Rivers Web site.

#### What is it?

Rivers may be designated by Congress or, if certain requirements are met, the Secretary of the Interior. Each river is administered by either a federal or state agency. Designated segments need not include the entire river and may include tributaries. For federally administered rivers, the designated boundaries generally average one-quarter mile on either bank in the lower 48 states and one-half mile on rivers outside national parks in Alaska in order to protect river-related values. Designated rivers are classified as wild, scenic, or recreational.

#### Why is it important?

The designation of a river or river segment under the Wild and Scenic Rivers Act provides legal protections from adverse development and provides a mechanism for management of the river's resources. In addition to the river segments designated as wild and scenic, many more segments are believed to possess one or more outstanding or remarkable natural or cultural values judged to be of more than local or regional significance. Under a 1979 Presidential directive, and related CEQ procedures, all Federal agencies must also seek to avoid or mitigate actions that would adversely affect one or more National River Inventory (NRI) stream segments.

#### What can be done about it?

Federal agencies must consider the values of these segments prior to taking actions that could exclude them from future wild, scenic, or recreational status. Generally, timber harvests and agricultural operations on privately owned lands are unaffected in wild, scenic, and recreational river designations. However, some activities may require permits or may be covered under special provisions of the management plan. Each designated river has a Federal river manager who may assist and cooperate with States or local organizations, landowners, and individuals to plan, protect, and manage river resources. The assistance may include limited financial assistance.

### Wild and Scenic Rivers at a Glance

Problems / Indicators - Proposed action may adversely impact a designated river or river segment	
Causes	Solutions
<ul style="list-style-type: none"> <li>Land use changes adjacent to river segment</li> <li>Riparian modifications</li> <li>Changes in local hydrology (e.g., adjacent wetland draining activities)</li> <li>Dredge and fill activities</li> <li>Pollution from point sources (e.g., CAFO)</li> </ul>	<ul style="list-style-type: none"> <li>Mitigation during the planning process</li> <li>Wetland Restoration</li> <li>Riparian Forest Buffers and/or Herbaceous Cover</li> <li>Forest Harvest Management/BMPs</li> <li>Prescribed Grazing</li> <li>Consult with NPS to coordinate mitigation plan</li> </ul>

**600.72 Exhibit 3 – System Effects Worksheet**

Example System Effects Worksheet.—This example shows the effects of an alternative system on a cropland field for seven identified resource concerns.

Management System Options		Client: Ira Farmer Land Use: Crop						
		Soil Erosion		Soil Quality/Health Degradation		Water Quality Degradation		Degraded Plant Condition
Field or PLU	3/Conservation Practices	2/Sheet, Rill and Wind	Concentrated Flow : Classic Gully and Ephemeral	Organic Matter Depletion	Compaction	Excess Nutrients in Groundwater	Excess Nutrients in Surface Water	Excessive Plant Pressure
5	Alternative #1	4/						
	Crop Residue Use 20%	+2	+1	+1	0	-1	2	0
	Terraces (Storage)	+5	+3	0	-1	-1	0	0
	Underground Outlet	0	0	0	0	0	0	0
	Contour Farming	+4	+2	+2	0	-1	+3	0
	Nutrient Management	0	0	+2	0	+5	+5	+1
	Integrated Pest Management	0	0	0	+1	+5	+5	+5
	Meets Planning Criteria?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

1/ Enter the broad resource considerations illustrated in the CPPE matrix located in FOTG, Section V.

2/ Enter identified resource concerns.

3/ Develop alternative systems by listing combinations of practices logically used to address an identified resource concern on a given land use.

4/ Express the effects of selected practices. Refer to CPPE matrix located in FOTG, Section V.

Effects on the **problem**:

- Substantial Improvement +5
- Moderate to Substantial Improvement +4
- Moderate Improvement +3
- Slight to Moderate Improvement +2
- Slight Improvement +1
- No Effect 0
- Slight Worsening -1
- Slight to Moderate Worsening -2
- Moderate Worsening -3
- Moderate to Substantial Worsening -4
- Substantial Worsening -5

**600.73 Exhibit 4 – Relationship of the Planning Process and FOTG**

<b>Planning Process</b>		<b>FOTG</b>
Preplanning Activities		Sections I, II, III, and V Reference Material Soils Information Guidance Documents Case Studies
Step 1	Identify Problems	Sections I, II, III, and V Reference Material Soils Information Guidance Documents Case Studies
Step 2	Determine Objectives	Sections I and II Reference Material Soils Information
Step 3	Inventory Resources	Sections I, II, III, and IV Reference Material Soils Information Guidance Documents Practice Standards

Title 180 – National Planning Procedures Handbook

<b>Planning Process</b>		<b>FOTG</b>
Step 4	Analyze Resource Data	Sections I, II, III, and V Reference Material Soils Information Guidance Documents Conservation Effects
Step 5	Formulate Alternatives	Sections II, III, IV, and V Soils Information Resource Management Systems Guidance Documents Conservation Practice Descriptions Conservation Effects
Step 6	Evaluate Alternatives	Sections I, II, III, IV, and V Conservation Practice Physical Effects (CPPE) Matrix Reference Material Soils Information Resource Management Systems Predictive Tools and Models Practice Standards Conservation Effects
Step 7	Make Decisions	Section V Conservation Effects
Step 8	Implement Plan	Section IV Practice Standards and Specifications
Step 9	Evaluate Plan	Sections I, II, III, IV, and V Conservation Effects Case Study Potential new data for some or all sections

**600.74 Exhibit 5 – Relationship of the Planning Process and RMS Tools**

<b>Planning Process</b>	<b>Tools</b>	<b>Actions</b>
<b>Phase I</b>		
<b>Step 1</b> Identify Problems	Conservation Practice Physical Effects (CPPE)	Provides a list of resource considerations, problems, practices, and effects
<b>Step 2</b> Determine Objectives		
<b>Step 3</b> Inventory Resources	Conservation Effects for Decision Making Worksheet (CED)	Documentation of the benchmark conditions
<b>Step 4</b> Analyze Resource Data		Documentation of land uses, resources, resource considerations, resource concerns, practices, and site-specific effects

<b>Planning Process</b>	<b>Tools</b>	<b>Actions</b>
<b>Phase II</b>		
<b>Step 5</b> Formulate Alternatives		Combining conservation practices into systems that adequately treat identified resource concerns
<b>Step 6</b> Evaluate Alternatives	CPPE, System Effects Worksheet CED	Determination and display of the expected effects of options
<b>Step 7</b> Make Decisions	CED	Use of the CED by the client to evaluate options and select desired option

<b>Planning Process</b>	<b>Tools</b>	<b>Actions</b>
<b>Phase III</b>		
<b>Step 8</b> Implement Plan	N/A	N/A

<p><b>Step 9</b> Evaluate Plan</p>	<p>CED</p>	<p>Comparison of actual effects to benchmark conditions and projected effects, and providing feedback into the FOTG, electronic tools, NPPH, policy, and programs</p>
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**600.75 Exhibit 6 – Resource Concerns and Planning Criteria**

A. List of Resource Concerns

**SOIL EROSION**

- Sheet, Rill, & Wind Erosion
- Concentrated Flow Erosion (Classic Gully & Ephemeral Erosion)
- Excessive bank erosion from streams, shorelines, or water conveyance channels

**SOIL QUALITY DEGRADATION**

- Subsidence
- Compaction
- Organic Matter Depletion
- Concentration of Salts and other Chemicals

**EXCESS / INSUFFICIENT WATER**

- Ponding, Flooding, Seasonal High Water Table, Seeps, and Drifted Snow
- Inefficient Moisture Management
- Inefficient Use of Irrigation Water

**WATER QUALITY DEGRADATION**

- Excess Nutrients in surface and ground waters
- Pesticides transported to surface and ground waters
- Excess Pathogens and Chemicals from manure, bio-solids, or compost applications in surface waters and ground waters
- Excessive Salts in surface waters and ground waters
- Petroleum, Heavy metals, and other pollutants, transported to waters
- Excessive Sediment in surface waters
- Elevated Water Temperature

**DEGRADED PLANT CONDITION**

- Undesirable Plant Productivity and Health
- Inadequate Structure and Composition
- Excessive Plant Pest Pressure
- Wildfire Hazard, Excessive Biomass Accumulation

**INADEQUATE HABITAT FOR FISH AND WILDLIFE**

- Habitat Degradation (Food, Water, Cover/Shelter, and Habitat Continuity/Space)

**LIVESTOCK PRODUCTION LIMITATION**

- Inadequate Feed and Forage
- Inadequate Livestock Shelter
- Inadequate Livestock Water

**AIR QUALITY IMPACTS**

- Emissions of Particulate Matter (PM) and PM Precursors
- Emissions of Greenhouse Gases (GHGs)
- Emissions of Ozone Precursors
- Objectionable Odors

**INEFFICIENT ENERGY USE**

- Equipment and Facilities
- Farming/Ranching Practices and Field Operations



## Resource Concerns

# ENERGY

## Equipment and Facilities

Soil

Water

Air

Plants

Animals

Energy

Inefficient Use

Equipment and  
Facilities

Field Operations

### INEFFICIENT ENERGY USE - Equipment and Facilities

The inefficient use of energy increases costs and dependence on non-renewable energy sources.

