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# Best Management Practices for Water Quality: Agriculture in the Lower Rio Grande Valley



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This publication was produced by the Texas Water Resources Institute, in collaboration with the Texas A&M AgriLife Extension Service. Funding was provided through a Clean Water Act 319(h) Nonpoint source grant from the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency; Project 10-11.



TWRI EM-117



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# Introduction

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## Agriculture in the Arroyo Colorado Watershed

The Arroyo Colorado Watershed is 706 square miles and runs from McAllen to the Lower Laguna Madre. The water body is impaired for dissolved oxygen, bacteria and legacy pollutants. In 2007, local stakeholders developed and published *A Watershed Protection Plan for the Arroyo Colorado Phase I* that identifies strategies to address water quality issues. The plan is currently being implemented throughout the watershed.

Agricultural production comprises almost half of the land within the Arroyo Colorado Watershed. A goal of the watershed protection plan is to have best management practices (BMPs) implemented on half of the irrigated agricultural lands by 2015. Runoff from these agricultural lands carries nutrients and sediments, which contribute to the above impairments in the Arroyo Colorado.

## What is a BMP?

A BMP is a method or technique that has consistently shown results superior to those achieved with other means, and that is used as a benchmark. In addition, a BMP can evolve to become better as improvements are discovered. BMPs designed to reduce nutrient and pesticide runoff from agricultural land have been implemented in the Arroyo Colorado watershed on a producer-by-producer, voluntary basis. There are many state and federal programs that can provide funding and assistance for implementing BMPs.



## What can you do and who should you contact?

The Texas State Soil and Water Conservation Board (TSSWCB) and the USDA Natural Resources Conservation Service (NRCS) have multiple programs that offer technical and financial assistance to agricultural producers to implement BMPs on their farm. The Environmental Quality Incentives Program (EQIP), offered by NRCS, is an annual program with specific time frames and registration periods.

TSSWCB offers assistance through its Water Quality Management Plan (WQMP) Program. A WQMP is a voluntary site-specific plan developed by local Soil and Water Conservation Districts for producers that includes land and production practices as well as management measures. Both WQMPs and EQIP are designed to reduce nonpoint source pollution and provide cost share assistance.

If you have questions, you may also contact the Texas AgriLife Extension Service agent for your county.

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# Irrigation Land Leveling

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Irrigation Land Leveling is reshaping the surface of land to be irrigated to panned grades. This BMP can improve field gradient for irrigation purposes and reduce runoff frequency and volume.

## What are the benefits of this practice?

- Permits uniform and efficient application of irrigation water to the leveled land
- Helps reduce runoff and erosion

## Where can this practice be applied?

This BMP can be applied to leveling irrigated land based on a detailed engineering survey, design and layout.



# Irrigation Management

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This BMP uses a well-organized system that adequately supplies water by controlling the amount, frequency and application rate to crops so that production and water use are maximized.

## What are the benefits of this practice?

- Makes best use of available water
- Efficiently delivers soluble fertilizer to crops
- Prevents unnecessary water loss and potential water quality problems
- Controls salts in crop root zones
- Establishes vegetation cover and minimizes soil erosion
- Increases crop yields

## Methods of Irrigation Management

- Irrigation Storage Reservoir
- Micro-irrigation
- Irrigation – Sprinkler
- Tailwater Recovery from Irrigation Water
- Irrigation Land Leveling



# Irrigation Polypipe

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Irrigation Polypipe is the use of gated or flexible pipe (commonly called polypipe) to convey and distribute water to the furrow and border irrigated fields. This BMP can resolve water quantity issues for irrigation purposes and lessen the impact of agriculture on water quantity but still maximize yields.

## What are the benefits of this practice?

- Permits uniform and efficient application of irrigation water
- Helps reduce the amount of water lost to evaporation
- Saves producers money on water after the initial cost of setup

## Where can this practice be applied?

This BMP is applicable to agricultural producers that currently use unlined ditches to distribute water to furrow or border irrigation fields.



# Irrigation Sprinkler System

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This BMP is an irrigation system in which all necessary equipment and facilities are installed for effectively applying water with nozzles operated under pressure.

## What are the benefits of this practice?

- Applies irrigation water efficiently and uniformly to maintain adequate soil moisture for optimum plant growth without causing excessive water loss, erosion or water quality impairment
- Used for climate control and/or modification
- Applies chemicals, nutrients and/or wastewater
- Reduces particulate matter emissions to improve air quality

## Where can this practice be applied?

- On most crops and irrigable lands with water of suitable quality for the purpose intended
- During the planning and design of sprinkler systems for irrigation water and/or wastewater application, chemical application, climate control and/or modification and particular matter emission control



# Irrigation Storage Reservoir

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An Irrigation Storage Reservoir is a BMP that is built by constructing a dam, embankment or pit and is used to conserve water.

