Integrated Pest Management Budget Calculator:

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Abstract

Pest-proofing and building repair are integral parts of integrated pest management (IPM) programs designed to reduce the need for pesticides in schools and other complex structures; however implementing such practices can be costly. Without being able to weigh the costs and benefits of various maintenance activities, schools can find themselves paying for practices that are only marginally effective.

An Excel-based calculator was developed to help school decision-makers estimate the costs and pest-reduction benefits of various IPM-related actions. The calculator is built on a model for predicting pest risks based on facility inspection results and a history of facility pest problems. Default values are used in estimating costs of various maintenance actions; however these costs are easily customizable by each user. Use of the calculator allows managers to prioritize needed building improvements based on pest management needs. Structure of the calculator is described and results of an initial introduction to school IPM coordinators are presented. Initial testing of the beta-version of the spreadsheet is planned for four regional school IPM Coordinator training classes in 2006.

Introduction

One of the most controversial aspects about legislation requiring school districts to implement integrated pest management (IPM) practices is the potential financial impact on schools. School pest control budgets are typically small. In Texas, 71% of schools have pest control budgets of $10,000 or less (unpublished data, Hurley et al. 2006).

Little data is available on costs of school IPM programs nationwide. Complicating the issue of understanding school IPM budgets is a lack of consensus about what line items should be included in a pest control budget. Most school districts include costs of pesticides under the budgetary heading of pest control, but salaries for licensed pesticide applicators may or may not be included, depending on whether the employee has additional maintenance or supervisory duties. Money for hiring outside contractors is likewise usually included in pest control budgets; however costs of building repair and upgrades needed to pest-proof a building are commonly found in general maintenance budgets, not pest control.

Pest-proofing and building repair are integral parts of IPM programs designed to reduce the need for pesticides in schools and other complex structures. In this project we constructed a Microsoft® Office Excel-based calculator to help school decision-makers estimate the costs and pest-reduction benefits of various IPM-related actions.

The calculator was designed to allow school district administrators to weigh the costs and benefits of various maintenance activities while gaining insight in to the various external costs that go into an effective pest control program.

Pest Risk Functions Used

The calculator is designed to estimate overall pest risk based on an assessment of key pests and evaluations of conditions of key construction components of school buildings.

A list of 18 key pests and 33 key construction features was developed based on two focus group session consisting of nine school IPM coordinators and five pest management professionals who have worked extensively with schools.

These lists were used as the basis for development of two IPM pest risk formulas. O_c is an index, on a 0-100 scale, of the average overall pest risk factor for school district (or campus) *c*.

$$O_c = \frac{\sum_{f=1}^{x} P_f}{4x}$$

It is based on another index, the Priority for repair index, P_f (scale of 0-400):

$$P_f = R_f \cdot \left[\frac{\sum_{p=1}^{n} \left(CR_f(p) \cdot I(p) \cdot A(p) \right)}{\max score \cdot n} \right] \cdot 100$$

Variables in the above formulas include:

n = total no. pests (18)
p = pest *p*
x = total no. structural features (33)
f = feature *f*
y= total no. campuses in district
c = campus (or district) *c*

P_f = Priority for repair of feature *f* (0-400)
$CR_f(p)$ = Risk of complaint generated by pest *p* if feature *f* is in poor repair (0-4, where 0 is no risk of a complaint and 4 is high probability of a complaint) *Defaults, user can modify.*
I_p = Importance of controlling pest *p* (1-5, where 1 is lowest urgency, 5 is highest urgency in terms of potential threat to visitor/student/staff health or facility integrity) *Defaults supplied, user can modify.*
A_p = Abundance of pest (p) (1-3, where 1=rarely occurs, 2=sometimes occurs, 3= often occurs) *Input by user.*
R_f = Need for repair of feature *f* (0-4, where 0 is no feature repair on any instances needed, 4 = major repairs/replacement needed on all instances) *Generated by calculator from input by user.*
O_c = average overall pest risk for campus (or district) *c*

Acknowledgement

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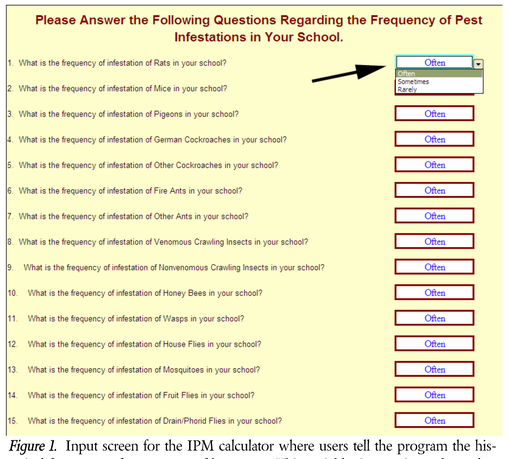

Figure 1. Input screen for the IPM calculator where users tell the program the historical frequency of occurrence of key pests. This variable, in turn is used to calculate the overall pest risk for campuses and districts.

