

January 2004

Guidance Document to Applicants:
FIFRA Section 18 Pilot Program Concerning (1) the Streamlined Application
Process for Select Repeat Emergency Exemption Requests and (2) the “Loss-Based”
(Tiered) Evaluation Criteria for Assessing Significant Economic Loss

This document is intended to provide guidance to State and Federal agencies which submit applications for specific emergency exemption requests under section 18 of the Federal Insecticide, Fungicide, and Rodenticide Act under the limited pilot program which was launched during the 2003 use season. The Agency piloted two initiatives related to the emergency exemption process. The pilot initiatives are expected to reduce the burden to both applicants (State and Federal agencies) and the EPA in connection with the preparation and evaluation of exemption requests. It is anticipated that actions submitted under the pilot can be processed more quickly by the Agency, without diminishing health and safety protections underlying the decision.

This document explains, in detail, the two areas of this continuing pilot and describes the steps that applicants should take in order to participate in this pilot program. Last year's 4/27/03 Federal Register Notice announcing initiation of the pilot might also be used as an additional reference document. Applicants should carefully review this document to determine whether a contemplated exemption request is eligible for the pilot.

The first area piloted allows applicants for certain repeat exemptions to re-certify that the emergency conditions, which initially qualified for an exemption, continue to exist. Under the pilot for this area, the applicants' own certification that the emergency situation is ongoing, along with their incorporation by reference of their earlier full application, takes the place of the submission of data generally required to support a repeat request for an emergency exemption. In this way, the burden associated with the application process for select repeat requests is significantly reduced. EPA has identified the specific uses (pesticide active ingredient-crop combinations) and states that meet the criteria and are eligible for this aspect of the pilot this year (see Appendix No. 1). Additionally, the applicants may certify that their use pattern remains the same as that granted by EPA under last year's exemption. Applicants may request a change in use pattern, but please be aware that such a change may require additional review time and an expedited response may not be possible.

The second area that will be piloted involves revising the analytical methodology and economic data necessary to assess whether a “significant economic loss” will occur. Such evaluations are typically needed to support applications for specific emergency exemption requests. Under the pilot, EPA will assess whether a “significant economic loss” will occur through a loss-based (tiered) approach. Successive tiers will require more data and analysis. However, it is thought that many “significant economic loss” findings can be made, without loss of reliability, using less data and analytical resources (by both the applicant and EPA) than the process currently requires.

There are two sections to this document, one for each of the two initiatives under the pilot. Questions about the pilot, or the section 18 process in general, can be directed to the Emergency Response Team leader at (703) 308-9366 or by e-mail at Sec-18-Mailbox@epamail.epa.gov.

Section 18 Pilot - Issue No. 1

Streamlined Application Process for Select Repeat Requests

Introduction

The regulations governing section 18 of FIFRA, allow the Agency to issue a specific exemption for “...as long a period as is reasonably expected to be necessary *but in no case for longer than 1 year.*” (40 Code of Federal Regulations CFR 166.28(a)). Therefore, EPA has reviewed exemption requests on a year-to-year basis, and required applicants to submit a complete application, along with all supporting documentation, each year. This requirement has been in place even if the situation is one which could reasonably be expected to recur in subsequent years. However, EPA recognizes that some emergency situations continue until the circumstances which precipitated the emergency somehow change.

In light of these considerations, a streamlined application program was piloted beginning with the 2003 use season. Under the pilot, for certain eligible repeat requests, applicants are permitted to certify that the conditions which brought about the emergency situation continue to exist. The applicants’ (i.e. the state or federal lead agency for pesticides) own certification and incorporation by reference of their earlier full application is intended to take the place of a new and complete exemption request. For the group of eligible repeat requests, therefore, it is expected that this pilot program will decrease the burden associated with developing and submitting an application for an emergency exemption for the eligible repeat requests. Additionally, it is anticipated that these changes will lead to less Agency review time and more rapid response on eligible requests, which will better support growers and the public in addressing emergency pest problems.

Under this portion of the pilot program, EPA has again identified the uses and states which are eligible, during the upcoming 2004 use season, to support a repeat exemption request by the applicants’ own certification that the emergency condition is ongoing. The list of uses and states which are eligible for this portion of the pilot are provided in Appendix No. 1 to this document. In developing the uses included in Appendix No. 1, EPA used the criteria discussed in the 4/27/03 Federal Register Notice and reiterated below. All four criteria were measured against the pool of requests submitted during the previous use season.

The criteria are presented here so that applicants and the public can better understand the manner in which the initiatives described in the 4/27/03 Federal Register Notice could be applied to existing emergency pest control programs.

I. *Eligibility Criteria for Streamlined Application Pilot for Repeat Section 18 Emergency Exemptions*

All four of the conditions listed below should be met before an emergency exemption request will be considered eligible for the streamlined application pilot.

1. EPA granted the same exemption the previous year, and it is the second or third year of the request by that applicant. The Agency determined that the situation the previous year satisfied requirements for an emergency condition [40 CFR 166.3(d)], and no additional information was required by EPA in the previous year's authorization. A complete application will be required the first year of an exemption for a particular applicant, in order to establish the existence of the emergency. Re-certifications will not be accepted as the basis for an emergency after three years of an exemption to an applicant.
2. The emergency situation can reasonably be expected to continue for longer than one year. Examples of these include situations where a registered product relied upon by growers becomes permanently unavailable; expansion of a pest's range; and, documented loss of efficacy of a registered product. Situations which would not be expected to continue would include a temporary supply problem of a registered product; an isolated weather event; and, a sporadic pest outbreak.
3. The request is not for a new chemical, a first food use, or for a chemical under Special Review. A request that is for a chemical which has never been registered as a pesticide under Section 3 of FIFRA, or has never been registered for a food use, or the chemical has officially been placed under Special Review by the Agency, would not be considered for candidacy for re-certification of the emergency.
4. The requested pesticide is registered for another use and has been designated as "reduced-risk" by EPA for one or more uses. The reduced risk program is explained in PR Notice 97-3. This program offers pesticide manufacturers incentives for developing registration applications for pesticides which are less risky than the alternatives for a given pest problem. A committee of EPA scientists evaluates and selects pesticides and uses which are considered to be reduced risk.

On a case-by-case basis, EPA will review with applicants whether other repeat requests, not listed in Appendix No. 1, meet all of the criteria listed here. Applicants who believe there are additional uses that should be added to Appendix No. 1 should contact the Agency.