#### What is it?

Inefficient energy use occurs whenever facilities, equipment, or machinery operate more hours than needed to meet production goals. It may also occur when facilities, equipment, or machinery become worn out, outdated, or are poorly controlled or maintained.

#### Why is it important?

High energy prices have put considerable pressure on the U.S. economy. High input costs and the inability to set prices leave the agricultural sector with limited options to be economically viable. Reducing energy use helps our nation to be energy independent and reduces costs, helping producers stay competitive in the marketplace.

#### What can be done about it?

There are two ways to reduce energy related production costs: 1) increase energy efficiency of the operation and 2) increase use of energy sources produced on the farm. For increased energy efficiency, NRCS Energy Estimator and Assessment tools gauge potential energy savings for a wide variety of efficiency upgrades. If these tools show energy saving opportunities, or if there are concerns about energy use and cost, NRCS staff will likely recommend an energy audit. During an energy audit, energy experts evaluate the farming operation and recommend changes to improve energy use. Common recommendations include changes to lighting, ventilation, heating and cooling of livestock facilities, drying/curing, milk cooling, irrigation pumping, and manure handling. An energy analyst evaluates the age and condition of facilities, equipment, and machinery, and how they are operated and maintained. For on-farm renewable energy, the Energy tools provide a similar gauge of renewable energy resources. NRCS staff can help identify ways, for example, to better use solar and wind resources, take advantage of geothermal or micro-hydropower potential, and use waste for bio-energy to leverage increased efficiency efforts.

### Equipment and Facilities at a Glance

Problems / Indicators - Unacceptably high energy costs	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Unvented, propane-fired heat poultry houses</li> <li>• Throttling valves to control water flow</li> <li>• Using incandescent or T12 lights</li> </ul>	<ul style="list-style-type: none"> <li>• Convert to radiant heating</li> <li>• Add a Variable Frequency Drive, and upgrade inefficient pump and/or motor</li> <li>• Upgrade to T8, LED, or CFL lighting</li> </ul>



## Resource Concerns

# ENERGY

## Field Operations

Soil

Water

Air

Plants

Animals

Energy

Inefficient Use

Equipment and  
Facilities

Field Operations

### INEFFICIENT ENERGY USE - Field Operations

The inefficient use of energy increases costs and dependence on non-renewable energy sources.

#### What is it?

Inefficient energy use occurs whenever equipment or machinery operates more hours than needed to meet production goals. It may also occur when equipment or machinery becomes worn out, outdated, or poorly controlled.

#### Why is it important?

High energy prices have put considerable pressure on the U.S. economy. High input costs and the inability to set prices leave the agricultural sector with limited options to be economically viable. Reducing energy use helps our nation to be energy independent and reduces costs, helping producers stay competitive in the marketplace.

#### What can be done about it?

Money can be saved and energy dependency can be reduced by improving the efficiency of field operations, and by adopting practices that help reduce energy-intensive inputs, such as soil amendments, fertilizers, or pesticides. For improved efficiency, Natural Resources Conservation Service (NRCS) staff will most likely start by evaluating field operations used to till, plant, cultivate, and harvest crops. This assessment helps identify steps to take to reduce field operations or improve efficiency. The NRCS Residue Management Energy Estimator tool can be used to estimate potential energy savings associated with changes in tillage, cultivation, and fertilizer use. By using a guidance system on tractors and equipment, application overlaps can be reduced and application rates can be optimized to account for variability in soil types, elevation, soil chemistry, fertility, and productivity within fields. These steps can reduce the need for fuel, fertilizer, herbicide, and insecticide, and save money. For reduced inputs, adoption of Integrated Pest Management techniques of prevention, avoidance, monitoring, and suppression can reduce pesticide and fuel use and lower environmental risk. Substituting manure for commercial fertilizer, or using nitrogen-fixing legumes as cover crops or in crop rotations can reduce the use of fossil fuel-based commercial fertilizer. Tractor operations are likely to increase, but usually money is saved. Overall energy use is lower because less natural gas will be used to produce commercial nitrogen fertilizer (that was not purchased).

### Field Operations at a Glance

Problems / Indicators - Unacceptably high energy costs	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Unnecessary trips across the field</li> <li>• Overlap when applying fertilizer, pesticides</li> <li>• High use of commercial fertilizer</li> </ul>	<ul style="list-style-type: none"> <li>• Switch to conservation tillage</li> <li>• Use Global Positioning System guided spraying equipment</li> <li>• Incorporate nitrogen-fixing legumes into rotation or as cover crop</li> </ul>



## Resource Concerns

# ANIMALS

## Feed and Forage

Soil

### LIVESTOCK PRODUCTION LIMITATION - Feed and Forage

Water

Feed and forage quality or quantity is inadequate for nutritional needs and production goals of the kinds and classes of livestock.

Air

#### What is it?

Plants

Livestock require five major classes of nutrients: energy, protein, minerals, vitamins, and water. All five are essential for normal health and production. Next to water, the greatest requirement is for energy, followed by protein, with minerals and vitamins needed in very small amounts. Without adequate energy from feed or forage, utilization of all other nutrients is impaired.

Animals

#### Why is it important?

Inadequate Habitat for Fish and Wildlife

Providing sufficient feed and forage helps to ensure animal health and performance. To sustain the resource base, it is critical to balance the required feed and kind of forage with the number and type of animals in the operation. Stocking rates must be adjusted and supplements provided, as needed, for livestock grazing pasture or rangeland. Improving animal feed and forage can improve livestock productivity and farm income.

Livestock Production Limitation

Feed and Forage

Livestock Shelter

Livestock Water

#### What can be done about it?

Energy

Applying the principles of forage production for livestock requires an understanding of how plants interact with soil and climate, as well as understanding the nutritional needs of the animals. Prescribed Grazing is the management of grazing land to adjust intensity, frequency, timing, and duration of grazing and/or browsing to meet the desired objectives for the plant communities and the grazing and/or browsing animal. A proper system manages animal number, grazing distribution, and length and time of grazing periods to provide grazed plants sufficient recovery time for regrowth and plant health. Feed and forage balance sheets and forage growth curves are used to make decisions about stocking rates and timing of grazing rotations based on plant growth and animal demands. Fencing and placement of livestock water can facilitate proper grazing management. Conservation practices, such as Forage and Biomass Planting and Forage Harvest Management, provide guidance to improve the forage base to support the prescribed grazing system.

### Feed and Forage at a Glance

Problems / Indicators - Feed and forage not adequate to support the livestock operation	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Insufficient livestock feed</li> <li>• Overstocking of livestock</li> <li>• Inadequate distribution of livestock grazing</li> <li>• Poor feed quality</li> <li>• Weed, insect, or disease problems</li> </ul>	<ul style="list-style-type: none"> <li>• Prescribed grazing systems</li> <li>• Adequate water distribution</li> <li>• Production of high quality feed and forage</li> <li>• Forage analysis for nutrient quantity and quality</li> </ul>



**Resource Concerns**

**ANIMALS**  
**Livestock Shelter**

Soil

**LIVESTOCK PRODUCTION LIMITATION - Livestock Shelter**

Livestock lack adequate shelter from climatic conditions to maintain health or production goals.

Water

Air

**What is it?**

Natural vegetation or landscape features are not adequate to provide shelter for livestock during periods of severe climatic circumstances.

Plants

**Why is it important?**

Livestock performance is reduced during periods of high heat or extreme cold weather. Providing sufficient shelter to offset these climatic conditions can be beneficial to animal performance and health. Without adequate upland shelter, livestock may seek shelter in low-lying areas, such as streams, which may cause riparian area deterioration and/or water quality issues.

Animals

Inadequate Habitat for Fish and Wildlife

Livestock Production Limitation

Feed and Forage

Livestock Shelter

Livestock Water

**What can be done about it?**

Shelters or windbreaks can be provided using natural vegetation or constructed sanctuaries to give animals sufficient protection from harsh climatic conditions. When livestock shelter is constructed or planted with ample buffer distances from riparian areas or water bodies, and in locations not susceptible to runoff and erosion, environmental risks associated with livestock concentration are minimized. Further, use of portable structures that are periodically moved helps prevent areas of heavy use and increased erosion possibilities.

Energy

**Livestock Shelter at a Glance**

Problems / Indicators - Vegetative, landscape, and/or structural options for livestock shelter do not exist; livestock are exposed to severe climatic conditions	
Causes	Solutions
<ul style="list-style-type: none"> <li>Exposure to extreme wind and cold in system that supports tree growth</li> <li>Historical shelterbelt is partially functioning</li> <li>Exposure to extreme wind and cold in area where plant options are limited or temporary shelter is preferred</li> </ul>	<ul style="list-style-type: none"> <li>Permanent windbreak establishment using native or naturally occurring plant materials</li> <li>Renovate partially existing shelter belt</li> <li>Portable season-long fabricated shelter</li> </ul>



## Resource Concerns

# ANIMALS

## Livestock Water

Soil

Water

Air

Plants

Animals

Inadequate Habitat  
for Fish and Wildlife

Livestock Production  
Limitation

Feed and Forage

Livestock Shelter

Livestock Water

Energy

### LIVESTOCK PRODUCTION LIMITATION - Livestock Water

Quantity, quality, and/or distribution of drinking water are insufficient to maintain health or production goals for the kinds and classes of livestock.