## What are the benefits of this practice?

It conserves water by storing water until needed to meet crop irrigation requirements.

## Where can this practice be applied?

- To irrigated areas where the available water supply is insufficient to meet conservation requirements during part or all of the irrigation season
- Where water is available for storage from surface runoff, streamflow or a subsurface source
- To a suitable site that is available for the construction of a storage reservoir



# Irrigation Water Management

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This BMP is the process of determining and controlling the volume, frequency and application rate of irrigation water in a planned, efficient manner.

## What are the benefits of this practice?

- Manages soil moisture to promote desired crop response
- Optimizes use of available water supplies
- Minimizes irrigation-induced soil erosion
- Decrease nonpoint source pollution of surface and groundwater resources
- Manages salts in the crop root zone
- Manages air, soil or plant micro-climate

## Where can this practice be applied?

- To all irrigated lands
- Where site conditions (soil, slope, crop grown, climate, water quantity and quality, etc) are present and capable of applying water to meet the intended purposes



# Micro-irrigation Systems

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Micro-irrigation is a trickle irrigation system in which all necessary components have been installed for efficient application of irrigation water directly to the root zone of plants by means of emitters, orifices or porous tubing.

## What are the benefits of this practice?

This BMP efficiently and uniformly applies irrigation water and maintains soil moisture for optimum plant growth. It can be used to apply chemicals directly to the plant root zone.

## Where can this practice be applied?

- On sites where a Micro-irrigation System has been determined to be the most desirable method of irrigation and where the soils and topography are suitable for irrigation and proposed plants
- On orchard and row crops, windbreaks, greenhouse crops and residential and commercial landscape systems
- On steep slopes where other methods would cause excessive erosion or on areas where other application devices interfere with cultural operations



# Filter Strips

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This BMP is an area of vegetation established to remove sediment, organic materials and other pollutants from runoff and wastewater to lessen the impact of agriculture on water quality.

## What are the benefits of this practice?

- Reduces sediment, particulate organics and sediment-absorbed contaminant loading in runoff and in surface irrigation tailwater
- Reduces dissolved contaminant and pathogen loading in runoff
- Reduces dissolved contaminants and particulate loading from an animal feeding operation
- Restores, creates or enhances herbaceous habitat for wildlife

## Where can this practice be applied?

- To areas situated below cropland, grazing land or distributed land
- Where sediment, particulate organic matter and/or dissolved contaminants may leave these areas and are entering environmentally sensitive areas
- To areas where permanent vegetative establishment is needed to enhance wildlife and beneficial insects or to maintain and enhance watershed function



# Surface and Subsurface Irrigation

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This BMP is a system in which all necessary water control structures have been installed for the efficient distribution of water by surface means, such as furrows, borders, contour levees or contour ditches; or by subsurface means.

## What are the benefits of this practice?

- Efficiently conveys and distributes irrigation water to the surface point of application without causing excessive water loss, erosion or water quality impairment
- Applies chemicals and/or nutrients as part of an irrigation system

## Where can this practice be applied?

- During the planning and design of an irrigation water distribution system or a chemical and/or nutrient application system
- To areas that are suitable for irrigation with water of suitable quality for the purpose intended
- To areas where water supplies are sufficient in quantity and quality to make irrigation practical for the crops to be grown and the application methods to be used



# Tailwater Recovery System

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This BMP is a planned irrigation system in which all facilities used for the collection, storage and transportation of irrigation tailwater have been installed.

## What are the benefits of this practice?

- Conserves irrigation water supplies
- Improves off-site water quality

## Where can this practice be applied?

- On lands that have a properly designed and installed irrigation system where recoverable irrigation runoff and/or rainfall runoff flows can be anticipated under current or expected management practices
- Applies to the planning and functional design of irrigation tailwater recovery systems including, but not limited to, pickup ditches, sumps, collecting basins, pumping plants and pipelines



# Conservation Crop Rotation

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Conservation Crop Rotation is a BMP where various crops are grown on the same piece of land in a planned sequence. The sequence may involve growing high residue-producing crops such as corn or wheat in rotation with low residue-producing crops such as vegetables or soybeans. The rotation can also involve growing forage crops in rotation with various field crops.