II. *Schedule and Purpose of the Pilot Program for the Streamlined Application Process for Repeat Requests*

EPA is continuing this pilot in order to (1) continue to gain experience with specific approaches for modifying the section 18 program and (2) take steps to put into place specific initiatives that have been suggested by key stakeholders. The Agency plans to soon publish a proposed rule concerning the emergency exemption process. EPA has found the information gained thus far from this pilot to be very helpful in proceeding with this rulemaking. EPA **may** decide to continue this pilot until such time as action is taken with respect to the proposed rulemaking.

Prior to the start of each use season, EPA will directly inform applicants and the public of their determination on whether this pilot program will continue in this same fashion.

III. *Overview of Schedule and Review Cycle for Actions Under the Streamlined Application Pilot*

An emergency exemption request that meets the criteria outlined in the Federal Register Notice will be eligible for streamlined application and “re-certification” of the emergency situation for two years following the initial year of the exemption for that applicant. If an emergency continues beyond three years for an applicant, they will again be required to submit a complete request each year, thereafter, with full supporting documentation described under 40 CFR 166.20. Other applicants will, likewise, be eligible for streamlined application and re-certification in the second and third years that they are experiencing the emergency situation. However, EPA’s initial operational design for this program suggests that long-running emergency exemption uses might not be appropriate candidates for this pilot.

As part of the review of an emergency exemption application, EPA makes a determination about whether the registrant is making adequate progress toward obtaining a full label for the requested use. That evaluation is based on the number of years the use (i.e. the chemical-crop combination) has collectively been sought under the emergency exemption program.

Once the data necessary to support the full registration for a use that is associated with an emergency exemption request are submitted, the Agency puts an explicit emphasis on quickly evaluating those data in hopes of eliminating the need for a long-running emergency exemption request. Nonetheless, there are instances when an emergency use will not receive its registration for a number of years while, simultaneously, the pest problems experienced by the agricultural sector have remained ongoing. In general, EPA might consider that a particular use (i.e. chemical-crop combination) that has been sought for the past six years might be too long-standing to be eligible for inclusion in the streamlined application portion of the pilot.

EPA believes that most candidates for re-certification can be registered relatively quickly. Pesticide producers should place a high priority on efforts aimed at seeking a full registration for a product that is sought under an emergency exemption. Over the past years, a large number of

emergency exemption requests have successfully been eliminated due to registration decisions which make the use available through a full label. Moving forward, this is expected to be a continuing emphasis within the Agency. Decisions on future registration work planning and scheduling will continue to bias and support the review of uses associated with emergency uses. Also, of note, the pilot is limited to reduced risk pesticides. Thus, there is a high likelihood that the registration and regulatory issues associated with obtaining a full registration for the subject use can be addressed. EPA will continue to evaluate this issue in its design and operation of the pilot program and also plans on addressing it in the proposed rule.

The Agency continues to encourage applicants to submit requests for re-certification of the emergency situation with sufficient lead time necessary to process the request in advance of the use season.

EPA will establish time-limited tolerances to support use of a chemical for the appropriate period of time in a situation where the emergency pest problem is ongoing. As is currently the case with all section 18s issued, the applicant is responsible for enforcing all aspects of the emergency program. Also, note that EPA retains the authority to revoke an exemption if necessary (40 CFR 166.35).

Specific Proposed Time Line for Eligible Repeat Requests

Year #1:

The Applicant will submit a complete emergency exemption application, along with all supporting documentation. EPA will conduct a comprehensive review to determine whether the request meets the regulatory criteria for an emergency, and whether the use would pose acceptable risks to health and the environment. For applications involving the treatment of food, EPA will also determine if the appropriate safety findings can be made with respect to reasonable certainty of no harm to human health as required by the Food Quality Protection Act, and establish any necessary time-limited tolerances.

Years #2 and #3:

For a repeat request in the second or third year for a given applicant, that applicant will have the opportunity to “re-certify” that the emergency situation continues to exist. The applicant must certify in writing that the emergency situation has remained unchanged and is ongoing and, further, that they wish to incorporate by reference the application on file with EPA which supported the emergency use initially. An example “re-certification” letter is included in this guidance as Appendix No. 2.

Additionally, the applicant is required to submit a detailed section 18 exemption pesticide usage report for the previous use season. Information must be included as set forth at 40 CFR 166.32, and the applicant will also address the effectiveness of the exemption program for the previous season.

EPA would review the “re-certification” submitted by the applicant, as well as the most recent risk evaluations for the proposed use, and consider whether any alternatives have become available, to ensure that the requested use still meets the criteria for approval. If these conditions have remained the same, and the use pattern is unchanged, the Agency’s review time is expected to be significantly reduced.

Note: If the use pattern for the second and third year is modified from that granted previously in any way, the applicant must clearly state so in the repeat request. A change in the use pattern will likely require additional review to reassess the estimated risk associated with the use. Any changes which may increase exposure will require that the risk be re-evaluated by EPA, and may undercut the ability of the applicant to receive an expedited decision. Such changes may include, but are not limited to: increased application rate or number of applications, additional method of application, changes to pre-harvest or re-entry intervals, or increase in total number of acres to be treated, change in counties or geographic area, and other changes in directions for use.

If the use pattern is changed additional documentation must be submitted along with the certification letter that will support the proposed change. At a minimum the applicant must submit revised section 18 use directions. However, additional information may be required based on the proposed change. For example, a change in the application rate or the PHI may require the time-limited tolerance to be revised. Yet, even though change in the use pattern will likely prevent the Agency from fully expediting the request through the re-certification program, the applicant can still re-certify that emergency conditions still exist, and need not submit a complete application addressing the existence of the emergency.

If the use pattern is the same as in the first year, applicants may include a separate certification that their requested use pattern has not changed from what was previously authorized in the re-certification year, and incorporate by reference all use pattern specifications submitted in a previous application or applications. This certification of an unchanged use pattern will aid in expediting the Agency’s decision.

Year #4 and beyond:

In the fourth and subsequent years of an exemption to a particular applicant, a complete application will again be required for EPA’s comprehensive review to determine whether it meets the criteria for an emergency exemption. Additionally, after the first 3 years of use, EPA will consider whether adequate progress toward registration is being made [40 CFR 166.25(b)(2)(ii)].

Key Considerations for the Streamlined Application Pilot

| Factors to be Considered by Applicant | Factors to be Considered by EPA |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> - consider whether the situation is an ongoing emergency (> 1 year) - address whether any alternatives have become available - assess experience from the first year of exempted use and submit annual report; determine whether the emergency program met the needs of the situation | <ul style="list-style-type: none"> - assess whether risk to human health and the environment is acceptable or has changed - evaluate progress that is being made toward registration of the exempted use - confirm Applicant's assertion that no alternatives have become available - consider whether the Applicant is requesting any change in the use pattern from previous year, and if so, the effect on risk |

Appendices Numbers 1-3 Support the Streamlined Application Pilot for the 2004 Use Season, for Eligible Repeat Requests:

Appendix No. 1: List of eligible uses and states for the 2004 use season.

