INTRODUCTION TO

OSPM

ORGANIC STRUCTURAL PEST MANAGEMENT

The methods of pest control used in food processing and handling establishments are an essential element of the organic certification process. Incorporation of organic practices in these establishments is required to assure the organic integrity of these products. As stated in the International Federation or Organic Agriculture Movements (IFOAM) Basic Standards, the organic industry needs to embrace a new philosophy of management rather than simply view the term organic as a chemical definition. The key to successful organic pest control is the management of the original dynamic elements of the structural environment, which influence pest occurrence.

Key Terms: Organic, Structural Stewardship, Creatures of Opportunity, Entrance, Establishment, Eternization

L. Ernest Otter, III
STRUCTURAL PEST MANAGEMENT SPECIALIST
PESTCO, INC.
LIVONIA, MICHIGAN 48154
USA

Presented at the
11th IFOAM Scientific Conference
Copenhagen, Denmark
August 1996

Introduction

The organic community has worked for decades to develop agricultural practices that maintain or increase the vitality of the environment, while providing wholesome products for the consumer. This work emphasizes practices that respect natural cycles in the farming environment and that prohibit the reliance on synthetic chemical inputs.

Certified organic food processors and handlers must maintain the *organic integrity* established by these agricultural producers, and they must continue this process by pursuing the basic principles of the organic community. Critical to this process is organic structural pest management (OSPM), which is defined as the pest control program in establishements that process or handle organic commodities.

The need for organic structural pest management (beyond the scope of organic integrity) is manifold. Rodent and insect pests serve as important vectors for disease and damage significant amounts of food annually. Experts estimate that rodents destroy enough food to feed 200 million people annually.[1] The Food and Agriculture Organization of the United Nations has estimated that if it could help reduce post harvest loss from stored grain pests by 50% worldwide, there would be enough food to feed the present world population.

Conventional pest management practices rely on the routine use of pesticides for the control of pests. In the current materials-based management system, it is reported that 56% of fruit, 39% of stored grains, and 34% of vegetables carry measurable amounts of pesticide residue.[ii] These residues are the result of an unsustainable and costly system of food production and handling, and they are unacceptable to increasing numbers of consumers who are legitimately concerned about their aggregate exposure to pesticides.

The organic community must concern itself with certification standards that address pest management issues in bulk storage, transportation, processing, warehousing and at retail. Methods must be required that competently and verifiably address issues of food safety and product loss due to insect and rodent pests--all in a manner that maintains the organic integrity.

Definition

The term *organic* as used in the organic foods community refers to a philosophy which is of classical (i.e., ancient Greek) origin. *Organic* refers to the philosophy of *Organicism* for which Aristotle is considered to be the founder. He argued for the view that organisms are wholes and their parts exist in context of a whole.

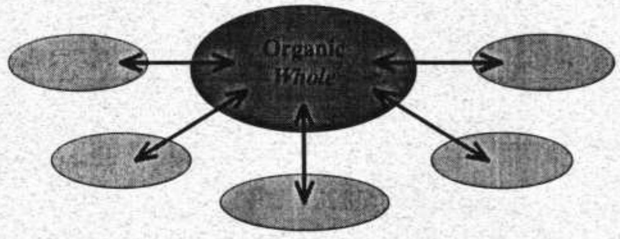


Figure One

The Organic W*hole* and the inter-relation of the *Parts*

The use of the term *organic* in chemistry is often confused with the concept of organic management. Centuries after the development of the concept of Organicism, scientists adopted the terms *organic* and *inorganic* in reference to chemical compounds. The organic community must not confuse these definitions when referring to organic management.

Current science is based on mechanistic thought. Rupert Sheldrake defines this as "the theory that all physical phenomena can be explained mechanically, without reference to goals or purposive designs."[iii] Current management practices view the world as a machine that can be manipulated and controlled completely by human design.