## What are the benefits of this practice?

- Reduces sheet and rill erosion and soil erosion from wind
- Maintains or improves soil organic matter content, soil tilth and soil condition
- Manages the balance of plant nutrients
- Improves water-use efficiency
- Manages saline seeps
- Manages plant pests (weeds, insects and diseases)
- Provides food and cover for wildlife and food for domestic livestock

## Where can this practice be applied?

This BMP can be applied to facilitate renovation or re-establishment of perennial vegetation, not to range and pasture land, or other land uses where crops are grown occasionally.

# Forage Harvest Management

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Forage Harvest Management is the timely cutting and removal of forages from the field such as hay, green-chop or ensilage. This BMP is used to promote plant re-growth, control insects and lessen the impact of agriculture on water quality.

## What are the benefits of this practice?

- Optimizes the economic yield of forage at the desired quality and quantity
- Promotes vigorous plant re-growth
- Maintains stand life for the desired time period
- Maintains desired species composition of the stand
- Uses forage plant biomass as a nutrient uptake tool
- Controls insects, diseases and weeds
- Maintains and/or improves wildlife habitat

## Where can this practice be applied?

This BMP can be applied to all land uses where machine harvested forage crops are grown.



# Nutrient Management

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Nutrient Management involves managing the amount, placement and timing of plant nutrients to obtain optimum yields and minimize the risk of surface water and groundwater pollution. This BMP is used to reduce nutrient loadings to water bodies and lessen the impact of agriculture on water quality.

## What are the benefits of this practice?

- Supplies plant nutrients for optimum forage and crop yields
- Provides nutrients to quickly obtain and maintain adequate vegetation for conservation cover, critical areas, grassed waterways, vegetative buffers or wildlife habitat
- Minimizes entry of nutrients to surface water and groundwater
- Maintains or improves chemical and biological conditions of the soil

## Where can this practice be applied?

This BMP can be used on land where plant nutrients are applied.



# Pest Management

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Pest Management is the managing of weeds, insects and diseases to reduce adverse effects on plant growth, crop production and natural resources. This BMP can lessen the impact of agriculture on water quality.

## What are the benefits of this practice?

- Enhances quantity and quality of commodities
- Minimizes negative impacts of pest control on soil resources, water resources, air resources, plant resources, animal resources and/or humans

## Where can this practice be applied?

This BMP can be applied wherever pests are or will be managed.



# Prescribed Grazing

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Prescribed grazing is using grazing animals to manage the controlled harvest of vegetation. This BMP is used to improve or maintain forage for livestock health, reduce runoff frequency and volume, promote economic stability and lessen the impact of agriculture on water quality.

## What are the benefits of this practice?

- Improves or maintains the health and vigor of plant communities
- Improves or maintains quantity and quality of forage for livestock health and productivity
- Improves or maintains water quality and quantity
- Reduces accelerated soil erosion and maintains or improves soil condition
- Improves or maintains the quantity and quality of food and/or cover available for wildlife
- Promotes economic stability through grazing land sustainability

## Where can this practice be applied?

This BMP can be applied to all lands where grazing animals are managed.



# Residue Management

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Residue Management is leaving protective amounts of crop residue on the soils surface during a prescribed time of the year by delaying primary tillage or seedbed preparation until immediately prior to planting time. This BMP reduces sediment erosion, increases organic materials and lessens the impact of agriculture on water quality.

## What are the benefits of this practice?

- Reduces sheet and rill erosion
- Reduces soil erosion from wind
- Reduces off-site transport of sediments, nutrients or pesticides
- Provides food and escape cover for wildlife

## Where can this practice be applied?

- To all land where crops are grown
- To seasonal residue management, which includes managing residues of annual crops from harvest until the residue is buried by tillage for seedbed preparation, removed by grazing or mechanically removed
- In the management of residues from biennial or perennial seed crops from the time of seed harvest until re-growth begins next season



# Surface Roughening

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Surface roughening is performing tillage operations that create random roughness of the soil surface. This BMP can help reduce wind erosion, protect plants from windblown particles and lessen the impact of agriculture on water quality.

## What are the benefits of this practice?

- Reduces wind erosion
- Reduces dust emissions into the air
- Reduces deposition of soil into surface water
- Protects plants from abrasion by wind blown particles

## Where can this practice be applied?

This BMP can be applied to soils that have a surface layer suitable for clod formation and have a high potential for wind erosion because of lack of surface cover. It should not be used as a primary erosion control practice.







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