Appendix No. 2: Proposed generic certification letter from applicant to EPA indicating the ongoing nature of the emergency pest situation.

Appendix No. 3: Example model format of EPA authorization of a repeat exemption that can be re-authorized under the pilot.

Section 18 Pilot: Issue No. 2
**Alternative Means of Supporting “Significant Economic Loss” Determinations for
Emergency Exemption Requests Based on Tiered and Streamlined Economic Data**

Introduction

EPA has initiated a pilot program concerning its approach for determining significant economic loss, in the context of FIFRA Section 18 emergency exemptions. This pilot program is motivated by three factors:

1. The Agency would like to focus the determination of losses due to emergencies on the losses caused by urgent and non-routine pest problems as compared to the non-emergency situation and not confound the issue with past volatility in revenues that may not be relevant.
2. The Agency would like to increase transparency and establish more consistent measures of economic loss.
3. The Agency hopes to reduce the burden of data collection and analysis on the part of the States and the Agency in cases where a decision can be made with less information, thus speeding decisions for these cases and permitting more resources to be devoted to more complex situations.

In lieu of the established practice involving net revenue methodology which relies on five historic years of yield, price, cost, and revenue data, the Agency has implemented a pilot project whereby it will use a new approach for determining the significance of economic losses. This approach focuses on the pest-induced losses and is intended to streamline data and analytical requirements. An analysis of past Section 18 requests suggests that this approach will not cause a significant change in the overall likelihood of a significant economic loss finding, but may, in many cases, lead to savings to both applicants and EPA from reduced data and analytical burdens. In particular, these assessment methodologies can reduce or eliminate the need for production cost data that is often difficult to obtain and often inappropriate for use. Further, the new, loss-based approach will be more flexible in using price data, especially when historical averages do not reflect the current situation.

The loss-based (tiered) approach uses the same methodology to calculate the economic consequences of an unusual pest outbreak. States will still have to submit data to demonstrate the emergency nature of the outbreak and the expected losses in quantity, quality and/or additional production costs. Whereas the existing method generally requires detailed historical data to establish a threshold of significance, the pilot approach imposes a standard criterion for determining the significance of that loss. Successive screening levels have been chosen that will permit situations that clearly qualify to be resolved quickly and with a minimum of data. If the pest situation does not appear likely to result in a significant economic loss based on the first tier analysis, it may qualify based on further analysis in succeeding tiers. Each additional tier requires more data and involves more analysis on how the emergency affects yields and/or revenues. Each tier has a quantitative threshold that will generally apply to all emergency exemption applications. This approach should work well in the majority of situations, where the pest emergency is expected to damage only the current year's production. In other cases, the Agency will evaluate the significance of economic losses on a case-by-case basis.

Similar to the pilot offered for repeat requests, only emergency exemption applications which request use of “reduced-risk” pesticides will be eligible for evaluation under this alternative tiered method. For this reason, applicants should especially consider new first time requests under section 18 for this area of the pilot. Repeat section 18s may also be good candidates for the pilot program for determining SEL. Applicants “opt in” to this portion of the pilot program. The list of pesticide active ingredients that are considered reduced risk is provided as Appendix No. 4.

Emergency exemption requests that are supported by economic data described in this pilot initiative continue to be subject to appropriate health and environmental standards under the section 18 regulations and the statutory provisions which govern pesticide use and food safety.

This document summarizes the Agency's positions and policies regarding the estimation of economic loss resulting from an emergency pest problem. It is not intended to supplant the Section 18 regulations at 40 CFR part 166. It is meant to clarify and explain the pilot program on substantiating economic loss. In that respect, this pilot guidance may be useful to all applicants, regardless of whether they qualify for the pilot program. The document is also meant to clarify how the Agency will analyze data and determine significant economic loss, and to serve as additional guidance to Federal and State agencies submitting Section 18 emergency exemption requests.

I. *Demonstration of Significant Economic Loss*

EPA currently defines “significant economic loss” as a substantial reduction in expected profitability of crop production in the area affected by the emergency (40 CFR § 166.3(h)). As an emergency, the pest situation causing the losses could not have been anticipated and addressed through the regular registration process and must fall outside the bounds of the normally expected pest populations. Such a situation might arise due to abnormal weather conditions, unexpected resistance to usual pest control practices, or loss of a pest control product due to regulation, market disruption or a marketing decision by the product source.

A. *Cause of an expected loss*

According to the regulations at 40 CFR § 166.3(h), only losses caused by the emergency conditions are relevant in determining expected economic losses. Losses due to changes in the output market do not qualify, nor do losses due to conditions other than the pest situation. For example, losses due to abnormal weather conditions cannot be addressed by pesticide policy, even if those losses also cause an unexpected pest situation. Only those losses directly attributable to the pest can be claimed. That is, if a drought were to result in a pest outbreak, the emergency would be the pest outbreak and the baseline yield would be that expected under a drought situation but without the pest.

B. *Evaluating the significance of an economic loss*

EPA has been evaluating the significance of an anticipated economic loss by determining if net revenues per acre for the current year fall within the normal range of variation, defined as grower profits over the most recent five years. If net revenues fall within the historical range, the expected loss is not considered by the Agency to be significant, since it would not exceed what would be expected as a result of normal fluctuations over a number of years. However, if prices for the commodity fluctuate widely over time, growers face a higher

standard of loss and may be inadvertently penalized when pest problems result in higher than normal yield losses.

EPA believes a better and simpler system would be to determine the significance of economic losses by comparing losses to standard measures. Successive screening levels (tiers) have been chosen that will permit situations that clearly qualify to be resolved quickly with a minimum of data. The system sets relatively high thresholds of loss in lower tiers that, if verified, will lead to a finding of significance with only biological information or a minimal amount of economic data. A lower threshold of loss is set for the final tier that will require no more data than is currently demanded.

1. *Tier 1, Yield Loss*

Tier 1 is based on crop yield loss and is a quantity-based measure. Under the pilot program, EPA will conclude that a significant economic loss will occur if the projected yield loss due to the emergency condition is verified to be more than 20% of yields in the absence of the emergency. The yield loss threshold in Tier 1 will be the same for all crops and regions. This threshold is set at a level such that a loss which exceeds the threshold would generally also meet the thresholds in Tiers 2 and 3, if the additional economic data were submitted and analyzed. Therefore, for large yield losses it is not necessary to separately estimate economic loss, which requires detailed economic data. Yield losses are measured as the difference between expected yields in the absence of the emergency and yields under the emergency condition when using the best available, registered alternative.

