Learning Objectives

- Identify potential routes of contamination from wildlife, domesticated animals, and land use
- Describe practices to mitigate risks associated with wildlife, domesticated animals, and land use
- Describe co-management strategies that address conservation and food safety goals
- Describe the importance of conducting a pre-plant and pre-harvest assessment of fields
- Describe corrective actions that could be used if significant risks are present in production fields
- Identify records that should be kept to document any management, monitoring, or corrective actions
§ 112.83(a) requires that those subject to the rule take the steps as outlined in §112.83(b) if there is a reasonable probability that grazing animals, working animals, or animal intrusion will contaminate covered produce.

- The requirements outlined in § 112.81, § 112.83, and § 112.84 apply when a covered activity takes place in an outdoor area or a partially-enclosed building and when, under the circumstances, there is a reasonable probability that animals will contaminate covered produce (§ 112.81(a)).

- The requirements in § 112.81, § 112.83, and § 112.84 do not apply when the covered activity takes place in a fully-enclosed building. These requirements also do not apply to fish used in aquaculture operations (§ 112.81(b)). Some other requirements in Subpart L related to domesticated animals and pests are covered in Module 6: Postharvest Handling and Sanitation.

Additional Resources:


### Additional Information

- This slide is optional.

- It highlights how complex farming environments can be and some of the risks that a grower may have to consider when developing a food safety program.

- Assessing food safety risks on the farm involves not only evaluating the practices on the grower’s own property, but also any risks that may be present on adjacent land that could impact the farm. This might include being aware of:
  - Wildlife movement patterns
  - Animal population density
Wildlife on the farm is natural and their presence is often unavoidable. Some types of wildlife can be beneficial to farm production, such as raptors or predator mammals that reduce rodent populations. Controlling wildlife is a complex process and may require multiple strategies. There are county, state, and federal laws that protect some wildlife species. Be sure your management practices are legal and effective. Contact a USDA Natural Resources Conservation Service (NRCS) specialist or Extension professional to learn about protected species and acceptable management practices. There is research to indicate wildlife associated with human activities (such as close proximity to cattle feedlots or garbage dumps) may present greater risk of spreading pathogenic microorganisms than other wildlife not associated with these feeding places, so consider activities that occur on or near the farm when assessing risks for this type of wildlife activity.
§ 112.83(a) requires that if there is reasonable probability that animal intrusion will contaminate produce, that those areas used for growing covered produce are monitored as needed during the growing season and immediately prior to harvest.

§ 112.84 states that nothing in the regulation authorizes the “taking” of threatened or endangered species as that term is defined by the Endangered Species Act (16 U.S.C. 1531-1544) (i.e., to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct), in violation of the Endangered Species Act. The regulation does not require covered farms to take measures to exclude animals from outdoor growing areas, or to destroy animal habitat or otherwise clear farm borders around outdoor growing areas or drainages.

Wildlife is more of a challenge to control on the farm than domesticated animals because wildlife are not under the control of the farm. Wildlife may have access to farm land that is adjacent to conservation land or other natural areas.

Many growers already deter wildlife because they are concerned with crop damage and destruction.

Wildlife entering fields or packing areas is a key concern, especially if significant evidence of potential contamination, such as the observation of animals, animal excreta, or crop destruction, is identified. § 112.83 (b)(2) requires that if significant evidence of potential contamination is found (such as observation of animals, animal excreta or crop destruction), you must evaluate whether the covered produce can be harvested in accordance with the requirements of § 112.112 and take measures reasonably necessary during growing to assist you later during harvest when you must identify, and not harvest, covered produce that is reasonably likely to be contaminated with a known or reasonably foreseeable hazard.

Regardless of what risks exist, all growers should be aware of how their actions may affect wildlife and natural habitats. Co-management is discussed in more detail in the next few slides.
Additional Resources:


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8

**Produce safety is not the only concern in the farm environment. Managing natural resources and conservation programs are also important.**

**Co-management** can be defined as the practices which minimize the risk of fecal contamination and microbiological hazards associated with food production while simultaneously conserving soil, water, air, wildlife and other natural resources.