#### What is it?

Water is an important but often overlooked nutrient for livestock. Water makes up over 98 percent of all molecules in the body and is necessary for regulation of body temperature, growth, reproduction, lactation, digestion, lubrication of joints, eyesight, and as a cleansing agent. Livestock water requirements are influenced by several factors, including rate of gain, pregnancy, lactation, activity, type of diet, feed intake, and environmental temperature.

#### Why is it important?

Water quality for livestock consumption can be detrimental based on several parameters, such as nitrates, sulfates, salinity, bacteria, pH, pesticides, and total dissolved solids. Water quantity and distribution of suitable water sources can affect livestock based on the basic need to meet daily intake requirements and issues related to grazing patterns and travel distance to water that may result in surplus/deficient forage availability and excessive/insufficient plant utilization. All of these ultimately affect livestock health and resource stability.

#### What can be done about it?

Water quality concerns, for both livestock health and the environment, can be addressed by limiting livestock access to ponds and water bodies or by installing watering facilities. Proper layout of water facilities will provide more even distribution of grazing that will enhance forage utilization. Animals do not graze or utilize areas that are remote from water sources and the size of the facility should be designed to avoid crowding. Having watering sites as evenly distributed as possible in a grazing system will help circumvent overused or underused areas of the pasture.

### Livestock Water at a Glance

Problems / Indicators - Lack of water, poor water quality, poor distribution can affect livestock health	
Causes	Solutions
<ul style="list-style-type: none"> <li>Water availability is limited</li> <li>Spring area trampled by livestock</li> <li>Livestock in stream or pond creating potential health concerns</li> </ul>	<ul style="list-style-type: none"> <li>Inventory, evaluate, and plan watering system for livestock type</li> <li>Develop spring for livestock water and outlet for wet area for native plants and wildlife</li> <li>Establish select watering points and construct watering facilities to move livestock away from streams and ponds</li> </ul>



## Resource Concerns

# PLANTS

## Plant Pests

Soil

Water

Air

Plants

Degraded Plant Condition

Plant Productivity and Health

Structure and Composition

Plant Pests

Wildfire Hazard

Animals

Energy

### DEGRADED PLANT CONDITION - Plant Pests

Excessive pest damage to plants including that from undesired plants, diseases, animals, soil borne pathogens, and nematodes.

#### What is it?

Plants provide food for many forms of life. Human beings and grazing animals depend on plants for food. It is important to note that large numbers of other much smaller creatures, such as insects and their larvae, also feed on plants. Other plants, fungi, bacteria, and viruses use plants as a host during part of their life cycle. Generally, these interactions are normal, predictable, and benign. However, we apply the term “pest” to any animal, insect, bacteria, or virus when any of these interactions become unbalanced and unacceptable plant damage results. Pests can also take the form of any organism that competes for space, nutrients, or water (e.g., weeds). Pests can vary from place to place, crop to crop, year to year.

#### Why is it important?

For plants to produce the expected yield, preferred products, or desired environmental outcomes, they must be protected from unchecked animal, weed, insect, and disease pests.

#### What can be done about it?

Management is the key to keeping damage from plant pests within tolerable limits. Integrated Pest Management is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. Set Thresholds - Before taking any pest control action, set a point at which pest populations or environmental conditions indicate that pest control action must be taken. Monitor and Identify Pests - Not all insects, weeds, and other living organisms require control. Identify pests accurately so appropriate control decisions can be made in conjunction with action thresholds. Prevention - As a first line of pest control, manage to prevent pests from becoming a threat. Rotate crops and select pest-resistant varieties. Control - If pest control is required, evaluate control methods for effectiveness and risk. Use less risky pest controls first, such as pheromones to disrupt pest mating, or mechanical control, such as trapping or weeding. If further monitoring, identifications and action thresholds indicate that less risky controls are not working, then employ additional pest control methods such as targeted spraying of pesticides. Use broadcast spraying of non-specific pesticides only as a last resort.

### Plant Pests at a Glance

Problems / Indicators - Animal, insect, and/or disease damage, or competition from common weeds or invasive plants substantially reduces yield or growth	
Causes	Solutions
<ul style="list-style-type: none"> <li>Plants suffer from attacks by pests or disease</li> <li>Weeds or invasive plants out compete desired crop</li> </ul>	<ul style="list-style-type: none"> <li>Use Integrated Pest Management to employ early detection, avoidance, and treatment of pests</li> <li>Consider brush management, vegetative weed control, mulching, or prescribed grazing or burning</li> </ul>



## Resource Concerns

# Plant Productivity and Health

# PLANTS

Soil

Water

Air

Plants

Degraded Plant Condition

Plant Productivity and Health

Structure and Composition

Plant Pests

Wildfire Hazard

Animals

Energy

## DEGRADED PLANT CONDITION - Plant Productivity and Health

Plant productivity, vigor and/or quality negatively impacts other resources or does not meet yield potential due to improper fertility, management or plants not adapted to site.

### What is it?

Plants established in the wrong climate or soil may be under stress and may never thrive, no matter how much fertilizer or water you supply. Natural events, such as drought, or mismanagement can cause plant stress. Plants under stress are more susceptible to disease and insect damage. Symptoms of poor plant vigor and health may include slow growth, discoloration of leaves, wilting or drooping of foliage, leaf drop, leaves covered with a sticky substance, and/or brown colored roots.

### Why is it important?

For plants to produce the expected yield, preferred products, or desired environmental outcomes they must be adapted to the site on which they are growing, provided with the appropriate amounts of nutrients, water, and sunshine, and protected from unchecked animal, weed, insect, and disease pests.

### What can be done about it?

Management is the key to maintaining plant productivity and health. Check that the desired plant is suited to the climate and soil type. Set realistic yield goals based on soil productivity information, historical yield data, climatic conditions, level of management, and/or local research on similar soil and cropping systems. The NRCS Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov>) is an excellent source for information about soils and their limitations for growing various crops. University Extension agents are a great resource for learning about the nutritional, cultural, and management practices needed to keep plants healthy and productive. The Nutrient Management practice will specify the amount, timing, and method of application of nutrients needed to achieve realistic production goals. The Integrated Pest Management practice will specify techniques to detect, avoid, and treat pests and diseases. Some causes of poor health and vigor may require the use of cover crops, the adoption of new crop rotations, or changes to tillage methods to address soil quality issues, such as soil compaction, poor drainage, low organic matter, or the presence of contaminants in the soil.

## Plant Productivity and Health at a Glance

Problems / Indicators - Yield or growth is substantially less than expected, plants are disease and/or pest-ridden, plants fail to thrive	
Causes	Solutions
<ul style="list-style-type: none"> <li>Plants receive inadequate nutrition during critical growth periods</li> <li>Plants fail to thrive due to poor soil conditions</li> <li>Plants wilt, freeze or rot even during normal climate conditions</li> </ul>	<ul style="list-style-type: none"> <li>Use nutrient management to address the form, rate, placement, and timing of nutrient application</li> <li>Consider crop rotations, deep rooted cover crops, drainage, and deep tillage</li> <li>Consider alternate crops or different plant varieties</li> </ul>



**Resource Concerns**

# PLANTS Structure and Composition

Soil

Water

Air

**Plants**

Degraded Plant Condition

Plant Productivity and Health

Structure and Composition

Plant Pests

Wildfire Hazard

Animals

Energy

## DEGRADED PLANT CONDITION - Structure and Composition

Plant communities have insufficient composition and structure to achieve ecological functions and management objectives. Inadequate structure and composition also includes degradation of wetland habitat, targeted ecosystems, or unique plant communities.

### What is it?

A stand of plants and associated organisms (bacteria, fungi, animals) that share a defined area or environment lack the diversity, density, distribution patterns, and three-dimensional structure necessary to produce the preferred products or desired environmental outcomes.

### Why is it important?

If landowners hope to achieve their production or environmental objectives, it is critical that they understand and work with the processes that affect structure and composition of plant communities. The interaction between plants, other organisms, and environmental factors such as soil, climate, and topography influence how a plant community functions to cycle nutrients, capture and release water, protect and build soil, nurture wildlife, or produce useable products.

### What can be done about it?

Addressing inadequate structure and composition is a complex problem that varies with the natural plant community that is desired. All human activities have the potential to impact natural communities, whether it is land use changes, drainage activities, controlling fires, or the introduction of different animal and plant species. Activities can include removal of unwanted plants to provide more space for desired species to increase in number or size. Desired plants can be reintroduced that are missing from the community. Practices such as grazing, mowing, fertilization, and burning can be used to promote and/or repress growth of target plants to attain the desired structure and composition.

