

# **Best Management Practices for Cornell Greenhouses (Ithaca)**

-- Revision 3 --  
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## Table of Contents

<a href="#"><u>INTRODUCTION</u></a> .....	ii
<a href="#"><u>PESTICIDE STORAGE</u></a> .....	1-1
<a href="#"><u>FERTILIZER STORAGE AND NUTRIENT MANAGEMENT</u></a> .....	2-1
<a href="#"><u>PEST CONTROL</u></a> .....	3-1
<a href="#"><u>INTERIOR AND EXTERIOR WEED CONTROL</u></a> .....	4-1
<a href="#"><u>HOUSEKEEPING</u></a> .....	5-1
<a href="#"><u>COMPOSTING</u></a> .....	6-1
<a href="#"><u>MAINTENANCE</u></a> .....	7-1
<a href="#"><u>RENOVATION AND NEW CONSTRUCTION</u></a> .....	8-1
<a href="#"><u>GLOSSARY</u></a> .....	9-1

## Introduction

The Best Management Practices (BMPs) outlined in this document have been prepared to satisfy special conditions in State Pollution Discharge Elimination System (SPDES) Permit # NY 023 1878; DEC #7-5007-00030/000001 for Cornell University (Ithaca). The BMPs were developed by a Cornell University Greenhouse BMP Task Force in 1998 and have been subsequently revised (2000, 2005) by the Cornell University Best Management Practices Implementation Steering Committee (BMP ISC).

**The Best Management Practices for Cornell Greenhouses (Ithaca) assume that all federal, state and local regulations and Cornell policies are the operational baseline. The BMPs state management goals beyond these legal and institutional requirements.**

The BMPs are specific to the greenhouses operated by the University in Ithaca. There are conditions present at Cornell's greenhouses that are not common in commercial operations that make it possible for Cornell to implement this program. These same conditions may limit Cornell's ability to implement certain BMPs that could affect research.

The greenhouses operated by Cornell University are diverse and unique because of their fundamental mission, teaching and research. For example, many individual greenhouses will contain hundreds of species of plants. Others will be used for the rearing of insects to support research and others may be used to study various growth conditions that dictate specific usage of water or nutrients.

Because of these unique issues, we believe the following statements must be considered when reviewing and implementing the BMP document:

1. The BMPs developed by Cornell University must take into careful consideration the teaching and research mission when evaluating preferred practices.
2. The BMPs were developed for an institution such as Cornell with diverse operations. These BMPs are not intended for the commercial greenhouse industry.
3. The categories – Level 1, Level 2, and Level 3 – all constitute Best Management Practices and outline the range of alternatives available. Any of these categories are intended to satisfy the BMP requirements and determinations will be made on a case-by-case basis to select the appropriate practice practical to achieve.

### Implementation Plan for Ithaca Greenhouse Best Management Practices

Training: Training to meet BMP objectives is a continuous process. Supervisors will train newly hired greenhouse staff employees as outlined in each section of the BMP document. Training needs of current staff as well as the need for new or revised policies to meet BMP objectives are assessed at quarterly meetings of the BMP ISC. Ongoing training and policy refinement is the responsibility of this Committee. Records are kept by the BMP ISC and include what is taught, who teaches, and who is trained.

Implementation: Adherence to BMPs is the responsibility of each individual greenhouse user, greenhouse or maintenance staff person.

The operations manager overseeing each greenhouse facility assumes day-to-day responsibility. Facilitation of BMPs is coordinated and monitored by the BMP ISC, consisting of operation managers, University and College of Agriculture & Life Sciences administrative representatives, and faculty members.

The BMP ISC oversees the plan, and is responsible for:

- organizing quarterly Greenhouse BMP ISC meetings;
- monitoring progress at each facility;
- communicating novel, improved BMP ideas throughout the greenhouse management network; and
- continuous improvement of the best practices.

As part of contractual agreements related to space allocation at these facilities, project leaders (faculty members and technicians) are required to comply with written policies and procedures for greenhouse use. Operation managers are given authority to enforce adherence to BMPs.

