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Cranberry Water Use

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CRANBERRY WATER USE

AN INFORMATION FACT SHEET

Water is the single most important resource in growing cranberries. Cranberry growers in Massachusetts rely on a clean, plentiful water supply to maintain their cranberry beds.

Water conservation is a priority to cranberry growers. In most cases, water used in cranberry production is returned to the groundwater/surface water regime close to the point where it was temporarily removed and in basically the same quantity. Water is recycled and reused from section to section and from grower to grower. Surface water supplies are replenished through a number of practices such as pumping ground water, capturing run-off and collecting water in reservoirs. Innovative water conservation practices such as water recovery systems and low volume sprinklers reduce water usage.

There are approximately 14,000 acres of cranberry bogs in Massachusetts with cranberry growers maintaining another 60,000 acres of open space serving to protect and recharge watersheds. Forty-eight cities and towns in Massachusetts have cranberry beds. The largest concentrations of cranberry acreage are in Carver, Wareham, Middleboro, Plymouth and Rochester. Together these five towns account for 62 percent of the state's cranberry acreage. Plymouth and Bristol Counties are the two major production areas; however, cranberry bogs are also found in Barnstable, Nantucket, Norfolk and Middlesex Counties.

Water is essential to cranberry cultivation. Because of the need for sizable amounts of water, impoundment of water adjacent to the bogs is a normal farming practice in cranberry production. Many growers have constructed reservoirs adjacent to their bogs to store the water needed for seasonal flooding and irrigation needs. Man-made reservoirs add new bodies of water to existing lakes and ponds, and the storage of water in reservoirs creates associated wetlands.

Plymouth County growers maintain more than 22 percent of the 20,943 acres of surface water in storage areas ranging in size from tenth-acre waterholes to large reservoirs. The annual winter flood holds an additional 12,200 acres of surface water over the state's cranberry bogs. This cultural practice not only protects the cranberry vines from cold winter winds, but also recharges needed ground water. Maintaining stable water levels also benefits wildlife and fish.

DO CRANBERRY BEDS HAVE WETLAND FUNCTIONS?

Cranberries are native to wetland habitats, requiring plentiful water supplies for their cultivation. During most of the year, well-drained soil is required for the development of healthy, functional cranberry root systems. However, evolution in a wetland setting has resulted in the ability of the cranberry plant to withstand periodic flooding without harm.

In 1990, the U.S. Army Corps of Engineers determined that commercial cranberry beds are Federal wetlands because they meet the necessary field test as prescribed in the Federal Wetland Delineation Manual. Commercial cranberry beds are also regulated as a "water-dependent" use by the U.S. Army Corps of Engineers. Even cranberry beds created from uplands are regulated as wetlands.

The Massachusetts Wetlands Protection Act regulates activities that alter the function of wetlands. Cranberry bogs and the water storage areas maintained by growers contribute significantly to flood control, prevention of pollution and storm damage, and ground water recharge - all functions of wetlands. Wetlands are defined in the Act to include vegetative communities such as "bogs." Cranberry beds meet the definition of "bog" in the Act and under 310CMR 10.04, defining land in agricultural use. In a rapidly growing region such as Southeastern Massachusetts, urbanization of the uplands, even when wetlands are avoided, results in major impacts to wetlands.

HOW DO CRANBERRY GROWERS USE WATER?

As a general rule, each acre of cranberries will use seven to ten feet of water to meet all production, harvesting and flooding needs. There are two main ways cranberry growers bring water onto the bogs – through sprinkler systems and through flooding.

SPRINKLER SYSTEMS

Sprinkler irrigation supplements soil moisture, protects the buds from spring frosts and the berries from fall frosts and cools the plants during intense summer heat. There are two vital operations performed by sprinklers on cranberry bogs - Irrigation and Frost Protection.