## Structure and Composition at a Glance

Problems / Indicators - Inadequate structure and composition	
Causes	Solutions
<ul style="list-style-type: none"> <li>Stress, disease and/or mismanagement reduces and/or eliminates key components of plant community</li> <li>Plant community is allowed to grow to late succession stage and fails to produce desired habitat for wildlife and/or insects that depend on early succession habitat</li> <li>Invasive species outcompete desired plants creating a monoculture</li> <li>Loss of fire regime</li> </ul>	<ul style="list-style-type: none"> <li>Employ or modify use of cultural practices (e.g., grazing, burning, mowing)</li> <li>Treat or remove vegetation to reestablish early seral stage habitat</li> <li>Exterminate invasive species, reestablish desired plant community, and utilize integrated pest management techniques to maintain stand</li> </ul>



**Resource Concerns**

**PLANTS**  
**Wildfire Hazard**

Soil

**DEGRADED PLANT CONDITION - Wildfire Hazard**

Water

Accumulated plant residue (biomass) creates wildfire hazards that pose risks to human safety, structures, plants, animals, and air resources.

Air

**What is it?**

Plants

All plants produce litter from leaves, stalks, or stems. Normally, this residue is either left to decompose and nourish the next generation of plants and animals, or it is harvested and used for straw, mulch, bio-fuel, pulp, etc. When the rate of utilization and/or decomposition is slower than the rate of biomass production, residues can accumulate to the point of becoming a fire hazard.

Degraded Plant Condition

**Why is it important?**

Plant Productivity and Health

While fire is an important and often beneficial part of the natural ecosystem, uncontrolled or “wild” fire poses a threat to life, health, and property. In addition, the secondary effects of wildfires, including erosion, landslides, introduction of invasive species, and changes in water quality, are often more disastrous than the fire itself.

Structure and Composition

**What can be done about it?**

Plant Pests

The amount of flammable biomass can be reduced to decrease the incidence of wildfires; the distribution of biomass can be manipulated to influence the direction and rate at which wildfires spread; and precautionary steps can be taken to protect life and property to lessen the impacts of wildfires.

Wildfire Hazard

Animals

**Wildfire Hazard at a Glance**

Energy

Problems / Indicators - Excess biomass, biomass distribution, lack of preparedness	
Causes	Solutions
<ul style="list-style-type: none"> <li>Overstocked forest increases the risk of fire outbreak</li> <li>Unbroken expanse of flammable biomass increases the risk of the spread of fire</li> <li>Lack of a plan on how to respond to fire increases risk to life and property</li> </ul>	<ul style="list-style-type: none"> <li>Thin excess trees and brush</li> <li>Treat or remove vegetation, debris, and detritus</li> <li>Create and implement a wildfire plan:               <ul style="list-style-type: none"> <li>post fire control agency phone numbers</li> <li>locate and map water sources</li> <li>map out evacuation routes</li> <li>equip vehicles with fire fighting tools</li> </ul> </li> </ul>



## Resource Concerns

# Concentrated Flow Erosion

### Soil

#### SOIL EROSION - Concentrated Flow Erosion

##### Soil Erosion

Untreated classic gullies may enlarge progressively by head cutting and/or lateral widening. Ephemeral gullies occur in the same flow area and are obscured by tillage. This includes concentrated flow erosion caused by runoff from rainfall, snowmelt, or irrigation water.

Sheet, Rill and  
Wind Erosion

#### What is it?

Concentrated Flow  
Erosion

Ephemeral and classic gully are forms of erosion created by the concentrated flow of water. They are easily identified through visual observation. An ephemeral cropland gully is larger than a rill and smaller than a classic gully. They usually result from the junction of rills that form a dendritic (branching or tree-like) pattern of channels. Ephemeral gullies usually appear on cultivated fields during the planting or growing season, but are temporarily removed by cultivation. Ephemeral gullies can reappear at or near the same location on a yearly basis because the surface topography of the field does not change appreciably. Classic gully erosion generally occurs in well defined drainage ways and generally is not obliterated by tillage. In some situations, headcuts are present and aid in advancing the gully upstream.

Shoreline, Bank  
and Channel  
Erosion

Soil Quality  
Degradation

#### Why is it important?

### Water

Concentrated flow erosion removes surface soil, which often has the highest biological activity and most soil organic matter. Nutrients removed by erosion are no longer available to support plant growth on-site, and when they accumulate in water, algal blooms, lake eutrophication, and high dissolved oxygen levels can occur. Deposition of eroded materials can obstruct roadways and fill drainage channels. Gullies can impact farm operations by creating barriers that change traffic patterns and create hazards that can damage farm equipment.

### Air

### Plants

### Animals

### Energy

#### What can be done about it?

Ephemeral erosion can be controlled using a conservation cropping system that includes residue management. High residue crops and maintaining soil cover throughout the year are effective means for controlling ephemeral erosion and aid in the control of classic gully erosion. Gully formations can be difficult to control if remedial measures are not designed and properly constructed. Correcting concentrated flow erosion involves mitigating the damage and addressing the cause. The cause of increased water flow across the landscape must be considered and the corrective action usually requires a system of conservation practices. Conservation tillage and cropping practices that increase water infiltration into the soil result in less runoff and protect land from erosion.

#### Concentrated Flow Erosion at a Glance

Problems / Indicators - Branching or tree-like pattern of rills, gullies, headcuts	
Causes	Solutions
<ul style="list-style-type: none"> <li>Bare or unprotected soil</li> <li>Excess runoff</li> <li>Inadequate outlet for water</li> </ul>	<ul style="list-style-type: none"> <li>Residue Management</li> <li>Cover Crops</li> <li>Terraces</li> <li>Grassed Waterway</li> <li>Grade Stabilization Structure</li> <li>Lined Waterway or Outlet</li> <li>Water and Sediment Control Basin</li> </ul>



## Resource Concerns

# Sheet, Rill and Wind Erosion

### Soil

### SOIL EROSION - Sheet, Rill and Wind Erosion

Detachment and transportation of soil particles caused by rainfall runoff/splash, irrigation runoff, or wind that degrades soil quality.

#### Soil Erosion

Sheet, Rill and  
Wind Erosion

Concentrated Flow  
Erosion

Shoreline, Bank  
and Channel  
Erosion

Soil Quality  
Degradation

### Water

### Air

### Plants

### Animals

### Energy

#### What is it?

Wind or water erosion is the physical wearing of the earth's surface. Erosion is not always readily visible, even when soil loss exceeds unsustainable levels. Symptoms of soil erosion by water may be identified by small rills and channels on the soil surface, soil deposited at the base of slopes, sediment in streams, lakes, and reservoirs, and pedestals of soil supporting pebbles and plant material. Water erosion is most obvious on steep, convex landscape positions. Symptoms of wind erosion may be identified by dust clouds, soil accumulation along fence lines or snowbanks, and a drifted appearance of the soil surface.

#### Why is it important?

Erosion removes surface soil material (topsoil), reduces levels of soil organic matter, and contributes to the breakdown of soil structure. This creates a less favorable environment for plant growth. Loss of only 1/32 of an inch can represent a 5 ton/acre soil loss. In soils that have restrictions to root growth, erosion decreases rooting depth, which decreases the amount of water, air, and nutrients available to plants. Erosion removes surface soil, which often has the highest biological activity and greatest amount of soil organic matter. Nutrients removed by erosion are no longer available to support plant growth on-site, and when they accumulate in water, algal blooms, lake eutrophication, and high dissolved oxygen levels can occur. Deposition of eroded materials can obstruct roadways and fill drainage channels. Blowing dust can affect human health and create public safety hazards.

#### What can be done about it?

Soil erosion can be avoided by maintaining a protective cover on the soil and modifying the landscape to control runoff amounts and rates. To avoid water erosion, include high residue, perennial, and sod crops in the cropping system, grow cover crops, manage crop residues, and shorten the length and steepness of slopes. To avoid wind erosion, keep soil covered with plants or residue, plant windbreaks, use stripcropping, increase surface roughness, cultivate on the contour, and maintain soil aggregates at a size less likely to be carried by wind.

### Sheet, Rill and Wind Erosion at a Glance

Problems / Indicators - Changes in soil horizon thickness, soil deposition in fields and water, and decreased organic matter	
Causes	Solutions
<ul style="list-style-type: none"> <li>Bare or unprotected soil</li> <li>Long and steep slopes</li> <li>Intense rainfall or irrigation events when residue cover is at a minimum</li> <li>Decreased infiltration by compaction</li> </ul>	<ul style="list-style-type: none"> <li>Residue Management</li> <li>Crop Rotation</li> <li>Cover Crops</li> <li>Terraces</li> <li>Contour Farming</li> <li>Stripcropping</li> <li>Windbreaks</li> </ul>



## Resource Concerns

# Shoreline, Bank and Channel Erosion

# SOIL

### Soil

### SOIL EROSION - Shoreline, Bank and Channel Erosion

Sediment from banks, shorelines or conveyance channels threatens to degrade water quality and limit use for intended purposes.