2. *Tier 2, Economic Loss as Percentage of Gross Revenues*

For situations with yield losses that do not meet the yield loss criterion for Tier 1, EPA will evaluate estimates of economic loss as a percent of gross revenue in Tier 2. In addition to yield losses there may be other impacts that contribute to economic loss such as quality losses and changes in production costs, including pest control, harvesting, sorting and processing costs. EPA will conclude that a significant loss will occur if the projected losses due to the emergency condition are verified to be more than 20% of baseline gross revenues. Baseline gross revenues are what gross revenues would be in the absence of the emergency. This threshold will be the same for all crops and regions. Quality losses occur when damage results such that the commodity fails to meet the market standards for a high-value segment (*e.g.*, export or fresh market) and must be sold in a lower value outlet (*e.g.*, domestic or processed market). Quality losses can occur without loss in quantity or can occur in conjunction with yield losses. This tier will also consider losses due to higher production costs. Higher production costs could include additional pest control costs, for example, mechanical weeding, or additional harvest costs, for example, sorting into different grades. However, these costs must be a result of the emergency before the expenses can be included in the projected loss.

3. *Tier 3, Economic Loss as Percentage of Net Revenues*

For situations in which losses do not meet the criteria for Tiers 1 and 2, EPA will evaluate estimates of economic loss as a percent of net revenue in Tier 3. Economic losses are defined as in Tier 2. EPA will conclude that a significant loss will occur if the projected losses due to the emergency condition are more than

50% of baseline net revenues. Baseline net revenues are what net revenues would be in the absence of the emergency. This threshold will be the same for all crops and regions. For this purpose, the Agency defines net revenue as gross revenues less variable operating costs (purchased inputs and hired labor). The Agency considers only variable operating costs because these costs are easier to measure and document than fixed costs, such as overhead and depreciation of machinery, and because they are likely to be more reflective of short-term impacts due to emergency conditions. The Agency recognizes that net revenues above operating costs overstate grower income, but believes the facility of measurement and verification make it a more useful measure and this overstatement of income was taken into consideration when setting the 50% threshold.

4. *Other considerations*

The Agency recognizes that in certain situations, significant economic losses may not be demonstrated using the approach outlined above. It is the applicant's responsibility to explain all relevant issues and provide justification for an alternative estimate of losses.

Long-term financial viability. For example, in evaluating the significance of an economic loss for production activities, the Agency may also consider whether the loss could affect the long-term financial viability expected for the activity. If the emergency situation does not lead to immediate economic losses but can be shown to significantly affect the life-span of a perennial crop (*e.g.*, an orchard or vineyard) or the ability to continue to cultivate an annual crop (*e.g.*, permanent establishment of a soil-borne pathogen) such that significant economic loss is likely in the near future, the Agency may grant the requested exemption. Multi-crop pest management strategies, where treatment would be better applied to pests on one crop to avoid damage to another crop, can also be considered with proper data. Post-harvest losses may not follow this pattern exactly, either, but can still be considered.

II. *Emergency Exemption Applications*

The EPA will base its determination of yield and/or economic loss on the average losses per acre anticipated to occur on affected acreage (the area for which the emergency exemption is requested), not the maximum possible losses. The Agency believes that as a matter of public policy, the average is the appropriate measure with which to balance the benefits accruing from the use of pesticides with any human or ecological risks that might arise.

A. *Documentation of the Emergency*

The application must include an explanation of the events that brought about the emergency pest pressures (weather conditions, resistance development, pesticide cancellation, *etc.*). Claims of abnormal pest or disease pressure must be documented with data or written testimony of qualified experts.

B. *Documentation of Yield Loss*

Baseline yield. Applications should include the yield that would be expected if no emergency existed, or the baseline yield. This estimate may be based on a historical average or other information. The former is likely to be easier to document. If based on other information, it should be documented that the estimate is for the most

likely yield and not the maximum possible.

Yield loss. The EPA would prefer that the requests for an emergency exemption be based upon the most likely or average yield and/or economic losses anticipated to occur on affected acreage (the area for which the emergency exemption is requested), not the maximum possible losses. If no estimate of average losses can be made, the agency requests both maximum possible losses and that loss that is most frequently observed (the mode of the distribution). If available, the minimum yield loss anticipated on the affected acreage can be helpful in describing the distribution in losses that may result from the emergency situation. Yield losses can be expressed in absolute terms or as percentage of the baseline expected yield. Yield loss estimates may be sufficient for a finding of significant economic loss at Tier 1, if they are verifiably equal to or greater than 20% of the expected yields, or the estimates may form the basis for findings at later stages in the review. Losses incurred as a result of the emergency should reflect only the losses that would be expected if growers use the best available (registered) means of control.

Loss estimates must be verifiable. The Agency would prefer to see comparative product performance studies of the efficacy or yields of currently registered pesticides, if any, and potential alternatives. If unavailable, noncomparative product performance studies of various pesticides compared to untreated control plots can also be used to verify yield loss claims. Economic injury studies documenting the relationship between pest populations and yield loss may be acceptable, particularly if no alternative control method is available. At the Tier 1 level, the Agency will not usually accept informal monitoring of pest damage and associated yield losses or expert opinion unless well documented and independently verifiable.

While yield loss is fundamental to calculating economic losses at Tiers 2 and 3, OPP recognizes that in many pest emergencies, informal or anecdotal evidence is all that is available. In those situations, additional economic data should be provided such that all losses can be evaluated and placed in the context of grower revenues. OPP may be able to reach a conclusion in a number of ways, including one of the following:

- (1) Minimum yield losses can be verified. If the smallest likely yield loss meets the criteria of Tiers 2 or 3, then OPP could conclude that average losses would cause significant economic losses;
- (2) Minimum yield losses passing Tiers 2 or 3 can be calculated. With sufficient data, the minimum yield loss necessary to meet the criteria for higher tiers can be calculated, and this yield loss may be considered likely to occur; or
- (3) Tiers 2 or 3 are passed by a large margin. If the criteria for higher tiers are met by a substantial amount, it would imply that the accuracy of the yield loss estimate is not crucial to the determination of significant economic loss.

C. *Documentation of Economic Loss and Gross Revenues*

If a request cannot be granted solely on the basis of yield loss, because losses are below the threshold or are based on data that does not meet verification standards, it will be reviewed at Tier 2, provided sufficient economic data have been included.

