US Environmental Protection Agency
Office of Pesticide Programs

Pesticide Regulatory Education Program's (PREP)
FIFRA Section 18 Emergency Exemption Program
Training Resource

Module 3

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PREP's Online Training of the FIFRA Section 18 Emergency Exemption Program: Transcript for Module 3: How to Demonstrate Significant Economic Loss

Slide 1
Welcome to Module 3, How to Demonstrate Significant Economic Loss.

Slide 2
As you heard in the last module, once EPA has established that the critical pest situation is "urgent and non-routine", the next determination EPA will consider is whether the consequences of the problem are severe enough – or significant enough – to justify an emergency exemption. Because Specific exemptions are the most common type of Section 18 exemption, this module will focus on one of the key concepts supporting the typical Specific request – the concept of significant economic loss or "SEL". In this module, we will go into great detail defining SEL, laying out the concepts of SEL, going through examples using the Tiered Approach to SEL, as well as other situations where the Tiered Approach is not applicable. By the end of this module, you will understand how to demonstrate SEL in a Specific exemption request. Let's get started.

Slide 3
Under the regulations, there are two definitions of "significant economic loss." The first, which is applicable in most agricultural situations, defines SEL by comparing the magnitude of the loss against measures of grower income. The definition sets several thresholds. The thresholds are, first, a loss in yield of 20% or more, second, a loss equal to 20% or more of gross revenue, and, third, a loss equivalent to at least 50% of net operating revenue. We'll define those terms in a little while. The thresholds are set up as a tiered approach to evaluating the magnitude of the loss. The first two tiers are "screening" tests that are designed to identify the most obvious cases of SEL with a minimum of data. As such, they are supposed to set a higher bar than the third and final threshold. You only need to meet the criteria in one threshold. Again, we'll go into some details shortly. Losses under this first definition of SEL will include reductions in yield or quantity produced, damage to the quality of produce that reduces the price received, and/or increases in production costs. This is the Tiered Approach to demonstrating SEL.

The second definition covers situations when the pest damages buildings, infrastructure (like irrigation systems), or other capital assets (like trees or vines) where the tiered approach won't work. In these cases, much of the damage would affect the fixed costs of production rather than the operating costs. These sorts of losses may affect long-term viability of an activity more than income over the short-term. The second definition also applies in situations where there aren't revenues generated, like urban forestry or recreational facilities. These various situations are fairly rare and very unique. Therefore, EPA hasn't tried to set any particular thresholds. These situations are evaluated on a case-by-case basis. More on this later.

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The regulatory phrase we use is "significant economic loss," but you shouldn't get too concerned over the term "economic." What constitutes a loss in the context of emergency exemptions is pretty basic. Unusual pest problems can reduce the quantity

of something that can be produced. That is, yield or output is reduced. Pests can also cause quality losses. Fruit can be blemished or the protein content of grains might be affected. Damage of this kind can affect the value of a commodity, that is, the price received by the producer. Pests can also affect the quality of non-marketed goods or services. Pest damage might reduce the aesthetic value of an urban landscape or make recreational activities less attractive. Those effects can be difficult to quantify, of course. Finally, pest problems may result in higher costs to the producer or the manager. Sometimes, damage from unusual pest problems may be avoided or reduced by taking control measures. If those measures would not normally be taken, however, the added control costs would be part of the total loss attributed to the pest problem. Any or all of these types of loss could occur. For example, a pest in fruit trees might reduce the total amount produced (yield loss), while causing blemishes on some of the fruit that is produced (a quality loss because they can only be sold for juice). Finally, costs may rise if the grower incurs extra costs for sorting out the blemished fruit.

The key thing to remember is that the comparison should be made between the typical or "routine" situation and the "non-routine" situation. The comparison is not with or without the requested chemical.

So it is very important that you clearly describe the typical situation, not just the circumstances of the emergency. You can't determine the magnitude of the problem if you don't have a good point of comparison.

Finally, it's important to remember that EPA considers the significance of the loss to the individual, not total losses to the state. Even though small losses to a lot of people might add up to a considerable amount at the state level, it's not part of the "significance" of the loss. Big losses, however, even if they affect just a few people in the state, may still qualify.

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Before we get into the details of the Tiered Approach to demonstrating SEL, let's discuss in a bit more detail the situations where it is applicable and where it is not. Remember, this is the approach that follows the first definition of SEL in the regulations. This approach is valid for the majority of Specific requests that EPA receives. It's applicable when pest damage occurs to annual crops grown for sale, such as field crops and commercial vegetable and ornamental production. It's also applicable for perennial crops, like fruit, if the majority of the damage occurs to the current crop or affects annual operating costs. Similarly, it works for livestock operations if the pest directly affects current production, like milk output or weight gain, or current production costs. The approach will also work in many situations where unusual pest damage occurs post-harvest.