#### Soil Erosion

Sheet, Rill and  
Wind Erosion

Concentrated Flow  
Erosion

Shoreline, Bank  
and Channel  
Erosion

Soil Quality  
Degradation

### Water

### Air

### Plants

### Animals

### Energy

#### What is it?

Stream stability is an active process, and while streambank erosion is a natural part of this process, it is often accelerated by altering the stream system. Streambank erosion is that part of channel erosion in which material is eroded from the streambank and deposited at the base of the slope or in the channel. Streambank erosion is usually associated with erosion of the streambed. It occurs along perennial, intermittent, and ephemeral streams.

#### Why is it important?

The benefits of proper streambank stabilization go far beyond preventing loss of land and keeping sediment out of streams. Streambank erosion increases sediment in the stream degrading water quality and resulting in the loss of fertile bottomland. The quality of wildlife habitat is impacted both on land and in the stream. Streambank erosion increases the stream's sediment load and changes its shape and function. When this happens the stream loses its ability to transport sediment which causes it to become wide and shallow. The stream channel can become braided, quality habitat is lost and the increased sediment can reduce overall biological productivity.

#### What can be done about it?

Determining the cause of accelerated streambank erosion is the first step in solving the problem. Development in the watershed often alters the stream equilibrium by changing rainfall-runoff relationships. Many of the traditional methods of dealing with streambank erosion, such as rock revetments, are expensive to install and maintain. While hard solutions are often needed to protect infrastructure, these treatments may solve the problem at the expense of habitat and stream corridor aesthetics. There are some promising developments in the area of streambank stabilization and stream restoration. Greener and more natural treatment alternatives are being more widely adopted. Soil bioengineering practices, native material revetments, combinations of rock and vegetation, and in-stream structures help to stabilize eroding banks. These techniques can be used to move a stream toward a healthy, stable and self-maintaining system.

### Shoreline, Bank and Channel Erosion at a Glance

Problems / Indicators - Eroding Banks, degrading streambed, and manipulated stream channels	
Causes	Solutions
<ul style="list-style-type: none"> <li>Increased runoff due to land use changes in the watershed</li> <li>Eroding or unstable streambanks</li> <li>Exposed tree roots along banks</li> <li>Large runoff events</li> <li>Degraded riparian areas</li> <li>Uncontrolled livestock access</li> </ul>	<ul style="list-style-type: none"> <li>Bank armor and protection</li> <li>Soil bioengineering practices</li> <li>In-stream structures</li> <li>Native material revetments</li> <li>Riparian areas with native or locally adapted vegetation</li> <li>Control livestock access to the water bodies</li> </ul>



## Resource Concerns

# SOIL Compaction

### Soil

Soil Erosion

Soil Quality  
Degradation

Subsidence

Compaction

Organic Matter

Salts and Chemicals

Water

Air

Plants

Animals

Energy

### SOIL QUALITY DEGRADATION - Compaction

Management induced soil compaction resulting in decreased rooting depth that reduces plant growth, animal habitat and soil biological activity.

#### What is it?

Compaction occurs when soil particles are pressed together, reducing pore space between the particles and pushing out the air normally located there. It is manifested as an increase in bulk density. A severely compacted soil can become effectively impermeable. Soils are either naturally compacted (heavy, clay soil) or compaction is caused by management activities. Compaction is assessed using measurements of bulk density, penetration resistance, porosity, and root growth patterns.

#### Why is it important?

Compaction reflects the soil's ability to function for structural support, water and solute movement, and soil aeration. It may cause restrictions to root growth, and poor movement of air and water through the soil. Compaction can result in shallow plant rooting and poor plant growth, influencing crop yield and reducing vegetative cover available to protect soil from erosion. By reducing water infiltration into the soil, compaction can lead to increased runoff and erosion from sloping land or waterlogged soils in flatter areas. In general, some soil compaction to restrict water movement through the soil profile is beneficial under arid conditions, but under humid conditions compaction decreases yields.

#### What can be done about it?

Long-term solutions to soil compaction problems revolve around decreasing soil disturbance and increasing soil organic matter. A system that uses cover crops, crop residues, perennial sod, and/or reduced tillage results in increased soil organic matter, less disturbance and reduced bulk density. Additionally, the use of multi-crop systems involving plants with different rooting depths can help break up compacted soil layers. Grazing systems that minimize livestock traffic and loafing, provide protected heavy use areas, and adhere to recommended minimum grazing heights reduce bulk density by preventing compaction and providing soil cover.

### Compaction at a Glance

Problems / Indicators - Bulk density, penetration resistance, porosity, root growth patterns	
Causes	Solutions
<ul style="list-style-type: none"> <li>Working wet soil</li> <li>Excess traffic, machinery or livestock</li> <li>Heavy machinery</li> <li>Repeated tillage at same depth</li> <li>Poor aggregation</li> <li>Low organic matter</li> </ul>	<ul style="list-style-type: none"> <li>Avoid working wet soil</li> <li>Reduce traffic/tillage operations, rotate</li> <li>Use controlled traffic patterns</li> <li>Subsoil or rip compacted areas</li> <li>Diversify cropping system</li> <li>Use conservation tillage</li> <li>Grow cover crops</li> <li>Add animal manures</li> <li>Use non-compacting tillage</li> </ul>



## Resource Concerns

# SOIL Organic Matter

### Soil

Soil Erosion

Soil Quality Degradation

Subsidence

Compaction

Organic Matter

Salts and Chemicals

Water

Air

Plants

Animals

Energy

### SOIL QUALITY DEGRADATION - Organic Matter

Soil organic matter is not adequate to provide a suitable medium for plant growth, animal habitat, and soil biological activity.

#### What is it?

Soil organic matter is carbon-rich material that includes plant, animal, and microbial residue in various stages of decomposition. Live soil organisms and plant roots are part of the carbon pool in soil but are not considered soil organic matter until they die and begin to decay. The quantity and composition of soil organic matter vary significantly among major ecosystems. Soil in arid, semiarid, and hot, humid regions commonly has less organic matter than soil in other environments.

#### Why is it important?

Many soil properties impact soil quality, but organic matter deserves special attention. It affects several critical soil functions, can be manipulated by land management practices, and is important in most agricultural settings across the country. Because organic matter improves soil structure and enhances water and nutrient holding capacity, managing for soil carbon can enhance soil productivity and environmental quality, and it can reduce the severity and costs of natural phenomena, such as drought, flood, and disease. In addition, increasing soil organic matter levels can reduce atmospheric CO<sub>2</sub> levels that contribute to climate change, and improved soil quality reduces dust, allergens, and pathogens in the air. Ground and surface water quality improve because better structure, infiltration, and biological activity make soil a more effective filter. For example, organic matter may bind pesticides, making them less active.

#### What can be done about it?

The most practical way to enhance soil quality, and as a result air and water quality, is to promote better management of soil organic matter or carbon. Practices that increase organic matter include: leaving crop residues in the field, choosing crop rotations that include high residue plants, using optimal nutrient and water management practices to grow healthy plants with large amounts of roots and residue, growing cover crops, applying manure or compost, using low or no tillage systems, and mulching.

### Organic Matter at a Glance

Problems / Indicators - Compaction, slaking, soil crusting, crop moisture stress, poor soil structure	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Soil disturbance</li> <li>• Intensive tillage systems</li> <li>• Low crop biomass (surface and subsurface)</li> <li>• Burning, harvesting or otherwise removing crop residues</li> </ul>	<ul style="list-style-type: none"> <li>• Diverse, high biomass crop rotations</li> <li>• Cover crops</li> <li>• Reduced tillage</li> <li>• Rotational or prescribed grazing</li> <li>• Perennials in rotations</li> <li>• Maintain crop residues on soil surface</li> <li>• Use of animal manure and compost</li> <li>• Water table management</li> </ul>



## Resource Concerns

# SOIL Salts and Chemicals

### Soil

Soil Erosion

Soil Quality  
Degradation

Subsidence

Compaction

Organic Matter

Salts and Chemicals

### Water

### Air

### Plants

### Animals

### Energy

## SOIL QUALITY DEGRADATION - Salts and Chemicals

Concentration of salts leading to salinity and/or sodicity reducing productivity or limiting desired use. The resource concern is also applicable to concentrations of other chemicals impacting productivity or limiting desired use.

### What is it?

Salinity is a process by which water-soluble salts accumulate in the soil. Saline soils are indicative of inadequate drainage to leach salts from the soil or upward migration of salt from shallow ground water. Sodic soils are high in sodium relative to concentrations of calcium and magnesium. Salinity or sodicity occurs naturally or may result from management practices. Soil formed on parent material high in salts, such as marine deposits, and with inadequate drainage, will be high in salts. Fertilizers, soil amendments (gypsum, lime), and manure may contribute to salinity problems, as well. Applications of saline and/or sodic water without adequate leaching or in the presence of a high water table will increase soil electrical conductivity over time, eventually resulting in saline soil. Soils can also become saline through the process of saline seeps.