Figure 2. Table assigning risk of pest complaint where a particular building feature is in poor repair. Ill-fitting lids on dumpsters, for example increase risk of rodents by a factor of 4, whereas this maintenance issue has little effect, say on the risk of a German cockroach infestation. These values have been assigned defaults, which may be customized by the user..

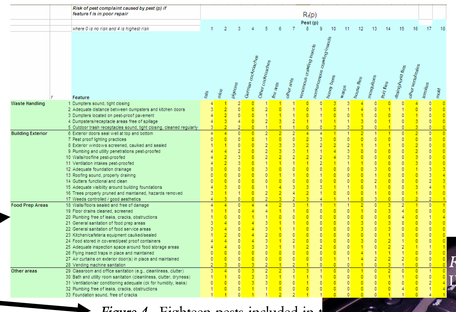

Figure 3. Most of the default values used in the IPM calculator are customizable by the user.

Figure 4. Eighteen pests included in t calculator.

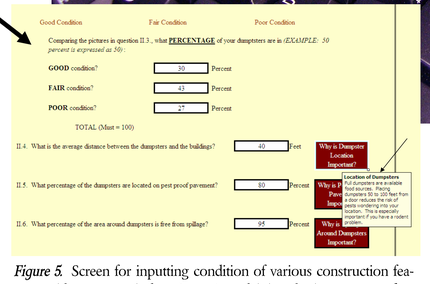

Figure 5. Screen for inputting condition of various construction features with pop-up window (arrow) explaining the importance of dumpster location to IPM practice. In addition to facilitating budget management, the IPM calculator is a teaching tool.

A Teaching Tool

An important aspect of the IPM calculator is its value as a teaching tool. As a user enters data, explanatory notes about the importance of various aspects of building maintenance are available as pop-up notes (see Figure 5). In the final calculator model, notes will be accompanied by diagrams and photographic images to illustrate, say, good-fair-poor conditions of different building elements.

Figure 6. Image illustrating "good" condition of landscape plantings around building foundation. Note the 12 inch zone of crushed granite separating the foundation from plantings. This feature facilitates easy IPM inspections and discourages pest entry into the school building..

Outputs

Once the user has entered all relevant information and completes the calculator, an overall pest risk is calculated from the average overall pest risk function (Figure 7). At this point the manager is given the opportunity to play "what if?", much as with a traditional financial spreadsheet. Two worksheets are produced that show "Changes Requiring Capital" (Figure 8) and "Changes Requiring Behavioral Modifications." The Changes Requiring Capital worksheet provides default estimates for making recommended facility improvements.

Once the user has selected the changes to be made, a revised, overall average pest risk screen is re-calculated and a pest control budget is printed (Figure 9).

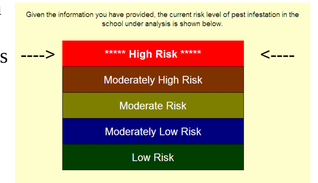

Figure 7. Screen showing overall average pest risk based on the user's assessment of pest pressure and facility condition. At this point user has an opportunity to make changes to the facility and view the changes to overall pest risk. The risk rating provides a tool the user can use to communicate with other school administrators.

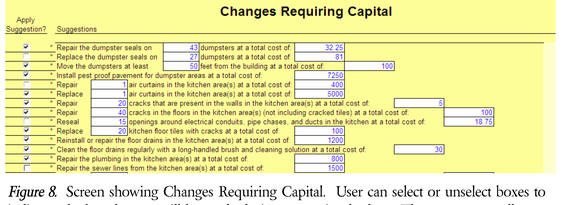

Figure 8. Screen showing Changes Requiring Capital. User can select or unselect boxes to indicate whether changes will be made during upcoming budget. The average overall pest risk (Figure 7) is then recalculated and a pest control budget for next budget cycle is printed (Figure 9).

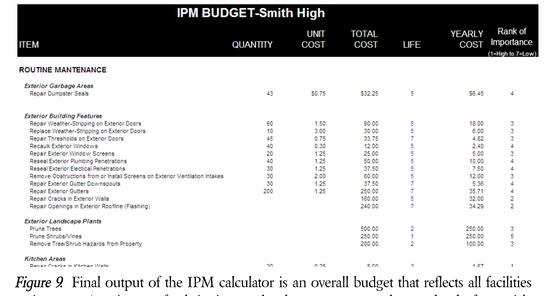

Figure 9. Final output of the IPM calculator is an overall budget that reflects all facilities maintenance/repair costs for bringing a school campus up to a known level of pest risk. Estimated life of the improvement (in blue) is customizable by the user.

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