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The Tiered Approach should also be applicable in some other situations, although a few modifications might be necessary. For example, an unusual pest problem may cause damage to forage crops or pasture that are not grown for sale but that are cultivated as part of a livestock enterprise. In this situation, the crop is not directly sold for revenue. However, the damage may affect revenues from livestock or affect livestock production cost. The analysis will, therefore, need to add a layer to show the impacts to livestock production.

Another situation where you may need to modify the Tiered Approach a bit is when damage occurs to a crop where the grower appears to be losing money even in the normal or routine situation. This may be the case for some crops grown as part of a rotation where production costs are greater than revenues, but the crop is important because it is used for disease or pest management or to improve soil fertility. In this situation, you will want to analyze the pest damage as part of the whole rotation. Otherwise, EPA analysts (and other stakeholders) may question the rationale for even producing the crop, much less granting a pesticide an exemption from registration for a losing situation. Again, part of this is fully explaining the "routine" situation so there is a good point of comparison.

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EPA developed the Tiered Approach to provide an easy and transparent method for demonstrating SEL, but it doesn't work in all situations. Again, it probably won't work if the pest is causing damage to capital assets because that affects the fixed costs of production, while the Tiered Approach is focused on operating costs. Generally, anything where the pest damage is likely to have long term affects won't fit with the Tiered Approach and you will want to demonstrate SEL under the second definition, which we'll discuss more later. These situations include perennial crop production where the pest kills or severely damages the trees or vines, causing damage that lasts years. Other examples where the Tiered Approach doesn't apply are situations where the damage is to buildings or equipment or affect irrigation systems. The Tiered Approach also won't work for non-commercial or non-profit activities, like urban landscaping or cooperative water delivery systems.

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Under the Tiered Approach, "significance" is – by definition – associated with three thresholds: yield loss of 20% or more, total loss equal to 20% or more of gross revenue, or total loss equal to 50% or more of net operating revenue. EPA defines the significance of a loss by comparing it to measures of grower income. EPA performs the analysis at the unit of a representative acre. EPA thinks that a per-acre analysis is conceptually easy to grasp and most of the data they use is given by acre or is easily converted to acre. Yield, for example, is usually given as quantity per acre and production costs are generally estimated per acre.

EPA uses two measures of grower income. One measure is gross revenue per acre, which is calculated as yield or output/acre times price/unit of output. As an aside, the first threshold is essentially a comparison to gross revenue, since a percentage loss in yield results in an equal percentage loss in gross revenue. The second measure of grower income is what EPA calls "net operating revenue per acre," because it is gross revenue minus operating costs, which are also known as "variable production" costs. Operating costs include the costs of all the variable inputs that are used in production, like seed, fertilizer, hired labor, and pesticides. They do not include the "fixed" costs of production, that is, the costs you would have to pay even if you didn't cultivate anything. Fixed costs include things like land costs (such as rent or mortgage), or overhead costs, or the value of the owner/operators time and effort. It's not that EPA doesn't think these costs are important, but there are so many land tenure systems and so many ways to allocate overhead costs across diverse production systems that estimating them per

acre becomes too complicated and requires too much data, especially in time sensitive situations like emergency pest problems.

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Generally speaking, the more quantitative the information that you provide, the faster EPA can verify the information and make a response.

Again, we point out that these aren't separate thresholds. EPA uses the Tiered Approach to help identify more obvious cases of SEL quickly. The two lower tiers require less data and less analysis. But the thresholds are actually higher. That is, anything that meets the Tier 1 threshold will (almost by definition) meet the threshold of Tier 2. And anything that meets the Tier 2 threshold will more than likely meet the Tier 3 threshold. The point is, the data build from tier to tier, but all the data needed at Tier 1 are also needed at Tiers 2 and 3. If you provide data showing you meet the threshold of SEL at Tier 1, you will not need to submit additional data for Tiers 2 and 3.

EPA recognizes that emergency situations, by their nature, mean that data may be very sparse. You should strive to prepare packages that contain the best available information, both quantitative and qualitative. If the emergency situation is likely to continue into the future, however, EPA may request that confirmatory data be collected and submitted in subsequent applications.

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EPA recognizes that it can be difficult to gather data for an emergency exemption request. Data often <u>are</u> available. Here are some sources or ideas for data collection that may be appropriate for many situations.