- Co-management provides a way to address complex farm management needs and there are many ways to approach them as mutually beneficial goals.

- The FSMA Produce Safety Rule encourages co-management practices, however, they are not mandated in the rule.

**Additional Resource:**

- Co-Management of Food Safety and Sustainability, University of California, Division of Agriculture and Natural Resources: http://ucfoodsafety.ucdavis.edu/Preharvest/Co-Management_of_Food_Safety_and_Sustainability/
Understanding food safety risks introduced by wildlife is a very complex task, even for researchers who have been thinking about it for a long time.

Some growers have been put under pressure to eliminate wildlife from fields and non-crop areas, such as riparian areas, woodlands, and other vegetated areas around fields, in the name of food safety.

There is some research that suggests riparian destruction may actually increase food safety risks, highlighting the fact that co-management can be critical to produce safety and environmental stewardship.

Careful monitoring for unintended consequences of management practices on both food safety and conservation is important for sound co-management.

Scientific evidence, not assumption, should guide risk management.

Additional Resource:


Co-Management Considerations

- Some conservation practices support wildlife and may increase wildlife activity near produce fields
- As food safety concerns have increased, some farms have stopped or changed their conservation practices, particularly those perceived to provide habitat for wildlife (e.g., vegetation and water sources)
- Removal of conservation practices can damage natural resources (e.g., soil, water, wildlife) and may not mitigate hazards posed by domesticated and wild animals
Practices that both reduce risks and limit environmental impacts can be a challenge to implement effectively. Contacting a local NRCS or Extension office can help with researching and implementing these practices.

- As an example, bare ground buffers allow easy monitoring of animal tracks and may discourage some animal movement BUT results in soil exposed to erosion, and may allow easier movement of pathogens in runoff, increasing the risks of contaminating water sources. Also, some animals may prefer bare ground for movement. Consider limiting bare ground buffers to key strategic areas to minimize soil erosion and pathogen movement risks.

- As another challenge, hedgerow vegetation supports threatened pollinator populations and supports beneficial insects for pest control BUT may encourage animal movement near produce fields. Consider whether these actions may increase the risk for contamination in produce fields by animals.

**Note:** Removal of habitat may undermine conservation mandates/objectives as vegetation often serves valuable functions to protect natural resources, including soil and water. Local, state, and federal laws may govern vegetation management options and should be consulted. Co-management can benefit both food safety and conservation; however, it is important to maintain adherence to both the regulatory food safety requirements and the intent of each management concern.

### Skills to Support Co-Management

- Review the risks and benefits of practices as they relate to food safety and conservation
  - e.g., bare ground buffer and hedgerow vegetation

- Consider impact on conservation when implementing produce safety practices
  - Unintended consequences
  - Direct conflicts between produce safety and conservation
Monitoring wildlife activity throughout the growing season is helpful for preventing crop contamination and loss. Additionally, monitoring may allow growers to develop an understanding of when and to what degree animal intrusion occurs throughout the season, allowing them to develop more effective animal management practices.

Consider crop characteristics when monitoring for food safety risks associated with wildlife. Tree crops and crops grown off the ground are less likely to be contaminated by small rodents and mammals since they do not grow where feces are likely to be deposited, but resident bird populations or migrating flocks, such as crows, might be more likely to directly affect a tree crop.

Consider factors that might lead to increased animal movement toward crop and/or water sources, for example drought, post-wildfire conditions, or other events that influence animal movement patterns.

As mentioned in previous slides, § 112.83(b) requires those subject to the rule assess relevant areas used for a covered activity for evidence of potential contamination of covered produce as needed during the growing season (based on covered produce; practices and conditions; and observations and experience) and; if significant evidence of potential contamination is found (such as observation of animals, animal excreta or crop destruction), those subject to the rule must evaluate whether the covered produce can be harvested in accordance with the requirements of § 112.112 and take measures reasonably necessary during growing to assist them later during harvest when they must identify, and not harvest, covered produce that is reasonably likely to be contaminated with a known or reasonably foreseeable hazard.