### Why is it important?

Since few plants grow well on saline/sodic soils, cropping options on these soils may be limited. Salts in the soil can negatively affect water uptake by plants, and saline soils tend to inhibit germination and plant emergence. Growth patterns in cropped fields can be poor, with spotty stand establishment. Under severe salt stress, herbaceous crops appear bluish-green. Leaf tip burn and die-off of older leaves in cereal grains can result from salinity or related drought stress. Salinization degrades the quality of shallow ground water and surface water resources, such as ponds, sloughs, and dugouts.

### What can be done about it?

Reducing the severity and extent of soil salinity is accomplished primarily with recharge and discharge water management. Recharge management is used on areas that contribute excess water to the soil and includes decreasing infiltration of excess saline/sodic water and irrigation to maintain salts at a level below the root zone. Discharge management is used on areas where excess water comes to the soil surface and includes growing salt tolerant crops, reducing deep tillage and eliminating seepage.

## Salts and Chemicals at a Glance

Problems / Indicators - White crusting of soil, irregular crop growth, and lack of plant vigor	
Causes	Solutions
<ul style="list-style-type: none"> <li>Naturally occurring in soils with high concentrations of soluble salts, e.g., sodium, calcium, and magnesium sulfates</li> <li>Inadequate drainage to leach salt from the soil</li> <li>Upward migration of salt from shallow ground water</li> <li>Application of saline and/or sodic water</li> </ul>	<ul style="list-style-type: none"> <li>Proper use of irrigation water</li> <li>Use of salt-tolerant crops</li> <li>Removal of excess water from recharge areas</li> <li>Maintenance of the water table at safe levels</li> <li>Use of cropping and tillage systems that promote adequate infiltration and permeability</li> <li>Reducing deep tillage</li> </ul>



## Resource Concerns

# SOIL Subsidence

### Soil

Soil Erosion

Soil Quality  
Degradation

Subsidence

Compaction

Organic Matter

Salts and Chemicals

### Water

### Air

### Plants

### Animals

### Energy

### SOIL QUALITY DEGRADATION - Subsidence

Loss of volume and depth of organic soils due to oxidation caused by above normal microbial activity resulting from excessive water drainage, soil disturbance, or extended drought. This excludes karst / sinkholes issues or depressions caused by underground activities.

#### What is it?

Subsidence is a gradual lowering of the surface elevation of an organic soil, or a reduction in the thickness of organic matter. Organic soils (Histosols) are those that are predominantly organic soil materials. They are commonly called bogs, moors, or peats and mucks. The most important cause of organic soil subsidence is a process commonly termed "oxidation." A high water table creates anaerobic conditions that slow the breakdown of organic materials. The balance between accumulation and decomposition of organic material shifts dramatically when soil is drained. Oxidation under aerobic conditions converts the organic carbon in the plant tissue to carbon dioxide gas and water. Aerobic decomposition under drained conditions is much more efficient thereby causing the loss of organic matter.

#### Why is it important?

Soil subsidence is usually irreversible. The natural rate of accumulation of organic soil is on the order of a few inches per 100 years; the rate of loss of drained organic soil can be 100 times greater, up to a few inches per year in extreme cases. Thus, deposits that have accumulated over hundreds of years can disappear relatively quickly in response to human activity. In time, the remaining organic material becomes diluted through the incorporation of the organic layer into the mineral subsoil. This reduces the productivity of the soil.

#### What can be done about it?

Once oxidation depletes the organic matter, it generally cannot be restored. The oxidation rate of organic matter can be minimized by managing water table levels to reduce aeration. In non-crop situations, keep the water table as close to the soil surface as possible. During the cropping season, maintain the water table at the optimum level for the crop being grown. Use cover crops to keep the soil covered and to return organic matter to the soil.

#### Subsidence at a Glance

Problems / Indicators - Loss of volume and depth of organic soils	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Drainage</li> <li>• Cultivation / Soil disturbance</li> </ul>	<ul style="list-style-type: none"> <li>• Water table management</li> <li>• Diverse, high biomass crop rotations</li> <li>• Cover crops</li> <li>• Reduced tillage</li> <li>• Perennials in rotations</li> </ul>



## Resource Concerns

# WATER

## Nutrients

Soil

Water

Excess Water

Insufficient Water

Water Quality  
Degradation

Nutrients

Pesticides

Pathogens

Salts

Petroleum and  
Heavy Metals

Sediment

Elevated Water  
Temperature

Air

Plants

Animals

Energy

### WATER QUALITY DEGRADATION - Nutrients

Nutrients (organics and inorganics) are transported to receiving waters through surface runoff and/or leaching into shallow ground waters in quantities that degrade water quality and limit use for intended purposes.

#### What is it?

Water bodies require nutrients, such as nitrogen and phosphorus, to be healthy, but too many nutrients can be harmful. Many of our nation's waters, including streams, rivers, wetlands, estuaries, and coastal waters, are affected by excess nutrients. The effect of nutrients for a given water body depends on its ecoregion and the source of nutrients.

#### Why is it important?

High levels of nitrogen and phosphorus in waters can produce harmful algal blooms. In turn, these blooms can produce "dead zones" in water bodies where dissolved oxygen levels are so low that most aquatic life cannot survive. This condition in water bodies is referred to as hypoxia.

#### What can be done about it?

Management is the key to protecting water quality from excess nutrients. Nutrient management shall specify the source, amount, timing and method of application of nutrients on each field to achieve realistic production goals, while minimizing movement of nutrients and other potential contaminants to surface and/or ground waters. Realistic yield goals shall be established based on soil productivity information, historical yield data, climatic conditions, level of management and/or local research on similar soil, cropping systems, and soil and manure/organic by-products tests. Areas contained within established minimum application setbacks (e.g., sinkholes, wells, or rapidly permeable soil areas) should not receive direct application of nutrients. Nutrients may also be lost due to erosion, runoff, irrigation and drainage, so applicable practices should be installed to address these concerns.

### Nutrients at a Glance

Problems / Indicators - Algae blooms, mass death of fish or aquatic organisms, dissolved oxygen concentrations, hypoxia	
Causes	Solutions
<ul style="list-style-type: none"> <li>Overusing fertilizer (both residential and agricultural usage)</li> <li>Erosion of nutrient-laden soil</li> <li>Rainfall flowing over cropland, animal feeding operations and pastures, picking up animal waste and depositing it in water bodies</li> <li>Low organic matter</li> </ul>	<ul style="list-style-type: none"> <li>Use nutrient management to address the form, rate, placement and timing of nutrient application</li> <li>Grow cover crops</li> <li>Use crop rotations</li> <li>Increase crop diversity</li> </ul>



## Resource Concerns

# WATER Pathogens

### Soil

### Water

Excess Water

Insufficient Water

Water Quality  
Degradation

Nutrients

Pesticides

Pathogens

Salts

Petroleum and  
Heavy Metals

Sediment

Elevated Water  
Temperature

### Air

### Plants

### Animals

### Energy

## WATER QUALITY DEGRADATION - Pathogens

Pathogens, pharmaceuticals, and other chemicals are carried by soil amendments that are applied to the land and are subsequently transported to receiving waters in quantities that degrade water quality and limit use for intended purposes. This resource concern also includes the off-site transport of leachate and runoff from compost or other organic materials of animal origin.

### What is it?

Many potential pathogens (disease-causing microorganisms) can be found in manure. These pathogens include bacteria, protozoa, and viruses. If effected soil amendments are not adequately treated and contained, pathogens may enter ground or surface water posing a potential risk to human and animal health.

### Why is it important?

Pathogens can be transmitted to humans directly through contact with animals and animal waste or indirectly through contaminated water or food. Human illness and death has resulted from exposure to pathogens from livestock and poultry manure. Pathogens can also be transmitted to domestic and wild animals with similar results.

### What can be done about it?

The most effective tool in eliminating pathogens from manure, from both practical and economic standpoints, is time. If manure is allowed to sit undisturbed in storage or in soil, the concentration of pathogens will decrease with time as they die off or are overgrown by native microbes. Managing manure for pathogens is approached in two phases: 1) collection and storage and 2) land treatment. In the collection and storage of manure, pathogens can be addressed by biological control (composting, anaerobic digesters, etc.), chemical methods, and control of runoff and leaching. It is also important to manage livestock access to streams, rivers and water bodies. Land application is commonly a critical process in manure management. Pathogens from manure can threaten humans who are exposed to runoff, have direct contact with manure, or consume food or water contaminated with manure. Application rate and seasonal conditions are important factors contributing to the transfer of pathogens from lands where manure has recently been applied to nearby surface water. Managing the rate, timing and method of application of manure are critical elements in managing for pathogens. Keeping a buffer zone or setback distance between manure application areas and water bodies is a common practice that greatly decreases the transport of pathogens to those water bodies.