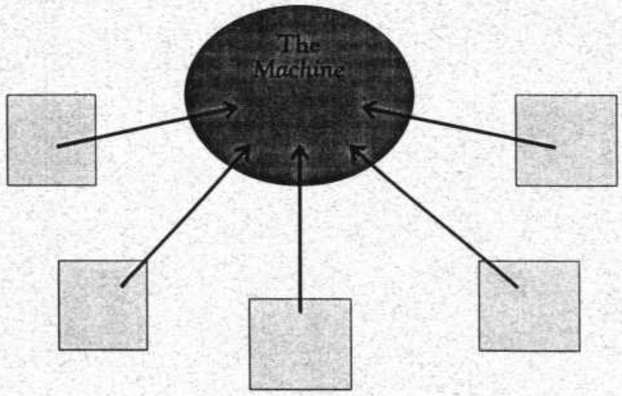


Figure Two

The *Machine* and the parts that build the machine.

Simplistic mechanistic thought considers the structural environment a static system. If a rodent invades a building, for example, the mechanistic approach for dealing with invasion of a structure by rodents is to design a new combative element for the machine, such as a rodenticide. Since the rodent invader is undesirable, the rodenticide is added to destroy the intruder. This is a successful tool for the task of killing the rodent, but the causal factors that allowed the rodent to enter the facility have not been addressed.

It is necessary to consider all of the reasons for the rodent's entry into the structure. Each creature has specific needs and reasons for its actions. The boundary conditions that determine the rodent's presence must be considered for proper management of the structural environment. Hence, the rodent is not the problem, but only a symptom of the problem.

Application of Philosophy

So how do we apply organic thought to the structural environment? Let us consider the root ideas of the term organic; *organism* and *organ*. We must understand that *organism* is only a metaphor that refers to a given system, and *organs* are the most basic elements of that system. When we use the term organism we think of a living creature; when we use the term organ, we think of a part of the creature, like a heart or lungs. It may seem obtuse to refer to the structural environment as an organism, but A. N. Whitehead defined organisms as "structures of activity" at all levels of complexity.[iv]

We must take examples of the structural environment (eg. bulk grain bin, warehouse, or food-processing facility) and look at them in their most simple terms. In the structure's initial state (walls, ceiling, floor) it is an incomplete habitat. When we add openings, such as doors and windows, it becomes suitable for basic shelter, but still does not provide the basic necessities of life. Finally with food, moisture, and a controlled climate we have defined a complete habitat, be it for humans, or even rodents, cockroaches and stored grain pests! (*See figure three*)

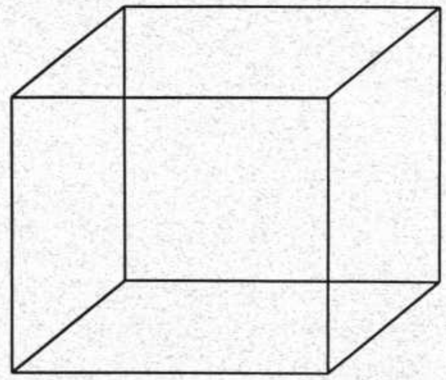
While the agrarian sector has many external environmental factors that cannot be controlled, in the structural environment it is possible to manipulate these factors (e.g. temperature, humidity, food supply, entry and exit). These environmental factors are the tools of organic structural pest management. They are the original elements that define a bulk grain bin or the processing floor of a food processor as a habitat for insect or rodent pests.

Applying the philosophy of organicism, we can look at the food-processing environment as an organism, to be treated in a Holistic fashion. With this perspective, it is possible to control pest populations <u>without the use of highly toxic pesticides</u>.