IRRIGATION

Cranberries can require 0.20-0.25 inches of water per acre per day during the hottest, driest and windiest weather. The standard recommendation is for vines to receive an inch of water per week from either rain, capillary action from groundwater, irrigation or some combination of these. Best Management Practices recommend irrigating in the early morning, so as not to extend the time the plants are naturally wet. This practice also minimizes loss from evaporation, run-off and drift, which can amount to 30 percent of water that comes out of the nozzle.

FROST PROTECTION

Frost protection applies water to prevent damage to buds and berries when they are sensitive to temperatures below freezing. There are two times of the year when cranberry growers worry about frost – in the spring and in the fall. It is necessary to apply at least 0.10 inch of water per acre per hour to provide basic frost protection. This will protect the plants to about 24 degrees F under calm conditions.

FLOODING

The other practice when cranberry growers use water on the bog is flooding. Flooding is so important in cranberry cultivation that bogs where flooding is not possible are no longer considered profitable. Cranberry growers use flooding as a management tool to protect the plants from the cold, drying winds of winter, to harvest and remove fallen leaves and to control pests.

WINTER FLOOD

Cranberry vines may be injured or killed by severe winter weather. This injury, winterkill, is prevented by protecting the vines with a winter flood. The winter flood may be applied as early as December 1 and remains on the bog as long as winterkill conditions are present or forecasted. Generally, growers hold the flood no later than March 15.

LATE WATER

Another flooding technique cranberry growers use is known as late water. Late water floods have been used since the 1940's and have been used to protect the bog from spring frost and to provide some pest control. In modern cranberry production, holding late water refers to the practice of withdrawing the winter flood in March then re-flooding the bog in later April for one month.

HARVEST FLOOD

The most widely-known use of flooding in cranberry cultivation is for harvest. Approximately 90 percent of the crop is harvested this way. Flood harvesting occurs after the berries are well colored and the flood waters have lost their summer heat. The bogs are flooded with up to one foot of water. In order to conserve water, harvest is managed so water is reused to harvest as many sections of bog as possible before the water is released from the system. Flood water is recycled in the cranberry bog system, passed from bog to bog through canals and flume holding ponds and reused, often shared by several growers.

WHO REGULATES CRANBERRY WATER USE?

WATER MANAGEMENT ACT

Water usage in cranberry production is regulated by the Department of Environmental Protection (DEP) under the Water Management Act. The 1985 Water Management Act requires new water uses in excess of 100,000 gallons per day or 4.6 acres of bog to secure a permit for that use. Existing usage was grandfathered in when the act was passed.

Since bog owners had no available, accurate equipment for metering, DEP agreed to issue estimated withdrawal registrations based on an industry wide standard of 10 acre feet of water per acre per year and results of a 1986 USDA Natural Resource Conservation Service study. Cranberry water use was considered virtually non-consumptive by the DEP, but in order to protect their historic water usage, cranberry growers registered any bog over 4.6 acres within any one drainage basin. Today when building new bogs over 4.6 acres, growers implement Best Management Practices (BMPs) approved by the USDA Natural Resource Conservation Service. By utilizing BMPs, growers are allowed to plant up to 9.3 acres above their registered acres before requiring a permit from the DEP.

Approved water conservation BMPs include:

- Laser-leveling the bog to within six inches across the bed.
- Implementing tailwater recovery systems that will capture water from the bog so it can be reused.
- Having irrigation systems that minimize water usage designed by an engineer or USDA.
- Constructing water control structures and dikes that are approved by the USDA.

CHAPTER 91

Chapter 91 or the Public Waterfront Act is intended to protect and promote the use of tidelands for water dependent users, such as cranberry producers, and promote public access on great ponds and navigable rivers and streams. Due to an amendment to the law in 1983, cranberry growers who have structures such as flumes, dams and pumps on great ponds or navigable water ways are required to hold a Chapter 91 license for these structures if they were built after or have been substantially modified since 1984. However, some Chapter 91 licenses date back to the late 1800s when the statute was first on the books.