Baseline gross revenues are calculated by multiplying the baseline yield (see Section B, above) with the expected price: $GR_0 = P_0 @ Y_0$. The expected price may be calculated as the historical average or some other price if it is justified as more appropriate. Examples of acceptable prices are the futures price for the commodity, contract price or current market prices. The source of these prices should be documented, for example, USDA statistics or market reports. In all cases, the application should consider any government price supports, for example, as established in the 2002 Farm Bill, to determine the value of the commodity to the producer.

Economic loss. The Agency defines economic losses as originating from one or more of three sources:

1. Yield or quantity losses,
2. Quality losses that reduce the price received, and
3. Changes in production costs due to the emergency.

These losses are compared to the gross revenues that would be expected without the emergency situation, that is, the baseline gross revenues. Losses of 20% or more meet the criteria for significant economic loss.

Yield losses. The impact of yield loss on gross revenue is straightforward. The percentage loss of revenues is equal to the percentage loss of yield when no price changes resulting from the emergency are anticipated. Since yields are fundamental in calculating revenues, yield losses should be verified as explained above. Exceptions can be made as explained above, and often apply when revenue losses from yield losses are not a major part of the total loss.

Quality losses. Quality losses are associated with a reduction in the price received for a commodity. Most agricultural commodities are graded in some fashion or can be used for different purposes. For example, grains may be graded on their protein content and fruit may be sold to the fresh market or for processing (canned or frozen). Typically, production is distributed among grades but pest damage can alter the distribution from higher quality to lower quality. This can result in lower revenues.

Calculation of quality impacts may be more complicated. Gross revenue may be calculated as the sum of the prices of different grades or categories (P_i , where the grades are denoted i) times the quantity of produce in each category (Y_i). that is where Y_i could also be expressed as a proportion of total yield. The usual distribution of yields between grades could be documented through historical data. The distribution between grades due to the emergency should be documented in the same fashion as yield losses discussed above. Gross revenue under the emergency (GR_E) is calculated using the yields in each category resulting from the emergency, with the grade prices held constant.

$$GR_0 = \sum_i P_i Y_i$$

Example. Table 1 provides an example of calculating gross revenue losses with combined yield and quality losses due to a pest outbreak in fruit where the produce may be sold to the fresh market, processed (canning) and juice. In this example, yields are reduced 10%, according, for example, to studies at the Agricultural Experiment Station. However, because of quality losses, the amount of fruit sold in the fresh market is reduced

by 25% and the amount of fruit sold to processors is reduced by 20%. In other words, addition to the 10% yield loss, some of the fruit does not make grade and is culled for juice. From this information, new quantities of fresh and processed yields are calculated (yield of juice-grade fruit is simply the residual) and gross revenue under the emergency situation is determined. The result is a decline of almost 22%. The economic loss is calculated as the difference in gross revenue, $GR_0 - GR_E$. The percent loss is the loss divided by the baseline gross revenue, GR_0 .

Table 1. Example of economic loss due to both yield (quantity) and price (quality) losses.

| | Baseline | Emergency | Change |
|----------------------------------------------|------------|------------|--------|
| Yield (tons/acre) | 16.3 | 14.7 | -10.0% |
| Yield, fresh (tons/acre) | 8.2 | 6.2 | -25.0% |
| Price (\$/ton) | \$360.00 | \$360.00 | |
| Yield, processed (tons/acre) | 6.5 | 5.2 | -20.0% |
| Price (\$/ton) | \$220.00 | \$220.00 | |
| Yield, juice (tons/acre) | 1.6 | 3.3 | 107.5% |
| Price (\$/ton) | \$30.00 | \$30.00 | |
| Gross Revenue (\$/acre) | \$4,430.00 | \$3,457.60 | -22.0% |
| Economic Loss (\$/acre) ($GR_0 - GR_E$) | | \$972.40 | |

Sources: Yield and Price data from State Statistical Service (date), weights calculated from usage figures (State Statistical Service), yield losses from study conducted at State Agricultural Experiment Station (researcher, date).

Note: Shading denotes calculated figures.

In this example, grade prices remain constant despite the emergency, even though the average price of the commodity changes. Generally, EPA assumes that changes in the supply of the commodity would not cause prices to change because sufficient production would come from other producers, including imports. This may not be true of all commodities, but estimates of price effects are likely to be difficult to find. In any case, EPA would expect, for example, that a claim that juice prices would fall due to oversupply would also come with estimates of price increases for fresh and processed fruit due to reduced supply.

Changes in production costs. Economic losses can also result from changes in production costs, including additional pest control costs and higher harvesting and sorting costs, which would not occur in the absence of the emergency. These extra production costs, including alternative chemical, biological or mechanical measures, can be documented by economic studies or other verifiable sources.

Example. An example is provided in Table 2. Suppose losses due to a new pest infestation could be as high as 60% with no control, but may be mitigated by a marginally effective registered alternative, which would

normally be used against a different pest at a different growth stage. The alternative costs an additional \$100/acre including application costs. According to studies, losses with the alternative could be as high as 30%, with most acreage suffering about 10% losses. Average losses for the affected acreage is estimated at 15%. Economic losses are calculated at \$370/acre (\$270/acre due to yield losses and \$100/acre in additional costs) and represent over 20% of baseline gross revenues.

Table 2. Example of economic loss due to yield (quantity) losses and additional pest control costs.

| | Baseline | Emergency | Change |
|-----------------------------------------|------------|------------|--------|
| Yield (ton/acre) | 15.0 | 12.8 | -15.0% |
| Price (\$/ton) | \$120.00 | \$120.00 | |
| Gross Revenue (\$/acre) | \$1,800.00 | \$1,530.00 | -15.0% |
| Additional Pest Control Costs (\$/acre) | | \$100.00 | |
| Economic Loss (\$/acre) | | \$370.00 | |
| Economic Loss/GR ₀ | | 20.6% | |

Sources: Yield and Price data from State Statistical Service (date), yield losses from studies conducted at State Agricultural Experiment Station (researchers, dates), additional pest control costs from estimates by local applicators (documentation included in request).

Note: Shading denotes calculated figures.

D. Documentation of Net Revenues

Requests that do not meet the criteria at Tiers 1 and 2 will be considered against a standard of losses as a percentage of baseline net revenues, provided sufficient data are provided. Economic losses are calculated as in Part C, above, as a combination of yield (quantity) losses, quality losses affecting the price received, and additional pest control costs. If these losses are shown to be 50% of net revenues or more, the Agency will find that a significant economic loss has occurred.