Yield loss estimates may be found or based on data from economic injury studies or comparative product performance studies, which are often conducted at land grant universities or through university extension programs. Industry field trials may also provide data that can be used to estimate yield loss. While trials may be focused on identifying a new control method to address the emergency, most trials have some points of comparison that may allow you to estimate the impact of a non-routine pest problem.

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Data for a Tier 2 analysis include measures of loss other than yield. Estimates of quality or price loss might be based on marketing studies and surveys of farmers, processors, and/or wholesalers. Similarly, estimates of cost increases might be available in or collected through market surveys, for example, of packers and shippers. University extension programs may have labor demand studies to estimate the labor required for additional pest control activities, and crop budgets prepared by university extension programs can provide information about typical wages or costs of other resources.

Routine yield and price can often be found through the State or National Agricultural Statistics Service (State or NASS) reports or monthly crop reports. And market surveys might provide more current information and the future's price may be available for some commodities that indicate the expected price at harvest time.

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Finally, at Tier 3, operating costs may be obtained from crop or livestock budgets prepared by university extension programs or from grower surveys.

Please try to cite all the data submitted or include the source of the data in the package. Doing so will greatly facilitate EPA's validation of the information and reduce uncertainty in the conclusions.

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Does this sound complicated? It's really not. Let's walk through an example! At the end of each Tier we have provided a chart summarizing the analysis for each Tier.

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Suppose that fruit packers in the State of Oregon are finding that a fungal pathogen is causing more and more spoilage in pears that are stored for future sale. They do some testing and find evidence that the pathogen has developed resistance to the commonly used pesticide that is used to treat the pears. The problem arises post-harvest, so yields are not directly reduced. However, the amount of produce that can be marketed is reduced. Quick review! Is this situation 'urgent' and 'non-routine'? Yes. It's urgent because the damage is occurring now – there's increased spoilage in the current pear crop. It's also non-routine. Resistance to the pesticide has developed. The routine situation was when the commonly used fungicide provided adequate control.

As a result of the pest resistance, let's suppose that storage losses increase from about 2% in normal times to about 10%. We should also be aware that the loss occurs in produce destined for the fresh market, not the produce that is culled and sent for processing into juice. Further, if retailers receive shipments with lots of spoiled fruit, they may reject the load leading to a complete loss for the packer and the grower whose fruit is being sold. That's pretty severe! But if we think about it, no packer is going to risk that. Instead, they will check the boxes for spoilage prior to shipment and, if necessary, repack the boxes with the good fruit. So it's not a total loss, but there's obviously a cost to avoiding the bigger problem. Spoilage doesn't happen in every box, but it is spread across multiple boxes. In this case, we find that about 15% of the boxes have to be repacked.

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So that's the problem and the reason you are requesting an emergency exemption for the use of some fungicide. Remember, though, that you need to explain the severity of the problem, not the advantages of the requested chemical. So you need to distinguish between the routine situation and the non-routine situation. And you need to do this for people who were born and raised in cubicles in Washington, DC, and have never seen a pear tree. You will want to explain what usually happens so you can explain why the current situation is causing 'significant economic loss.'

Usually, pears are sorted at harvest. There will typically be some amount that doesn't meet market standards and is sold for processing, while the higher quality ones are sold for the fresh market. Some of the pears are sold immediately, but most are boxed and placed into cold storage for sale throughout the year. Consumers, after all, want fresh fruit all year around. Fruit will spoil, however, so the stored fruit is generally treated for

pathogens and that keeps storage losses to about 2%. Growers retain ownership of the fruit in storage and they pay the packing house fees to cover the storage and handling costs.

So it's pretty obvious that things have changed. The goal for the SEL analysis is to quantify how much things have changed.

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Tier 1 only considers yield loss. That is, it may not account for all of the loss suffered by the grower. That's a disadvantage. On the plus side, quantity loss is often the easiest to determine. In this situation, you need to translate the additional loss in storage (remember, some storage loss is inevitable) into the impact to the grower. So we need to figure out how much of the pear harvest, from a typical acre, would go into storage.

Let's suppose that average pear yields in Oregon are about 12.9 tons/acre. This sort of information is generally available through the State or NASS. If the problem affected only a few growing areas in Oregon, you might check county level statistics to see if there are more appropriate values to use. You would probably want to look at several years of data, say three to five, to calculate an average yield. You might also want to consider whether to exclude a year with an untimely freeze because it would not be representative of typical conditions.

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The same data source probably provides an overall estimate of how the pear production is utilized. Let's say that generally about a third of production is sold for processing. That would translate into about 4.4 tons out of the 12.9 tons/acre yield on a representative acre. The rest, 8.5 tons on average, go to the fresh market. You could also look at monthly marketing reports to show that roughly 5-6% of the crop is sold the month of harvest, which indicates that about 8 tons, on average, are going into storage.