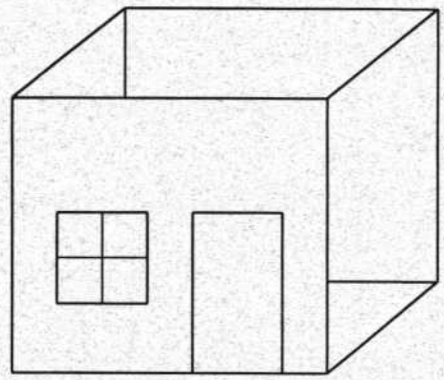
We cannot proceed in this progression of thought without a basic understanding of what we mean by the *boundary conditions* of the organisms that we define as pests. Every creature has certain biological needs that need to be met for survival. The key factors for survival have been provided in the accompanying illustration *(see figure four)*.

Each of these factors must fall within a certain conditional range for a creature to survive. When the conditions fall within these boundaries, the offending pest can survive and perpetuate. Conversely, when these factors fall outside the boundary conditions for survival, the pests will not survive. The application of a pesticide against a pest population in a facility should never be considered without first doing an inventory of these boundary conditions for pest survival. These needs should first be identified, and the alteration of these survival conditions should be considered a remedial action.

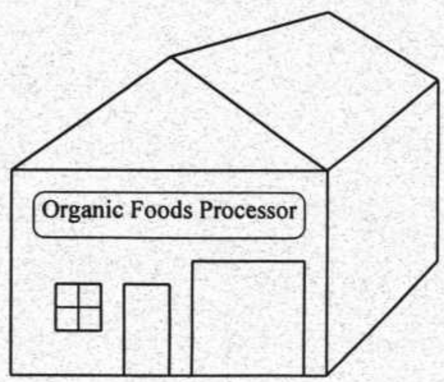
There is another philosophical misunderstanding, which if corrected, will have profound practical consequences for this industry. This misunderstanding is that insects and rodents are considered *creatures of competition*. This incorrectly describes these creatures. The use of the word *competition* implies that these creatures have a need to win, as if their ultimate premeditated goal is to beat humans. (An anthropocentric view to be sure). In this perspective man brings out the big guns (or pesticides) with war like tactics and blasts the invading creatures. Unfortunately he shoots himself in the foot in this battle! It would be more productive to understand that these creatures are nothing more than *creatures of opportunity*. If we allow ways for rodents to enter our homes, they will. If we create a processing facility that satisfies the conditions for cockroach survival, they will perpetuate. If we do not store our grains correctly, grain pests will invade.



<u>Box</u>
Devoid of life and life sustaining properties.



<u>Simple Structure</u>
Suitable for basic shelter, but will not sustain life for extended periods.
Incomplete Habitat



<u>Complex Structure</u>
Will sustain life for extended periods.
Complete Habitat

<u>Figure Three</u>

Shelter / Harborage

Temperature

Moisture

Food

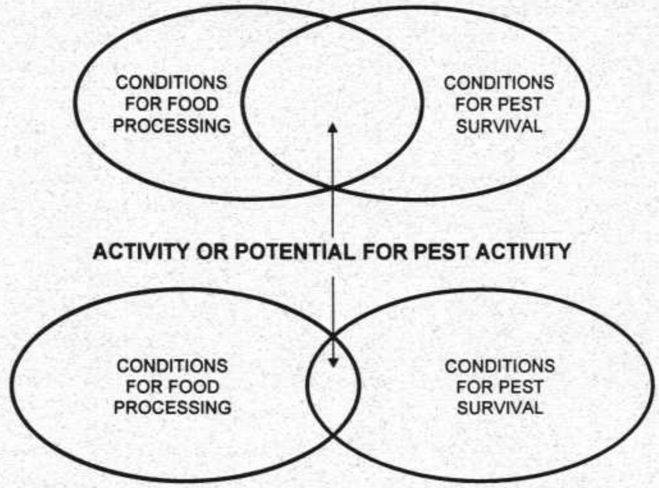
Light

Behavior

Parasites / Predators

Factors for Survival

Figure Four



Venn Diagram

Figure Five

The interaction of the boundary conditions of pests and their interaction with the surrounding environment are conceptualized in the Venn Diagram provided *(figure five)*. Imagine the universe of all the possible conditions of a food processing or handling structure. Only a subset of these conditions will be physically and economically suitable for effective food processing. A second circle (within this universe of possible conditions) represents the conditions in which a pest can survive. Because the factors of the environment of a structure are under our control, we can attenuate them to a degree to make these two subsets of conditions as mutually exclusive as possible. By viewing the boundary conditions of both food preparation and pest survival in all their multidimensional complexity, it should become obvious that using pesticides is only one factor out of many that we can manipulate to make these subsets mutually exclusive.