Operations managers are required to report all instances of non-compliance with BMPs (e.g., spills or intentional disregard for the established practices) to the Chair of the Implementation Steering Committee.

Simultaneous to the introduction of BMPs into the CALS/Ithaca greenhouses, the greenhouse management developed a web-based greenhouse request instrument, which is completed by project personnel (faculty members, technicians, and graduate students). The request instrument identifies needs for space, equipment, and cultural practices and provides an opportunity for greenhouse staff and project managers to discuss management of plant material with respect to the BMPs.

Non-Compliance and Internal Control: The BMP ISC has developed an internal audit procedure that is used to audit the BMP Plan and

evaluate conformance with this Plan. The BMP ISC modifies internal audit procedures as the BMP program evolves.

**On an individual employee basis, Cornell encourages a culture of teamwork, collegiality, and cooperation. Employees are encouraged to meet group goals. Within that culture, enforcement of goals is achieved through each supervisor implementing established performance management practices for employees (professional improvement, level of salary improvement, and, if necessary, disciplinary action). Group achievement is nurtured through regular meetings, progress reports, and performance management intervention by the department or College, as needed.**

## Considerations

The BMP Plan incorporates several major themes, as identified by the New York State Department of Environmental Conservation (NYS DEC). These themes are outlined briefly here and are interwoven into the development and implementation of the BMP Plan.

**Risk identification and assessment.** The BMP Plan identifies greenhouse operational aspects that present the potential to have substantial consequences to the environment (e.g., pesticide use and storage, nutrient handling) and systematically presents the best practice options that minimize those risks.

**Employee training.** Training is intrinsic to the culture of Cornell. Cornell is fortunate to have relatively low turnover in greenhouse staff. However, new staff are hired on occasion and managers are responsible for training new greenhouse staff in all aspects of job performance, including the theory and implementation of Best Management Practices (generally) and facility-specific practices. Much peer-to-peer training also occurs with regard to specific

equipment and facility practices. Cornell greenhouse employees are required to take a University provided hazardous communication training. All greenhouse staff are required to be NYS commercially certified pesticide applicators, and applicators are required to take continuing education credits. Finally, the College of Agriculture and Life Sciences offers an annual greenhouse “update” for all employees with greenhouse-related responsibilities, as well as task and equipment-specific workshops (e.g., spill clean-up, fertilizer injector maintenance and repair).

**Inspections and records.** The BMP program has developed several standardized forms for pesticide and fertilizer inventory, sprayer maintenance, fertilizer injector maintenance, etc. Record keeping is sometimes voluntary (e.g., for sprayer maintenance) but sometimes mandatory (e.g., for pesticide applications). Training sessions and other communications remind greenhouse management and staff of record keeping tools and objectives.

Inspections occur along a continuum. Quarterly reminders sent to all greenhouse managers remind them to verify: 1) integrity of all pesticide containers; 2) all pesticides stored by compatibility; 3) ventilation functioning in all pesticide storage areas; 4) pesticide application equipment in proper operating condition; 5) fertilizer

injectors in proper operating condition; 6) integrity of fertilizer reservoirs; 7) concentrations of fertilizer solutions; and 8) open fertilizer containers stored in secondary containment. University and College programs work with greenhouse managers to conduct more comprehensive, periodic, internal inspections.

**Preventive maintenance.** Greenhouse managers work in close cooperation with greenhouse facility staff to ensure mechanical, electrical, plumbing and structural systems are as well maintained as possible, and that issues with the potential to impact the environment are given the highest priority for repairs. Greenhouse staff report concerns to the greenhouse management in a timely manner to ensure that issues are addressed as early as possible before conditions worsen.

**Good housekeeping.** Good housekeeping is a fundamental principle of effective greenhouse operations. Good housekeeping prevents pest harborages, allows for easier and quicker problem identification, and sets a tone of discipline. Greenhouse staff and management put a priority on well-maintained, neat and orderly greenhouse facilities that create the proper conditions for successful production of research and teaching plant material.