## Pathogens at a Glance

Problems / Indicators - Storage, handling, and application of manure, bio-solids, or compost	
Causes	Solutions
<ul style="list-style-type: none"> <li>Collection, handling and storage of manure</li> <li>Land application of manure</li> </ul>	<ul style="list-style-type: none"> <li>Biological treatment (anaerobic storage, composting, anaerobic digesters)</li> <li>Vegetative filter strips, setbacks and buffer zones</li> <li>Managing livestock access to water</li> <li>Managing the rate, timing, and method of application of manure</li> </ul>



## Resource Concerns

# WATER Salts

### Soil

### Water

Excess Water

Insufficient Water

Water Quality  
Degradation

Nutrients

Pesticides

Pathogens

Salts

Petroleum and  
Heavy Metals

Sediment

Elevated Water  
Temperature

### Air

### Plants

### Animals

### Energy

## WATER QUALITY DEGRADATION - Salts

Irrigation or rainfall runoff transports salts to receiving waters in quantities that degrade water quality and limit use for intended purposes.

### What is it?

Salinity is a process by which water-soluble salts accumulate in the soil and water. Nearly all waters contain dissolved salts and trace elements, many of which result from the natural weathering of the earth's surface. In addition, drainage waters from irrigated lands and effluent from city sewage and industrial waste water can impact water quality. In most irrigation situations, the primary water quality concern is salinity levels since salts can affect both the soil structure and crop yield. Most salinity problems in agriculture result directly from the salts carried in irrigation water.

### Why is it important?

Salinity increases the cost of treating water for drinking, reduces the availability of water for irrigation, and renders farmland useless, costing the economy millions each year. Salinity is an ecological factor, influencing the types of organisms that live in a body of water. It influences the kinds of plants that will grow either in a water body, or on land fed by irrigation water or groundwater. If water containing too much salt is applied during irrigation, salt tends to build up in the soil, reducing the amount of water available to plants. Salts in the soil increase the efforts by plant roots to take in water and can make water unavailable to plants at higher salt levels. Few plants grow well on saline soils; often restricting options for cropping in a given land area.

### What can be done about it?

Salinity as a water quality issue is addressed through soil management activities. Reducing the severity and extent of salinity is accomplished primarily with recharge and discharge water management. Recharge management is used on areas that contribute excess water to the soil and includes decreasing infiltration of excess saline water and irrigation to maintain salts at a level below the root zone. Discharge management is used on areas where excess water comes to the soil surface and includes growing salt tolerant crops, reducing deep tillage and eliminating seepage.

## Salts at a Glance

Problems / Indicators - White crusting of soil, irregular crop growth, and lack of plant vigor	
Causes	Solutions
<ul style="list-style-type: none"> <li>Naturally occurring in soils with concentrations of soluble salts, such as sulfates of sodium, calcium, and magnesium in the soil</li> <li>Inadequate drainage to leach salt from the soil</li> <li>Upward migration of salt from shallow ground water</li> <li>Application of saline water</li> </ul>	<ul style="list-style-type: none"> <li>Proper use of irrigation water</li> <li>Use of salt-tolerant crops</li> <li>Removal of excess water from recharge areas</li> <li>Maintain the water table at a safe levels</li> <li>Use cropping and tillage systems that promote adequate infiltration and permeability</li> <li>Reducing deep tillage</li> </ul>



## Resource Concerns

# WATER

## Sediment

Soil

Water

Excess Water

Insufficient Water

Water Quality  
Degradation

Nutrients

Pesticides

Pathogens

Salts

Petroleum and  
Heavy Metals

Sediment

Elevated Water  
Temperature

Air

Plants

Animals

Energy

### WATER QUALITY DEGRADATION - Sediment

Off-site transport of sediment from sheet, rill, gully, and wind erosion into surface water that threatens to degrade surface water quality and limit use for intended purposes.

#### What is it?

Wind or water erosion is the physical and chemical wearing of the earth's surface and is a natural ecosystem process. Problems arise when excess fine sediment enters surface water at rates and volumes greater than under natural conditions, resulting in turbidity and sedimentation. Typically, erosion related to human activities generates excessive sediment and should be controlled to acceptable levels.

#### Why is it important?

Sediment can have a significant impact on water quality and aquatic habitat. Not only does sediment carry nutrients and pesticides that can negatively impact water quality, but the physical characteristics of sediment can clog stream channels, silt in reservoirs, cover fish spawning grounds, and reduce downstream water quality. Sediment makes the water more turbid and restricts light penetration into the water, which impacts the ability of aquatic plants to perform photosynthesis. Suspended sediments can clog the gills of aquatic organisms and cause death. Sediment build up on the stream bottom can lead to the suffocation of fish eggs and macro invertebrates and impact natural spawning. Additionally, with an increased amount of particles in the water, dissolved oxygen levels may be reduced due to elevated water temperatures. Excessive sediment also impacts coastal area water quality as it can smother and kill coral tissue and reduces light levels and food supplied to the coral by symbiotic algae.

#### What can be done about it?

The issue of excessive sediments for water quality is managed by addressing the source and/or transport of soil. Controlling the source of soil erosion involves maintaining a protective cover on the soil and modifying the landscape to control runoff amounts and rates. Specific practices include growing perennial crops in rotation or as permanent cover, growing cover crops, managing crop residue, shortening the length and steepness of slopes, and increasing water infiltration rates. Controlling the transport of soil into water bodies involves buffers and edge of field treatments. Specific practices include grassed waterways, field borders, filter strips, and riparian forest/herbaceous buffers.

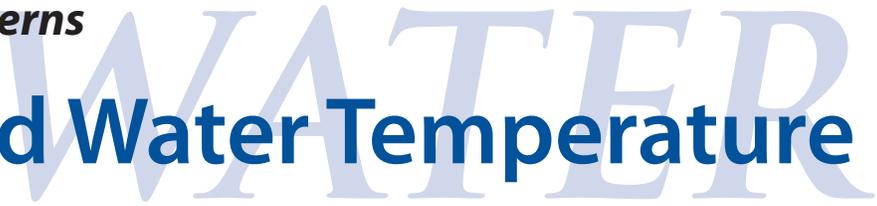
#### Sediment at a Glance

Problems / Indicators - Cloudy or muddy water, stream/water body soil deposition	
Causes	Solutions
<ul style="list-style-type: none"> <li>Bare or unprotected soil</li> <li>long and steep slopes,</li> <li>Intense rainfall or irrigation events when residue cover is at a minimum,</li> <li>Decreased infiltration by compaction</li> </ul>	<ul style="list-style-type: none"> <li>Residue management</li> <li>Crop rotations with high biomass crops</li> <li>Cover crops</li> <li>Terraces</li> <li>Strip Cropping</li> <li>Windbreaks</li> <li>Buffers and filter strips to address the transport of sediment</li> </ul>



## Resource Concerns

# Elevated Water Temperature



Soil

Water

Excess Water

Insufficient Water

Water Quality  
Degradation

Nutrients

Pesticides

Pathogens

Salts

Petroleum and  
Heavy Metals

Sediment

Elevated Water  
Temperature

Air

Plants

Animals

Energy

## WATER QUALITY DEGRADATION - Elevated Water Temperature

Surface water temperatures exceed State/Federal standards and/or limit use for intended purposes.

### What is it?

Temperature has an important influence on water chemistry. As water temperature rises, there is a corresponding decrease in the availability of oxygen, carbon dioxide, and other gases important to aquatic life. Elevated water temperature also results in increases of dissolved minerals that can further degrade water quality. In some areas, Federal and/or State law regulate the temperature of surface water.

### Why is it important?

Water temperature has extremely important ecological consequences. The metabolic rate of organisms rises with increasing water temperatures, resulting in increased oxygen demand. This is coupled with the reduced amount of oxygen that is available as the water temperature increases. During extended periods of warming, water may lose its potential to support healthy populations of fish and other aquatic organisms and may even kill desired species or lead to a change in species diversity. Warm water also has the potential to increase the presence of dissolved toxic substances that may restrict the suitability of water for human use.

### What can be done about it?

There is actually very little an individual landowner can do to cool surface waters. Most conservation actions designed to address water temperature issues reduce additions of heat energy. Heat can enter surface water through direct sunlight and by the air directly above the water. Reestablishing or protecting riparian vegetation is often the first step to address water temperature issues. While riparian vegetation does not cool the water, on small water bodies it can block much of the sun and keep the air in direct contact with the water surface cooler. Groundwater inflow and outflow, precipitation, runoff, and evaporation are also responsible for heat energy exchange. Water entering a water body from below ground flows tends to be much cooler than the surface water. Actions that conserve or increase shallow groundwater may increase the amount of cool water entering a water body. The sediment load of a water body also plays a role in water temperature. When the sediment load increases, water tends to spread out over a larger area. Shallow, wide channels provide more surface area for solar energy to enter the stream, potentially increasing water temperature. In addition, turbidity raises water temperature because the suspended particles absorb the sun's heat. Actions to reduce sediment reaching a water body will help reduce warming of surface water.