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If we know that typical storage loss is about 2%, a statistic packing houses probably monitor, we would know that less than 0.2 tons/acre are normally lost. You might be able to confirm that with the State or NASS data, which often will provide data on harvested versus utilized production.

That's the routine situation. If we go back to the problem, we've got storage losses of 10% now (again, a statistic the packing houses should be able to provide). That means storage loss is now around 0.8 tons/acre, on average, rather than 0.2 tons/acre or a loss due to the problem of about 0.6 tons from every acre. Are you still with me here?

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What conclusion can we draw at Tier 1 in this example? Well, the loss of 0.6 tons/acre as a proportion of typical yields of 12.7 tons/acre implies about a 5% yield loss.

The threshold at Tier 1 is 20% yield loss. The grower in our example is clearly under that. So we can't make a determination of SEL at this point. We are not saying that there <u>isn't</u> a significant loss – this is just a screening level. We just can't say the loss <u>is</u> significant – yet.

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This chart summarizes the Tier 1 analysis for the Oregon pear example you just completed.

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We need to go onto Tier 2. At Tier 2, we are going to make a full accounting of the whole loss, not just yield, and compare this to gross revenue. On the revenue side of loss, remember that the loss is in the high-value fresh produce; it doesn't affect the pears that are sold for processing. And on the cost side, remember that we have to check the boxes and repack about 15% of them to get rid of the 10% of the product that is spoiling or has spoiled. At Tier 2, we are going to compare that loss to the grower's gross revenue.

What information do we need to do this? First, we're going to use all the information we put together for Tier 1. Then, to calculate gross revenue and to determine the revenue loss, we need the prices received by growers for each end market. The State or NASS are a great source of this information and it's publicly available and easy to verify. You might also submit data compiled from packers or grower organizations, although this may be harder to verify. Let's say that the State or NASS information shows that the price for processing pears has averaged about $170/ton over the last several years while the fresh price is about $470/ton. Let's also say that packing houses charge growers a handling fee of $2.75 per box, where the standard size box is about 44 lbs. This information might be collected by surveying packing houses or growers, but it might be readily available by looking at crop budgets prepared by the university extension program. Most state land grant institutions estimate crop and livestock budgets for major crops in the state. Neighboring state universities might also provide appropriate information.

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OK, time to total this up. We previously figured that an average grower will lose about 0.6 tons/acre of fresh pears. With a value of $470/ton, this results in a revenue loss of about $280/acre.

The cost increase is a bit more complicated. We earlier figured that about 8 tons of pears would go to storage from a typical acre. That's 365 44-lb boxes. If 15% of those boxes are affected by spoilage, that means 55 boxes from each acre need to be repacked. At $2.75 per box, that's an additional cost of about $150 per acre. The total loss due to this resistance problem is, therefore, about $430 per acre.

Routine gross revenues can be calculated from yields and prices by end market. Typically, a grower would get about 4.4 tons of processed pear per acre, with a value of $170 per ton, or nearly $750 per acre. Accounting for some spoilage, the grower sells about 8.3 tons of fresh pears per acre at $470 per ton, or about $3,900. That gives us a total gross revenue of $4,650 per acre.

Slide 23
What can we conclude from this Tier 2 analysis? A loss of $430/acre represents about 9% of gross revenues of $4,650/acre. The threshold at Tier 2 is a loss equivalent to 20% of gross revenue. That means we can't conclude that the loss is significant – but

neither can we say that the loss is not significant. We need to conduct a Tier 3 analysis. Of course, if the loss had been 20% or more, we could make the determination and be done!

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This chart summarizes the Tier 2 analysis for the Oregon pear example you just completed.

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A Tier 3 analysis may sound complicated, but it's not a lot harder than Tier 2. In fact, we've already done most of the work. Tier 3 compares the loss due to the unusual pest problem to net operating revenue. We've already calculated the total loss – it came out to be about $430/acre. We've calculated gross revenue, so all we need to do now is identify the variable production costs and calculate net operating revenue. That information is often available from university extension programs.

A little bit of detail is often helpful in this analysis so everyone is clear on what is included and what is not. Remember, we don't include fixed production costs, that is, the costs that would have to be paid whether or not any production was undertaken. It's not that these costs aren't important, it's that they are difficult to allocate on a per-acre basis, especially when the same activity or piece of equipment might be used on different crops in a diverse production system.