In Subpart K, § 112.112 requires those subject to the rule must take all measures reasonably necessary to identify, and not harvest, covered produce that is reasonably likely to be contaminated with a known or reasonably foreseeable hazard, including steps to identify and not harvest covered produce that is visibly contaminated with animal excreta. At a minimum, identifying and not harvesting covered produce that is reasonably likely to be contaminated with animal excreta or that is visibly contaminated with animal excreta requires a visual assessment of the growing area and all covered produce to be harvested, regardless of the harvest method used.
If you know you have a significant, recurring wildlife issue and are concerned about fecal contamination of the produce, water sources, or other areas of the farm, consider practical methods to discourage wildlife presence in those areas.

The FSMA Produce Safety Rule does not require the use of deterrents as a method to manage wildlife intrusion, however, these suggestions are often effective in minimizing the presence of wildlife.

Before taking any action, evaluate how these actions might impact wildlife habitat and movement. Natural Resource Conservation Service (NRCS) specialists or Extension professionals may be able to help recommend methods and evaluate possible impacts.

Decoys can be an effective method for scaring away a number of different types of wildlife. Plastic coyotes (some with bushy tails that blow in the wind) can be used to deter birds, deer, and other rodents. Swans are naturally aggressive towards Canada geese, so swan decoys can be effective around waterways or flyways that are frequently visited by geese. It is especially important to move decoys every few days so that they can remain effective and wildlife do not get used to them being in one particular area.

Fencing and netting can be very expensive; however, investing in fencing might be beneficial in the long term in reduced and recurring damage to crops. Even sections of fencing can be effective in moving wildlife around areas where produce may be growing. High value crops such as berries often benefit from lightweight netting to prevent bird damage.

Additional Resources:


Noise deterrents, such as air cannons, can be effective on birds and ultrasonic devices can be helpful if the pests are groundhogs or small rodents.

There are a wide range of visual deterrents that can be used such as reflective tape, inflatable air noodles (think: car dealerships), and balloons.

Relocation of wildlife is also an option using ‘Have-a-Heart’ type traps for release. If this option is chosen, be sure to consult with a professional and consider the impacts to the critter’s natural habitat. As a safety note, use extra precaution if you plan to handle or be near wildlife since they may transmit diseases, such as rabies, which have very serious health consequences!

As a last resort, nuisance permits can be used to reduce wildlife populations.

Additional Resources:


14 Additional Information

- This slide is optional.
- Pathogens can be transferred from livestock to wildlife and vice versa.
- Any land or natural resources, such as water, that are shared by both wildlife and domesticated animals may present an opportunity for the transfer of pathogens.
- This type of information is important because it helps growers understand risks and where controlling wildlife access to fields and domesticated animal production areas may be even more important.

Additional Resources:


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- Many of the principles for food safety related to wildlife also apply to domesticated animals. With domesticated animals, there are some additional considerations on the farm because the grower has more control over these animals.
- Pathogen loads carried by domesticated animals may be influenced by a number of factors including: age of animal, type of animal, rearing practices, and other management factors (As highlighted in Module 3: Soil Amendments).

Notes:
- There may be situations where animals are allowed to enter produce fields as part of the production process. Considerations for working animals are discussed in a later slide.

- Some animals may enter fields and even packing areas unexpectedly such as wildlife, livestock that escape their pens, or pets that live outside. Excluding these animals may be more difficult, so outlining corrective actions in advance may be helpful.

- Corrective actions may include monitoring and plans for how to avoid or to address contamination events (i.e., fecal matter) that may pose a risk to the produce.