BEST MANAGEMENT PRACTICES

In 1996 the University of Massachusetts Cranberry Experiment Station, CCCGA, Conservation Districts and the USDA Natural Resources and Conservation Service worked together to produce a set of Best Management Practices (BMPs) for cranberry growers. In 2000 they revised the BMPs and expanded information on water use and protection. Today there are 24 “stand alone” BMPs available to cranberry growers. Scientists and researchers at the UMass Cranberry Experiment Station and cranberry growers collaborated to write the BMPs.

Each BMP includes a description of the part of cranberry production addressed in the BMP; a series of Recommended Practices designed to maximize productivity while preserving the environment; and a list of reference materials that growers can read for additional information.

Some of the BMPs addressing water use issues are:

- Water Resource Protection and Enhancement
- Irrigation Management
- Frost Management
- Flood Management
- Chemigation
- Water Control Structures

WHO IS COMPETING FOR WATER RESOURCES IN SOUTHEASTERN MASSACHUSETTS?

According to a 1998 study done by the Center for Policy Analysis at the University of Massachusetts Dartmouth, the southeastern Massachusetts region has been developing 4.7 square miles of vacant undeveloped land each year for the past 30 years. Southeastern Massachusetts has been adding approximately 10,000 new residents each year, resulting in a 50 percent increase in the region's total population since 1960. Population growth has produced 3,500 housing units per year and the consumption of an additional 710,000 gallons of water each day.

Cranberry production is a water-intensive and water-dependent industry. It is estimated that current cranberry production in Massachusetts has a water need of 41.3 billion gallons to 44.9 billion gallons of water per year.

Estimates show that only 40 percent of cranberry bog acreage has adequate supply of water under all weather conditions. 84 percent of cranberry acreage relies on groundwater as the sole source of water supply.

The 48 cities and towns with cranberry acreage currently consume more than 35.6 billion gallons of water per year for residential, commercial and industrial uses. 68 percent of the water consumption by public water systems is for residential use. By the year 2010, it is estimated that the residential, commercial and industrial demand for water will grow between 24% and 49%. Estimates also show that by 2010 the residential, commercial and industrial demand for water will increase from 33.4 billion gallons in 1995 to between 41.5 billion gallons and 50.1 billion gallons. 95 percent of public water systems rely on groundwater aquifers as the sole source of water supply.

The estimated combined water needs for public water systems and cranberry culture in the state's 48 cranberry producing communities indicate that total demand could increase from 76.8 billion gallons in 1997 to 101.8 billion gallons in 2010. Many of the towns with sizeable cranberry acreage are also among the communities expected to have above average population growth in the next decade: Carver, Middleboro, Plymouth, Rochester and Wareham.

WHAT IS THE INDUSTRY DOING TO PROTECT ITS WATER RESOURCES AND THE ENVIRONMENT?

CONSERVATION FARM PLANS

To cranberry growers, land and water conservation is vitally important. Together with the USDA Soil Conservation Service and the County Conservation Districts, growers have developed comprehensive land and water conservation plans to preserve land and water resources. Using BMPs, growers work with Farm Planners from County Conservation Districts to develop a Conservation Farm Plan tailored to their operation.

A Conservation Farm Plan documents land use and resource management on the farm. It states how natural resources are managed and what measures should be taken to provide efficient use of those resources without their depletion. The plan contains a schedule of decisions, technical assistance and the documentation of the implementation of BMPs on the farm. The development and implementation of a Farm Plan aids growers in keeping their farm in compliance with local, state and federal regulations.

For more information, see: Ground Water and Surface Water: A Single Resource (U.S. Geological Survey Circular 1139); Best Management Practices Guide for Massachusetts Cranberry Production, UMass Cranberry Experiment Station; Water Use in Southeastern Massachusetts and Cape Cod: Implications for the Cranberry Industry, UMass Dartmouth Center for Policy Analysis.

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