A Shift in Paradigm

It may help to clarify these ideas by paraphrasing them in terms taken from the philosopher of science, Thomas Kuhn. His classic, *The Structure of Scientific Revolutions*,[v] describes how science advances through alternating periods of scientific activity that he termed "normal and extraordinary science". Normal scientific activity is characterized by a consensus amongst the members of the scientific community about the basic assumptions of the belief in regards to what is being studied, how to study it, and, most important, what sorts of results one should expect. Extraordinary scientific activity, Kuhn argued, results when normal scientific practice breaks down and fails to achieve results that can be accounted for by the immediate theories and assumptions of the scientific community.

When results consistently do not conform to the expectations of regnant theories governing current scientific practice, then according to Kuhn, extraordinary scientific activity begins. It is only then that scientists begin to act as philosophers, and finally begin to challenge and reanalyze the assumptions behind their theories.

Modern pest control practice has been governed by the implicit theory that chemicals alone could control pests. The anomalous phenomena that resulted from our adherence to this theory has been the increase in tolerance by the pest to the pesticides, growing economic cost of chemical pesticide application due to public concern, and finally the utter failure of many of these pesticide to work at all. It is also legitimate to be concerned about the side affects of these chemicals continually spilling into the food chain. Clearly we need to rethink our "normal science" in pest control practices.

In Kuhn's original terms, we need a paradigm shift (or a change in our models and assumptions) of what comprises good pest control techniques.

The philosophical discussion up to this point has been a way of sketching and characterizing what our new assumptions should be. It is the purpose of this paper to explicitly describe, if only in introductory form, an alternative paradigm for the approach to pest management in food processing and food handling.

We are no longer simply trying to defeat nature. We have to recognize the dynamic and organic systemic qualities of the environment in which we work. Our role is one of stewardship, not one of absolute control.

The OSPM Model

The purpose of this paper is to outline clearly the elements of organic structural pest management. These elements have been assembled in a model that will successfully guide the structural pest manager in the organic decision making process. The author has endeavored to trace the steps of this learning process, and has condensed the critical elements into what is termed the Organic Structural Pest Management Model.

Structural pest management has not known a formal system for problem solving--other than routine pesticide application. This OSPM model will demonstrate the primary difference between current mechanistic management, and organic management. A hierarchy is given to the steps that must be taken in the management of the structural environment.

The model begins *(see figure six)* with the identification of the necessary elements which *formalize* the management program. We proceed to the *operational* steps that must be taken to effectively manage pests. Third, the process must include intervalic *analyses*, which assesses the efficacy of the preceding and following phases. Finally, we must consider the steps that may be taken in the event that unacceptable pest activity has been identified. This final *remedial* phase must first address the reasons for the pest activity, and uses the primary factors for survival to eliminate and further prevent activity.

Phase I Formalization	GOALS PLANNING EDUCATION DOCUMENTATION
	♦
Phase II Operational Basis	EXCLUSION ESTABLISHMENT ETERNIZATION
	♦
Phase III Analysis	INSPECTION MONITORING
	♦
Phase IV Remediation	PASSIVE MANAGEMENT ACTIVE MANAGEMENT CHEMICAL TOXICANT

OSPM Model

Figure Six

Phase One: Formalization

The first phase of the model are the formal elements, necessary to any good business plan. Within this phase specific *goals* must be set, and written *plan* devised which maps out how goals are to be achieved. This process should include elements of *training* for the individuals who are to perform the assigned tasks. All of these elements should be tied together with appropriate and substantiating *documentation*.