Net revenue. For these purposes, the Agency defines net revenues as the difference between gross revenues and variable operating expenses. Variable operating expenses include purchased inputs and hired labor, but do not include fixed operating costs such as depreciation of machinery (they would include direct operating expenses, such as fuel) and infrastructure or amortized establishment costs. The Agency believes that these variable costs are most likely to be affected by short-term emergency situations and easiest to document. Further, fixed costs per acre may be highly heterogeneous across farms, depending on size, asset ownership and diversification. Finally, the Agency wishes to avoid problematic issues arising from negative net returns that have sometimes appeared in past requests. If growers are unable to cover their variable operating costs in the baseline scenario, the Agency will question the economic rationale for production.

Rotation crops. In situations where farmers produce at a loss as part of a rotation of crops (for example, if growers typically cultivate a leguminous forage crop in a cycle with a grain crop to restore soil nitrogen), this

information should be provided and data for the entire rotation should be included in the request. This is especially true if pest damage to one crop may affect production of the following crop.

Crop budgets. Many Land Grant institutions publish cost of production or crop budgets. However, these studies may include fixed costs deemed inappropriate for use in this situation or may not be completely accurate for the specific area suffering the emergency. Some, for example, may be more reflective of high-input producers than typical growers. Any changes in budget figures should be accompanied by an explanation as to the reason for the changes. Likewise, not all institutions publish studies for all commodities, but if neighboring states' budgets are reflective of growers' costs, those data are likely to be adequate.

Example. Table 3 presents an example of a calculation of losses as a percentage of net revenues. In this scenario, losses average around 10% on affected acreage, using a marginally effective alternative that costs an additional \$20/acre. Economic losses are calculated to be about \$101/acre. This yield loss would not be sufficient for Tier 1; nor would economic losses as a percentage of gross revenues (12.5%) qualify under Tier 2. Economic data are needed to provide additional evidence. Operating costs are shown to be about \$650/acre, leaving net revenues of \$160/acre as the baseline. Losses therefore represent over 60% of net revenues, and support a finding of significant economic loss.

Table 3. Example of losses as a percentage of net revenues.

| | Baseline | Emergency | Change |
|-----------------------------------------|----------|-----------|--------|
| Yield (ton/acre) | 6.0 | 5.4 | -10.0% |
| Price (\$/ton) | \$135.00 | \$135.00 | |
| Gross Revenue (\$/acre) | \$810.00 | \$729.00 | -10.0% |
| Additional Pest Control Costs (\$/acre) | | \$20.00 | |
| Economic Loss (\$/acre) | | \$101.00 | |
| Economic Loss/Baseline Gross Revenue | | 12.5% | |
| Operating Costs (\$/acre) | \$650.00 | \$650.00 | |
| Net Revenue (\$/acre) | \$160.00 | \$59.00 | |
| Economic Loss/Baseline Net Revenue | | 63.1% | |

Sources: Yield and Price data from State Statistical Service (date), yield losses from comparative product performance experiments (source), additional pest control costs from estimates by local applicators (documentation included in request), operating costs from cost of production survey by Land Grant Institution (researcher, date).

Note: Shading denotes calculated figures.

E. *Other Information*

The Agency recognizes that certain situations that impose significant economic losses may not be captured by the analyses outlined above. For example, the Agency acknowledges that failure to control pests may not result in immediate yield losses but could lead to future losses, as in the case of perennial crops weakened by pest damage. In this situation, biological and economic data relevant to establishing expected long-term profits and changes in long-term profits due to a pest outbreak will be considered. We will also consider cases where control of a pest in one crop avoids damage to another crop as part of an Integrated Pest Management strategy.

Post-harvest losses. Post-harvest losses are also somewhat common. Some post-harvest losses should be expected. Therefore, it would be useful for applicants to clearly distinguish between harvested yields, which may be unaffected by the pest problem, and utilized yields. Utilized yields under the emergency should be compared to typical utilized yields, including any changes in grade. Repackaging costs should be clearly documented. Finally, it would be helpful to know whether the producer retains ownership through storage and shipment or if the packer/shipper incurs the loss. If the latter, losses should be put into the context of the packer/shipper revenues per unit (for example, ton or box instead of acre) rather than the gross value of the commodity.

Example. Table 4 presents a hypothetical situation to illustrate calculations of post-harvest losses. Yields are about 6 tons/acre, of which about 25% is sold for processing and the rest for the fresh market. However, about 80% of the fresh market produced is boxed and stored for a period of time before sale. To do otherwise would result in a drastic decrease in prices at harvest and shortages of produce later in the year. Typically, losses in storage are only about 2%, but wetter-than-normal conditions at harvest may promote more fungal growth leading to 10% losses. These losses only occur on the stored commodity, implying that the additional losses are only about 4% of total yields. (Because these losses occur in the higher valued grade, losses as a percentage of gross revenues are somewhat higher.) Spoiled produce cannot be sent to retail stores, however, without risk of rejection or substantial reductions in price. Therefore, the boxes are repacked prior to shipment. Typically, growers are charged fees for packing and storage and these are estimated at about 10% of the gross value. Spoiled product may be found throughout the stored amount, but a conservative estimate is that 20% of the boxes will have to be repacked. Additional marketing costs are calculated at 10% of the value of the affected produce (20% of 3.0 tons in storage). Total losses are therefore equivalent to \$360/acre or 7.1% of gross revenues. Operating costs are \$3,500/acre, implying baseline net revenues (gross revenue minus operating and marketing costs) of about \$1050/acre. Losses are therefore calculated as 34.4% of net revenues. This would not qualify as a significant economic loss.

Table 4. Example of post-harvest losses.

| | Baseline | Emergency | |
|----------------------|------------|------------|--------------------------------|
| Yield (ton/acre) | 6.00 | 6.00 | |
| Processed (ton/acre) | 1.25 | 1.25 | |
| Fresh (ton/acre) | 3.75 | 3.75 | |
| Stored (ton/acre) | 3.00 | 3.00 | |
| Losses (ton/acre) | 0.06 | 0.30 | 4.0% of total yield |
| Price (\$/ton) | | | |
| Processed (\$/ton) | \$500.00 | \$500.00 | |
| Fresh (\$/ton) | \$1,200.00 | \$1,200.00 | |
| Gross Revenue | \$5,053.00 | \$4,765.00 | |
| Marketing Costs | \$505.30 | \$577.30 | |
| Total Losses | | \$360.00 | 7.1% of baseline gross revenue |
| Operating Costs | \$3,500.00 | \$3,500.00 | |
| Net Revenue | \$1,047.70 | \$687.70 | |
| Total Losses | | \$360.00 | 34.4% of baseline net revenue |

Sources: Yield and Price data from State Statistical Service (date), yield losses from studies conducted at Land Grant institution (researcher, date), marketing and operating costs from cost of production survey by Land Grant Institution (researcher, date).