What we would include are the variable inputs that make up the pre-harvest production costs, including, for example, fertilizer, pesticides or pollinator services and labor costs for pruning, thinning, etc. Let's say that our university extension program has estimated the pre-harvest production costs to be $1,620/acre.

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Next, let's talk about establishment costs. Pears are a perennial crop, so there aren't planting costs every year like in annual crops. But the trees are obviously planted at some point and there may be several years of care invested before the trees begin to produce. So for perennial crops, EPA includes an annual payment to account for those costs: amortized establishment costs. Most tree crop budgets prepared by university extension programs estimate this cost so it's often fairly easy to obtain. In this case, let's say the costs are $370/acre.

Now, let's look at harvest costs. In this situation, because some of the loss resulting from the pest resistance problem affects post-harvest marketing costs, you might want to provide some detail about the harvest costs. The budget we have shows that the direct costs of harvesting are about $35/bin. According to the budget, a bin of pears weighs about 1,050 lbs, so we're going to harvest about 24 bins in picking 12.9 tons of pears per acre. So harvest costs will be around $840 per acre.

Slide 27
Finally, let's look at packing costs. The grower is also going to have the fruit sorted. Remember, we previously calculated there would be about 8.5 tons of fresh pears (about 8 tons to go into storage). These are packed into 44-lb boxes – 386 of them – at a cost of $2.75/box. So the packing costs will be about $1,060 per acre. If we total all that up, we find that operating costs are about $3,890 per acre. Subtracting that

amount from the $4,650 per acre we estimated for gross revenue leaves $760 per acre as net operating revenue.

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After all that, what can we conclude? We've estimated an average loss of $430 per acre and estimated net operating revenue to average $760 per acre. That means the loss is 57% of routine net operating revenue.

The threshold at Tier 3 is 50% of routine net operating revenue and this loss surpasses the threshold. That means we find that the pest resistance problem is likely to cause significant economic loss.

Therefore, this situation meets the criteria for an emergency condition: the problem is urgent (pears are spoiling this year) and non-routine (Oregon has not previously had pest resistance problems) and it will likely result in significant economic loss (demonstrated by a Tier 3 analysis). And note: as we worked our way through the tiers, we never had to mention the chemical requested in the application.

Slide 29
This chart summarizes the Tier 3 analysis for the Oregon pear example you just completed.

Slide 30
If you'd like to see a summary of Tiers one through three data, then click on the link shown.

Slide 31
The majority of emergency exemption requests are Specific requests and the majority of those will need to demonstrate significant economic loss. But what about those situations where the Tiered Approach doesn't work?

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Earlier, we discussed a few situations where the Tiered Approach isn't applicable. An example of these situations would be perennial crops where damage results in the death of trees, vines, etc., which means that effects may be felt for a long period of time. Other examples include situations where the pest damages buildings or infrastructure like irrigation canals where effects can't easily be attributed to a single crop. The Tiered Approach also won't work in non-commercial or not-for-profit situations like parks or urban landscapes.

But we can still think of loss as affecting activities in a similar way as in the Tiered Approach. That is, there may be losses in revenues, either because of reduced production or reduced quality. This may even be the case in non-profit activities. For example, there may be a reduction in visitors to a park as a result of pest damage and that reduces the collection of entrance fees. In addressing unusual pest problems, there may be additional pest control costs associated with the use of available, but costly or relatively ineffective measures. Or there may simply be replacement or repair costs that must be undertaken if the pest cannot be controlled.

Whatever the loss, you should try to describe it as clearly as possible, with reference to a typical situation without the pest problem.

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If we don't have tiers, what does constitute a 'significant' loss? That's a very good question. Unfortunately, there isn't a very good answer. The regulatory definition refers to effects on capital assets or the viability of an operation. Thus, a 'significant' loss might be associated with the viability of an investment in production: does it make sense to establish a new orchard or maintain an existing orchard? Significance can also be demonstrated by comparing repair or replacement costs with existing operating budgets for a public or non-profit enterprise, such as an irrigation district or recreational facility.

As we've discussed, these cases are relatively rare and they represent widely differing situations, so it's hard to draw any clear lines like EPA was able to do after years of experience with losses in agricultural production. Each case has to be evaluated on the specifics of the situation.

The information needed to support any Specific case will also be unique. You should try to be as quantitative as possible and, as appropriate, provide information about typical or routine revenues and costs as a point of comparison to the magnitude of the loss.

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In this module, we looked at the concept of significant economic loss with respect to a Specific exemption request. We also went through example calculations using the Tiered Approach and briefly looked at situations where the Tiered Approach doesn't work.

In the next module, we'll take a detailed look at what information and data you must include in a Section 18 application for all types of emergency exemption requests.