Phase Two: Operational Basis

The operational basis of organic structural pest management can be characterized by three concepts, which are as follows:

Entrance: The means by which a pest gains access into a facility.

Establishment: Provision of the basic necessities for life in the facility to sustain life for short periods.

Eternization: Provision of the basic necessities for life in the facility to sustain life and the reproductive process (succeeding generations).

These three fundamental concepts are the principle elements of structural stewardship.

Entrance represents the ways in which a pest enters a facility. This is the first and most important step in preventing pest occurrence. This may be achieved by simply making sure that doors and windows seal tightly, or that holes in walls are repaired.

More difficult is the issue of entry through transportation. A perfectly sealed building may have pests introduced by means of the commodities and supplies brought in. Routine inspection of incoming products is an important deterrent to entry of unwanted pests.

Establishment of a pest in the structural environment occurs after a pest has entered the facility. As we understand, the pest requires certain necessities of life to survive. If these basic needs for survival are met, the pest will establish itself in the structural environment.

Eternization is the final stage a pest population may achieve in the structural environment. The necessities of life are so completely provided that successive generations are sustained. This concept is commonly referred to as infestation.

Phase Three: Analysis

Analysis is implemented through intervalic physical inspection and monitoring in and around the structure. As established, we are dealing with a dynamic environment. Many variables exist which may eventually allow some type of pest activity. The structural pest manager must provide a program that accounts for these variables, and attenuates the support programs as a need is identified. This is achieved by means of a formalized program and routine physical inspections. The practitioner must continuously monitor the facility for variances in the predefined operational practices. The key to monitoring and inspection is to use the information obtained by the process. The goal is not to control the pests, but to control the variability of the facility that contributes to pest activity. Pesticides are routinely used to cover other deficiencies in practice--clouding the true nature of problems within facilities. Their use in fact does nothing to address the variability within other support programs.

Phase Four: Remediation

It is expected that with-in any establishment, a pest problem will be encountered. Some form of planned response must be in place to protect the organic commodities. Some form of active intervention must be available, and by virtue of this approach, we are no longer limited to simply applying a pesticide in retaliation.

Now that we are taking into consideration that every creature does have a specific range of needs that must be accommodated to survive, we can now utilize a broader range of tools for their remediation. This is re-enforced in Shelford's his *Law of Tolerance*, which states: "Too much of too little of a necessity of life can have a negative effect on a population".[vi] By restricting or limiting the factors for life, it is possible to negatively impact a pest population. By bringing a necessity to an extreme, it may be possible to destroy a pest population.

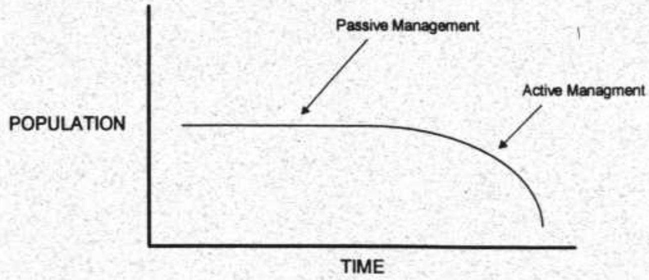
True remeditaion begins with the alteration of the factors for survival (within the dynamic environment). This alteration can take several forms:

Passive Management

Passive management techniques manipulate the structural environment in context of a specific pest's factors for survival. These practices do not destroy the pest, but restrict its needs to such a degree that it will limit its ability to live and reproduce. While the goal is to completely deter all activity, an economic tolerance threshold (and reality) indicates that an absolute zero tolerance is not an achievable goal. Passive management endeavors to provide a form of stasis in the structural environment, as a baseline. With this accomplished, a facility may encounter the occasional invader, but no longer has to over-react with heavy pesticide use. The facility has in essence established resilience against the target pest.