Note: Shading denotes calculated figures.

Other situations. If these guidelines are not relevant to the applicant's situation, the applicant must explain why and provide an alternate analysis, with supporting documentation, to demonstrate that significant economic losses are the result of the emergency condition.

Appendix Number 1. Emergency Exemptions from 2003 Eligible for Recertification for 2004

| Chemical | Site | State |
|--------------------|---------------------|-------|
| Azoxystrobin | Safflower | MT |
| Azoxystrobin | Safflower | ND |
| Azoxystrobin | Tobacco | CT |
| Azoxystrobin | Tobacco | MA |
| Carfentrazone | Fruiting Vegetables | FL |
| Diflubenzuron | Alfalfa | UT |
| Indoxacarb | Collards | GA |
| Indoxacarb | Cranberry | MA |
| Lambda-Cyhalothrin | Grass, Pasture | NY |
| Lambda-Cyhalothrin | Wild Rice | MN |
| Spinosad | Onion | NM |
| Tebufozide | Sweet Potato | NC |

Appendix Number 2. Example format of submission from the application requested or “re-certification” language describing the continuation of emergency conditions in year #2 and 3

The Xyz State Department of Agriculture requests a specific emergency exemption under the provisions of section 18 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended, for use of (chemical), formulated as (product name (EPA Reg. No. xxx-xx), on (crop) to control (pest). This is the (#) year the Xyz State Department of Agriculture has requested this use. The Xyz State Department of Agriculture asks that this specific exemption request be processed as an expedited repeat request as the Department certifies that emergency conditions continue to exist for (pest) on (crop). In addition, Xyz State Department of Agriculture further certifies that pesticide applications will be made in accordance with all the provisions of our specific exemption application submitted in (insert year) and the Agency’s authorization letter of (insert date) for (insert ee number).

Sincerely,

Designated State Official

Appendix Number 3. Example format for EPA authorization of exemption found to meet streamlined re-issuance criteria

Commissioner
Big State Department of Agriculture
Main Street
City, State 00000

Attn: State Contact

Date Issued: June 10, 2002
Date Effective: July 1, 2002
Expiration Date: September 10, 2002
Report Due: March 10, 2003
File Symbol: 02-xx-13
Year Number: 2nd Year (4th Year Overall)

The Environmental Protection Agency hereby reissues a specific exemption under the provisions of Section 18 of the Federal Insecticide, Fungicide, and Rodenticide Act, as amended, to the Big State Department of Agriculture for the use of lambda-cyhalothrin, formulated as Warrior Insecticide with Zeon Technology, on wild rice to control rice worms. In a letter dated June 1, 2002, the Big State Department of Agriculture re-certified that the emergency condition still existed and that there were no changes to the use directions as approved in last year's authorization, including, but not limited to, the use rate, type of application, number of acres, PHI, geographical restrictions, etc.

The Big State Department of Agriculture is responsible for ensuring that all provisions of this specific exemption are met as specified in last year's authorization. It is also responsible for providing information in accordance with 40 CFR 166.32. This information must be submitted to EPA headquarters and the EPA regional office. The EPA shall immediately be informed of any adverse effects resulting from the use of this pesticide in connection with this exemption.

This is the second year that the Agency has issued this exemption to the BSDA and the first year it has been re-issued. The BSDA will be allowed to re-certify this exemption for one additional year after which a full application must be submitted to the Agency for comprehensive review.

Director, Registration Division
Office of Pesticide Programs

Date: _____

Appendix No. 4

*Conventional Pesticide Active Ingredients Eligible for the Section 18 Pilot Initiative
Concerning an Alternative Means for Establishing "Significant Economic Loss"
Reduced Risk Ingredients*

acequinocyl
acetamiprid
alpha-metolachlor
azoxystrobin

bifenazate
boscalid
buprofezin

carfentrazone-ethyl
cyhalofop-butyl
cyprodinil

diflubenzuron
diflufenzopyr
s-dimethenamid

Ecolyst
EH-2001
etoxazole

fenamidone
fenhexamid
fenpyroximate
fluazinam
flucarbazone-sodium
fludioxonil
flumiclorac-pentyl

glufosinate ammonium
glyphosate

hexaflumuron
hymexazol

imazamox
imazapic
imazethapyr
indoxacarb

lambda-cyhalothrin

macalaya extract
mefenoxam

mesotrione
methoxyfenozide
methyl anthranilate

novaluron
noviflumuron

prohexadione-calcium
pymetrozine
pyriproxyfen

quinoxifen

spinosad

tebufenozide
trifloxystrobin

zoxamide

*** EPA will continue to apply appropriate regulatory and statutory standards to any emergency exemption request involving these chemicals.

**Biological, Microbial and Other Ingredients
Eligible for the Section 18 Pilot Initiative
Concerning an Alternative Means for
Establishing “Significant Economic Loss”**

Floral Attractants/plant Volatiles

Anise, oil of
Mustard, oil of
Citronella, oil of yr in question
Indole
Lavandin oil
Jasmine, oil of
Lemon grass, oil of
Eucalyptus, oil of
Cinnamaldehyde
1,2,4-Trimethoxybenzene
3-Phenyl-2-propenol
Orange, oil of
(Z) cis-1-octen-3-ol
2-Phenylethyl propionate (Nuranone)
Eugenol
Bergamont, Oil of
Geraniol
2-Cyclopenten-1-one, 2-hydroxy-3-methyl
(maple lactone)

Plant Growth Regulators and Herbicides

Ethylene
Gibberellic acid
Gibberellic Acid, monopotassium salt
Acetic Acid
Indole-3-butyric Acid
1,4 Dimethyl-napthalene
Kinetin (N6 furfuryladenine)
Cytokinin
N6-Benzyladenine
Gibberellin A4 Mixt with Gibberellin A7
Chitosan
Sodium 5-nitroguaiacolate
Sodium o-nitrophenolate
Sodium p-nitrophenolate
Aminoethoxyvinylglycine
Pelargonic acid
1-methylcyclopropene
Lactic acid
Lysophosphatidyl-ethanolamine
Corn Gluten Meal

Natural Insect Growth Regulators

Isopropyl (2E,4E)-11methoxy-3,7,11-trimethyl-2-
4
dodecadienoate
Isopropyl (2E,4E,7S)-11-methoxy-3,7,11-

trimethyl-2-4-
dodecadienoate
2-Propynyl (S-(E,E))-3,7-11-trimethyl-2,4-
dodecadiene
Azadirachtin
Ethyl (2E,4E,7S)-trimethyl-2,4-dodecadienoate