**Additional Resources:**


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- In the case of domesticated animals on the farm, there are usually more opportunities to exclude and control animals from entering produce fields and water sources than with wildlife.

- If using animals during production (such as horses), it is important to think about when and how often they are in the field. Is the crop present? Risks vary depending on the developmental stage of the covered produce (edible portion present) and when animals are present. Always consider the risk of fecal contamination to covered produce.

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**Assessing Risks: Domesticated Animals**

- Are domesticated animals allowed in the field while the crop is present as part of the production process?
  - Are they working animals?
- Are workers aware of cross-contamination risks from fecal contamination of hands, clothing, shoes, and equipment after handling animals or fecal material?
- Are production fields rotated into grazing land?
  - If manure is present on the ground, one recommendation is to extend the period of time between when animals were grazed and when produce can be planted.
It is also important to think about where produce fields and packing areas are in relationship to pastures and areas where animals live.

- Is runoff of manure or urine a concern?
- Are animals controlled so that they do not have access to fields and packing areas? This includes pets, especially close to harvest.
- Are the people that work with animals (and animal manure) aware of cross-contamination risks from hands and clothing such as boots?

§ 112.32(b)(2) requires that any workers in direct contact with working animals take appropriate steps to minimize the likelihood of contamination of covered produce, and § 112.32(b)(3)(v) requires thoroughly washing hands as soon as practical after touching animals or any waste of animal origin.

Module 3: Soil Amendments covers considerations of using or storing manure or compost on the farm so that it does not become a source of contamination, and also covers the requirements of Subpart F.

§ 112.83 states that if there is reasonable possibility that grazing animals, working animals, or animal intrusion will contaminate covered produce, those subject to the rule must assess relevant areas for evidence of potential contamination of covered produce as needed during the growing season. If significant evidence of potential contamination is found during growing (such as observation of animals, animal excreta, or crop destruction), they must evaluate whether the covered produce can be harvested under § 112.112 and take measures reasonably necessary during growing to assist with identifying and not harvesting covered produce reasonably likely to be contaminated with a known or reasonably foreseeable hazard.

§ 112.134(a) requires that if those subject to the rule have domesticated animals, to prevent contamination of covered produce, food contact surfaces, areas used for a covered activity, agricultural water sources, or agricultural water distribution systems with animal waste, they must:

1) Adequately control their excreta and litter; and
2) Maintain a system for control of animal excreta and litter

Additional Resource:

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- Knowing the history of the production land can help identify any problems before crops are planted including biological, chemical, and physical hazards from previous uses.

- Reviewing topography of the land can identify areas prone to flooding, runoff to agricultural water sources and fields, and wind patterns that might blow contamination from compost piles or animal operations onto produce.

- If there are sewage systems or septic tanks on the farm, §§ 112.131(a) and (b) require that they be maintained in a manner that prevents contamination of produce or food contact surfaces.

- It is also important to know whether animals have grazed on the land, as the time between manure deposits from grazing to harvest of produce should be maximized.

- Adjacent land use can also pose a risk if there are livestock or production animals present. Contamination can come from wind drift or runoff from manure piles as well as animal access to water sources used for the production of produce. Other adjacent land uses associated with residential or commercial areas may present other risks.

- Wildlife can contaminate produce with their fecal material. Determining the number and type of resident and transient animals entering production fields, and monitoring the potential for introduction of known (or foreseeable) hazards can help identify the severity of the problem (as required in § 112.83(b)(1)) and whether produce can be safely harvested (§ 112.112).

Additional Resource:

The FSMA Produce Safety Rule does not prohibit the use of working animals. The use of working animals does not mean food safety goals cannot be achieved, however the risks they may pose to produce safety should be considered and minimized.

The best way to minimize risks is to not allow working animals in the fields close to harvest and when the edible portion of the crop is growing.

As with all animals, they may defecate (poop) while they are in the field, so there should be a written SOP that deals with how a ‘poop event’ is handled.