Active Management

Active management techniques bring a necessity of life to such an extreme that it has a destructive effect on the population (figure seven). Population growth is not simply held static, but the environmental necessities of life are brought to a level that adversely affects the target population.



Graph Illustrating Passive and Active Management Concept

Figure Seven

Chemical Toxicant

Also a form of active management, this concept is separated, as it is not an original factor of survival (or demise) within the structural environment. Pesticides, be they synthetic or naturally occurring are not original components of the structural system. The only original components of the system are the factors for survival that we have provided for these creatures.

It may be argued by some that since the structural environment is man made (synthetic), that synthetic pesticides may be used appropriately within the context of the structural organic program. This is incorrect, as the pesticides are *not original* to the food that we are handling in these facilities.

Organic certification programs allow the use of certain pesticide materials without restriction in organic management. The basis for this use, initially, is whether it is original (natural) to the system. Materials are not always allowed because they are naturally occurring. In many instances, natural materials are very toxic or very disruptive to the balance of the managed system. In these cases, the organic community prohibits even natural pesticides.

It is not the focus of this paper to elaborate on the specific materials that are, or should be allowed in the organic industry. What should be clearly demonstrated by this paper is that materials are not the basis of management in an organic system, they are only an adjunct to management practices.

It is not the use of pesticides that ultimately solves insect and rodent problems in a structural facility. These materials only temporarily suppress or contain the activity, and add a deleterious factor to the structural environment. Chemical toxicants do not change or modify the original factors for pest survival.

With this understanding, it may on occasion be necessary to use a toxicant in specific situations. These materials must only be used when the original contributing conditions have been identified, and after proactive steps have been taken in passive and active management.

Rigorous record keeping and residue testing may be required to assure that the organic integrity is not compromised. The following points will help clarify how and when materials are properly used in an organic program.

I. Established pest populations may require active chemical intervention. Only materials that are allowed by the organic certifier should be used.

II. If materials prohibited by an organic certifer are used in the structural environment, organic products must be segregated from the treatment area.

III. Pesticides that are prohibited or restricted by organic standards should not be used in prophylaxis. Even natural pesticides are not the basis for true organic management.

IV. Organic pest management is based on practice, not product.

IPM vs. OSPM

The current trend in pest control is Integrated Pest Management (IPM). This has been an excellent step to pesticide use reduction. It actively explores non-toxic means to destroy pests. The author acknowledges that good information and research is available through this pest control trend. But in its current state IPM does not serve as an adequate model to either establish or maintain organic integrity.

IPM has not established a formal disciplinary matrix. It does not discriminate when or what types of pesticides may be used. In fact, the current trend within the structural pest control industry is the *integration of chemicals*, not *methods*. IPM remains inherently mechanistic in approach.

Organic Certification Standards

Organic certification standards define the practices that must be implemented in organic production and processing to establish and maintain *organic integrity*. Organic certification standards need to do more than establish a baseline for the minimum requirements of a certification body. Standards (or rules) should serve as a model to assist the novice practitioner in both technical and heuristic skills development. One of the founding premises of the Organic Crop Improvement Association is that producers and processor members must strive for continuous improvement. The goal of the organic industry should be to guide the organic practitioner in skills acquisition and improvement in practice. Building better stewards will ultimately allow the organic community to provide quality assured products to the consumer.

Effective basic organic certification standards are comprised of several key elements: principles, conditions and guidelines.

Principles are the industry's *meta-criteria*, or that which inherently separates organic producers and processors from the conventional sector. These defining elements are what ultimately guide the organic practitioner in determining the directions and levels of management to be taken.

Conditions provide the *operational basis* for certification. In the pursuit of organic principles, minimum levels of compliance are set which *must* be met to establish and maintain *organic integrity*.

Guidelines provide the *testable index* of management practices. Conditions, in some cases, may be broad in scope and require that specific management elements be in place to establish compliance. While specific guidelines may not solely establish organic integrity, they are the elements that *should be* in place in a given management system.