## Elevated Water Temperature at a Glance

Problems / Indicators - Water temperature exceeds legal standard, threatens the health of aquatic organisms, or limits the intended use by the client.	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Surface water unprotected from direct sunlight</li> <li>• Little or no groundwater contribution to water body</li> <li>• Sediment laden runoff reaching water body</li> </ul>	<ul style="list-style-type: none"> <li>• Reestablish riparian vegetation</li> <li>• Brush management, residue management, terraces to reduce transpiration, evaporation and/or increase infiltration of upland water</li> <li>• Buffers and filter strips to intercept sediment</li> </ul>



## Resource Concerns

# Ponding, Flooding, Other Excess



Soil

### EXCESS WATER - Ponding, Flooding, Other Excess

Water

Surface water or poor subsurface drainage restricts land use and management goals. Wind-blown snow accumulates around and over surface structures, restricting access to humans and animals.

Excess Water

Ponding, Flooding,  
Other Excess

#### What is it?

Water can flood or pond and restrict plant growth and land use. Water may flow into or around buildings if they are constructed over or near a spring or seep. If the soil has a dense layer, especially a layer of clay, flow of water through the soil may be restricted and water may pond.

Insufficient Water

#### Why is it important?

Water Quality  
Degradation

Flooding and ponding impacts plant growth and land use. Plant growth is essential for improving soil quality and increasing soil organic matter. Saturated soils increase the likelihood of diseases, significant losses of soil nitrogen due to denitrification and leaching of nitrate N, and soil damage due to heavy equipment. Seeps and high water tables must be taken into account for conservation plantings and when evaluating sites for construction. Excess water can affect structures and slope stability while drifting snow may prevent access to livestock or farmsteads. Drifting snow can block access.

Air

Plants

Animals

#### What can be done about it?

Energy

Using a systems approach can help address excess water. Strategies include managing for drainage, conveyance, and multiple uses for crops and wildlife. Drainage systems must be compatible with crops grown, field layouts, and cultural practices such as crop rotation and cultivation. System choices include open ditches, tile drains, mole drains, and land forming for increased surface runoff. Planned systems can include diverting excess water and infiltration basins combined with roof runoff management systems. Restored and enhanced wetlands can also be key components in water management.

### Ponding, Flooding, Other Excess at a Glance

Problems / Indicators - Little to no established vegetation due to excess water, wet areas due to restrictive soil layers, flood prone buildings and structures	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Ponding and seeps</li> <li>• Stormwater runoff</li> <li>• Flood prone areas</li> </ul>	<ul style="list-style-type: none"> <li>• Drainage management and structures for water control</li> <li>• Roof runoff structures and capture for reuse methods</li> <li>• Floodplain management</li> <li>• Wetland restoration or enhancement</li> <li>• Windbreak placement for protection and to provide access</li> </ul>



## Resource Concerns

# Inefficient Use of Irrigation Water

# WATER

### Soil

### Water

Excess Water

Insufficient Water

Inefficient Moisture  
Management

Inefficient Use of  
Irrigation Water

Water Quality  
Degradation

### Air

### Plants

### Animals

### Energy

## INSUFFICIENT WATER - Inefficient Use of Irrigation Water

Irrigation water is not stored, delivered, scheduled and/or applied efficiently. Aquifer or surface water withdrawals threaten sustained availability of ground or surface water. Available irrigation water supplies have been reduced due to aquifer depletion, competition, regulation and/or drought.

### What is it?

Inefficient use of irrigation water impacts on- and off-site water quantity and quality. Irrigation systems and water management practices can waste water and negatively affect farm profitability.

### Why is it important?

Irrigated agriculture is essential in meeting the nation's food and fiber production needs. Agriculture is the nation's largest water user, accounting for more than 85% of the nation's annual water consumption. Emerging problems that further complicate resource protection and water allocation include: serious long-term drought conditions, critical ground water declines occurring in agricultural production areas, saltwater intrusion into ground water supplies, and competition for water among a multitude of water users, including power generation, drinking water supplies, minimum stream flows, etc.

### What can be done about it?

Solutions are available to address many of the competing water resource needs. Choices generally include conservation of the water used, conversion to other crops that utilize less water, and conversion to other sources of water. Conserving water could include improvements in irrigation water use efficiencies, off stream storage of water during periods of excess runoff, water re-use and water recycling, and ground water recharge.

## Inefficient Use of Irrigation Water at a Glance

Problems / Indicators - Irrigated crops, plant stress, insufficient water supply	
Causes	Solutions
<ul style="list-style-type: none"> <li>• Open earthen ditches</li> <li>• Irrigation water allowed to run off of fields</li> <li>• Losses due to improper system design, installation, or maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• Line ditches or install pipe; improve water transport systems</li> <li>• Manage applications to reduce runoff; tailwater return systems</li> <li>• Audit system and retrofit or replace where warranted</li> </ul>



## Resource Concerns

# Inefficient Moisture Management

# WATER

Soil

Water

Excess Water

Insufficient Water

Inefficient Moisture Management

Inefficient Use of Irrigation Water

Water Quality Degradation

Air

Plants

Animals

Energy

### INSUFFICIENT WATER - Inefficient Moisture Management

Natural precipitation is not optimally managed to support desired land use goals or ecological processes.

#### What is it?

In dryland conditions, management of available water is critical to production and to maintain natural systems.

#### Why is it important?

Water is important to farming and natural systems. In cropland, poor yields may be related to an insufficiency of soil moisture rather than an insufficiency of rainfall. Inefficient moisture management can result in increased runoff and reduced soil moisture. In some grassland systems, available water can be tied up by brush.

#### What can be done about it?

Managing residue and cover will aid in utilizing available soil moisture. Establish mulch and residue management systems to conserve soil moisture. New weed control techniques and tools, along with cover crops can help manage available water for crops. Minimize soil compaction to maintain water movement through the soil by reducing soil hydraulic properties such as infiltration. In some grassland systems, brush management can help restore a natural water regime. Using plants that are more tolerant of drought conditions is an effective measure in optimize existing soil moisture.

### Inefficient Moisture Management at a Glance

Problems / Indicators - Dryland farming in low rainfall areas	
Causes	Solutions
<ul style="list-style-type: none"> <li>No soil cover in the winter to prevent moisture loss</li> <li>Excess soil tillage and disturbance destroys soil organic matter and structure</li> <li>Unchecked brush growth creating potential for less available moisture for desired plants</li> </ul>	<ul style="list-style-type: none"> <li>Cover Crops</li> <li>Mulch or No-till farming systems</li> <li>Brush Management</li> </ul>

**600.76 Exhibit 7 – Example Products (Reserved)**

**600.77 Exhibit 8 – Example Plan (Reserved)**

**600.78 Exhibit 9 – Future Proposed Land Use Designations and Modifiers**

**The following is a list of proposed NRCS land-use designations:**

**Crop.**—Land used primarily for the production and harvest of annual or perennial field, forage, food, fiber, horticultural, orchards, vineyards, or energy crops.

**Forest.**—Land on which the primary vegetation is tree cover (climax, natural or introduced plant community) and use is primarily for production of wood products or nontimber forest products.

**Range.**—Land used primarily for the production of grazing animals. Includes native plant communities and those seeded to native or introduced species, or naturalized by introduced species, that are ecologically managed using range management principles.

**Pasture.**—Land composed of introduced or domesticated native forage species that is used primarily for the production of livestock. Pastures receive periodic renovation and/or cultural treatments, such as tillage, fertilization, mowing, weed control, and may be irrigated. Pastures are not in rotation with crops.

**Farmstead.**—Land used for facilities and supporting infrastructure where farming, forestry, animal husbandry, and ranching activities are often initiated. This may include dwellings, equipment storage plus farm input and output storage and handling facilities. Also includes land dedicated to the facilitation and production of high-intensity animal agriculture in a containment facility where daily nutritional requirements are obtained from other lands or feed sources.

**Designated Protected Area.**—Land or water used for the preservation, protection, and observation of the existing resources, archaeological or historical interpretation, resource interpretation, or for aesthetic value. These areas are officially designated by legislation or other authorities. Examples: legislated natural or scenic areas and rural burial plots.

**Developed Land.**—Land occupied by buildings and related facilities used for residences, commercial sites, public highways, airports, and open space associated with towns and cities.

**Water.**—Geographic area whose dominant characteristic is open water or permanent ice or snow. May include intermingled land, including tidal influenced coastal marsh lands.

**Associated Agriculture Lands.**—Land associated with farms and ranches that are not purposefully managed for food, forage, or fiber and are typically associated with nearby production or conservation lands. This could include incidental areas, such as idle center pivot corners, odd areas, ditches and watercourses, riparian areas, field edges, seasonal and permanent wetlands, and other similar areas.

**Other.**—Land that is barren, sandy, rocky, or that is impacted by the extraction of natural resources, such as minerals, gravel or sand, coal, shale, rock, oil, or natural gas.

**Land-Use Modifiers.**—An added level of land use specificity to help describe how land is managed.

**The following is a list of proposed NRCS land-use modifiers:**

**Irrigated.**—Applied when an operational system is present and managed to supply water.

**Wildlife.**—Applied when the client is actively managing for wildlife, and this management is reflected in the conservation plan through the application of practices that are beneficial to wildlife.

**Grazed.**—Applied when grazing animals impact how land is managed and influence the conservation plan.