Pheromones

Lauryl alcohol
Myristyl alcohol
(E,E)-8,10-Dodecadien-1-ol
German cockroach Pheromone
(E)-5-Decenol
(E)-5-Decenol Acetate
(Z,Z)-3,13-Octadecadien-1-ol acetate
(E,Z)-3,13-Octadecadien-1-ol acetate
(1R-cis)-1-methyl-2-(1-methylethenyl)
cyclobutaneethanol
(Z)-2-(3,3-Dimethylcyclohexylidene) ethanol
(E)-(3,3-Dimethylcyclohexylidene) acetaldehyde
(Z)-(3,3-Dimethylcyclohexylidene) acetaldehyde
(Z,E)-7,11-Hexadecadien-10yl acetate
(Z,Z)-7,11-Hexadecadien-10yl acetate
7,11-Hexadecadienol-1-ol, acetates
cis-7,8-Epoxy-2-methyloctadecane
(R,Z)-5-(1-Decenyl) dihydro-2(3H)-Furanone
(Z)-11-Hexadecenal
(Z)-4-Tridecen-1-yl acetate
(E)-4-Tridecen-1-yl acetate
(Z)-8-Dodecen-1-yl acetate
(E)-8-Dodecen-1-yl acetate
(Z)-8-Dodecen-1-ol
3,7,11-Trimethyl-2,6,10-dodecatriene-1-ol
3,7,11-Trimethyl-1,6,10-dodecatriene-3-ol
(Z)-11-Tetradecenyl acetate
(Z)-9-Dodecenyl acetate
(E)-11-Tetradecen-1-ol, acetate
(E)-11-Tetradecen-1-ol
(Z)-11-Tetradecenyl acetate
(E)-11-Tetradecen-1-ol, acetate
(Z)-11-Tetradecenyl acetate
(Z)-9-Tricosene
(E)-9-Tricosene
(Z)-9-dodecenyl acetate
3-methyl-2-cyclohex-1-one (MCH)
Z-9-Tetradecen-1-ol
Z,E,9,12-Tetradecadien-1-yl
Verbenone
(zz)-11,13-Hexadecadienol
4-(or5-)Chloro-2-methylcyclohexanecarboxylic
acid,
1,1-dimethyl ester
(Z)-11-Hexdecenyl Acetate

(E)-9-Dodecen-1-ol acetate

Repellents

Dried blood
Capsaicin
Red Pepper
Methyl Salicylate
Meat Meal
Putrescent whole egg solids
Methyl anthranilate
Allium sativum (Garlic oil)
Linalool
Fish oil
Cedarwood oil
Iron phosphate
.beta.-Alanine, N-acetyl-N-butyl-,ethyl ester (IR 3535)
p-methane-3,8-diol
Mint Oil
Thyme (herb)

Miscellaneous biochemicals

Neem oil
Clarified hydrophobic neem oil
Soybean oil
Castor oil
Jojoba Oil
Sodium bicarbonate
Potassium bicarbonate
Sodium lauryl sulfate RED multi divisional
Liquid Nitrogen
Ground sesame stalks
Poly-N-acetyl-D-glucosamine
Polyoxin D znc salt
Kaolin
Canola Oil
Monobasic potassium phosphate
Formic acid
Hydrogen peroxide
Harpin Protein
Phosphorous Acid
Reynoutria sachalinensis (Milsana)
4-allyl anisole
Dipostassium phosphate
Sucrose octanoate

Registered Microbial Pesticides

Bacteria

Spores of Bacillus popilliae
Bacillus thuringiensis subsp. kurstaki
Agrobacterium radiobacter K84
B. thuringiensis subsp. israelensis
B. thuringiensis . Berliner

B. thuringiensis subsp. tenebrionis
P. fluorescens A506
P. fluorescens 1629RS
P. syringae 742RS
B. thuringiensis subsp. kurstaki EG2348
B. thuringiensis subsp. kurstaki EG2424
B. thuringiensis subsp. kurstaki EG2371
B. sphaericus
B. subtilis GBO3
B. thuringiensis subsp. aizawai GC-91
B. thuringiensis subsp. aizawai
Streptomyces griseoviridis K61
B. thuringiensis subsp. kurstakiBMP123
B. subtilis MBI 600
P. syringae ESC 10
P. syringae ESC 11
B. thuringiensis subsp kurstaki EG7841
B. thuringiensis subsp kurstaki EG7826
B. thuringiensis subsp kurstaki M200
B. thuringiensis subsp kurstaki EG7673 col. toxin
Bacillus cereus Strain BP01
Paecilomyces fumorsoroseus Apopka strain 97
B. thuringiensis subsp isaelensis st g2215
Pseudomonas aureofaciens st Tx-1
B. subtilis amyloliquefacie ns strain fzb24
Bacillus subtilis qst 713
Pseudomonas chlororaphis St 63-28

Yeast

Candida oleophila I-182

Fungi

Phytophthora palmivora MWV
Colletotrichum gloeosporioides
f.sp.aeschynomene ATCC 20358
f.sp. aeschynomene ATCC 20358
Trichoderma harzianum ATCC 20476
Trichoderma polysporum ATCC 20475
Gliocladium virens G-21
Trichoderma harzianum Rifai KRL-AG2
Lagenidium giganteum
Metarhizium anisopliae ESF1
Ampelomyces quisqualis M10
Beauveria bassiana GHA
Beauveria bassiana ATCC 74040
Gliocladium catenulatum Strain J1446
Trichoderma Harzianum Strain T-39
Coniothyrium minitans St con/m/91-08
Killed fermentation solids & solubles of
Myrothecium
verrucaria
Myrothecium verrucaria
Beauveria bassiana st 447
Pseudozyma flocculosa

Protozoa

Nosema locustae

Viruses

Heliothis Nucleopolyhedrosis virus (NPV)

Douglas fir tussock moth NPV

Gypsy moth NPV

Beet armyworm NPV

Cydia pomonella Granulosis virus

Indian Meal Moth Granulosis Virus

Anagrapha falcifera NPV (Celery Looper Virus)

**Non-viable Microbial Pesticides--
(Engineered)**

Bt subsp. kurstaki delta-endotoxin in K P.

fluorescens in killed P. fluorescens

Bt subsp. san diego delta-endotoxin in K P.

fluorescens in killed P. fluorescens

Bt CryIA(c) & Cry I(c) delta-endotoxin in K P

fluorescens in killed P. fluorescens

Bt K CryIC in killed pseudomonas

Agrobacterium radiobacter Strain K1026