The use of certification standards in the production, handling and processing of food and fiber establishes the organic integrity of that commodity or product. Deviation from the basic standards may also demonstrate a compromise in organic integrity, which may cause the denial/revocation of organic seal and labeling privileges.

Conclusion

The discipline of structural pest management, and how to protect the food and fiber we process and handle from both pests and pesticides is an essential element of the organic certification process. Pesticide application is no longer viewed as an effective or safe way to manage the food supply. The anomalies within this discipline are increasingly present, only the most uninformed are not aware of this breakdown in our "normal science". The organic food and fiber industry has the ability to demonstrate more competent scientific principles to the world through our developments.

The organic industry must provide direction through clear, well-defined certification standards. The novice organic practitioner will always want to replace the synthetic pesticides with natural counterparts--as the basis for organic management. It is the organic certification community's responsibility to guide this novice practitioner down the path to true organic management.

The application of the OSPM method in industry has proven it to be a viable, competent, economical method for structural pest management. The OSPM model is presented with the intent to more clearly define the organic concept for the industry, and most importantly, assist the structural pest management practitioner in the development of the skills necessary to effectively manage the structural environment with out a dependence on toxic chemical intervention.

*****

Acknowledgments

A Grant made the presentation of this paper in Copenhagen possible from Eden Foods, of Clinton Michigan.

My father, Ernest Otter, II, for his experience and guidance in the pest control industry, which was the stepping stone for my research.

Charles VanBoven, for consultations in the area of applied epistemology.

Tina, my wife for her love and patience with my obsessions.

About the Author

L. Ernest Otter, III is a structural pest management specialist for Pestco, Inc. Pestco is a structural pest control company, which is located in Michigan. Mr. Otter has been involved in this family owned business since he was a child.

After attending the School of Engineering and Applied Sciences at Western Michigan University, Ernie rejoined the family pest control business. Today he specializes in pest and sanitation management in food processing and warehouse facilities. He uses the OSPM method with all of the clients--who serve as his living laboratory.

Mr. Otter has also served on the Organic Crop Improvement Association's International Standards Committee since 1991 and has chaired the committee since 1992. He also serves on the Farm Verified Organic Certification Committee as an adjunct member, and is active in the process of brand name materials acceptance for the organic industry.

Consultation services are available for both food safety and organic handling programs.

Additional Works by the Author

Pest Management Protocols -- A definitive operational guide that is tailored to specific food processing and handling operations.

Don't Recycle Your Pests! -- An award winning guide for homeowners to manage their home recyclable materials in a fashion that doesn't attract or harbor pests.

Beyond IPM, An Introduction to Advanced Structural Pest Management. -- This is the complete work, which fully explores the concept of OSPM. The book includes case studies, which provide concrete examples of this management process.

<u>Other papers by the author</u>

OSPM Introduction to

1. *Rodent Management*
2. *Cockroach Management*
3. *Stored Grain Pests*
4. *General Perimeter Invaders*
5. *The Organic Certification Process*
6. *Good Organic Handling Practices*

Bibliography

[i]Bennett, Gary W., Owens, John M., Corrgian, Robert M. *Truman's Scientific Guide To Pest Control Operations*. Duluth: Purdue University/Edgell Communications, 1988. 307.

[ii]United States Government, *1994 Pesticide Residue Monitoring Program Report*, Food and Drug Administration, 1995.

[iii]Sheldrake, A. Rupert. *The Presence of the Past*. New York: Random House, 1988.

[iv]Whitehead, Alfred North. *Science and the Modern World*. New York: Macmillan, 1925.

[v]Kuhn, Thomas S. *The Structure of Scientific Revolutions*, Chicago: University of Chicago, 1970.

[vi]Shelford, Victor E. *Animal Communities in Temperate America*. Chicago: University of Chicago Press, 1913.

More information about these and other topics is available on-line:

www.pestco.net