- It can be left in the field while a no-harvest buffer zone is established around the fecal contamination. If left in the field, be aware that splash from rain or irrigation may spread contamination.
- If a grower chooses to bury or remove the feces, it is critical to establish sanitation procedures to make sure equipment (such as buckets, shovels, gloves, etc.) are properly cleaned and sanitized and evaluate whether these actions may impact the safety of produce.
- § 112.83, § 112.127, and § 112.134 are applicable to domesticated animals, including working animals.
- There are many ways to address the risks of using working animals in the field, but it is important that practices do not result in more risks. For this reason, it is very important that anyone who handles working animals understand food safety risks that may be present and be trained to minimize them.
  - Dedicating boots to barn activities such as cleaning animal stalls is one way to minimize the movement of fecal contamination into the produce growing or packing areas.
  - Handwashing is critical. Always wash hands after working with animals or cleaning up their poop.
- As a reminder, § 112.32(b)(2) requires that any workers in direct contact with working animals take appropriate steps to minimize the likelihood of contamination of covered produce and to thoroughly wash hands, as soon as practical after touching animals or any waste of animal origin (§ 112.32(b)(3)(v)).

- More information on worker health and hygiene can be found in Module 2: Worker Health, Hygiene, and Training.

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- Dogs and cats are almost ubiquitous on family farms. Farmers should recognize that pets can represent a food safety risk if they have access to fields and packing areas.

- Pets can sometimes be effective working animals, such as in the case of dogs that control wildlife.

- Working dogs and cats are not prohibited in the FSMA Produce Safety Rule, however, their presence should be monitored and a corrective action plan established for their presence. See the previous slide for more information on working animals.

- Some growers like to use cats in their packinghouses as rodent control, but cats can carry *Toxoplasma gondii*, which can cause severe illness including blindness, miscarriage, and death. Because of these and other risks, cats must be excluded or separated from areas where covered produce activities performed in fully enclosed buildings (§ 112.127).

- Many farms also have U-pick operations. Instruct U-pick customers to leave their pets at home, for both food safety and liability reasons!

- Lastly, if the farm has a petting zoo or any other type of activity that involves workers or visitors touching animals, handwashing stations should be available. This is especially important if a U-pick farm is set up to allow visitors to wander from the animal barn (i.e., petting the animals) to the fields (i.e., picking fruit) where customers are likely to be eating or touching produce. There have been several foodborne illness outbreaks associated with petting zoos.

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*Notes:*
A pre-harvest assessment determines if it is safe for harvest to proceed. The main objective is to determine if anything, including wildlife, domesticated animals, adjacent land use, or even isolated events such as flooding have impacted the safety of the crop.

If wildlife or other animals have been in the field, there may be corrective actions that need to be taken to reduce the risks to fresh produce such as establishing no-harvest buffer zones or not harvesting parts of the field.

Any actions taken should be documented. This not only documents steps taken to reduce risks but helps track trends in animal activity and ensure workers have taken all of the necessary actions to make sure the produce is safe.

§ 112.112 requires immediately prior to and during harvest activities, those subject to the rule must take all measures reasonably necessary to identify, and not harvest, covered produce that is reasonably likely to be contaminated with a known or reasonably foreseeable hazard, including steps to identify and not harvest covered produce that is visibly contaminated with animal excreta. At a minimum, identifying and not harvesting covered produce that is reasonably likely to be contaminated with animal excreta or that is visibly contaminated with animal excreta requires a visual assessment of the growing area and all covered produce to be harvested, regardless of the harvest method used.

Additional Resources:
Additional Resource:

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- It is important to outline the immediate actions that should be taken in response to a contamination event.
- Not harvesting fresh produce with fecal material seems pretty straightforward, but this requires all those who harvest to know that this is a requirement (§ 112.112) and to know how to avoid contamination. If there is a significant amount of contamination, isolating the area and not harvesting any produce is the safest thing to do.
- The FSMA Produce Safety Rule does not require a no-harvest buffer zone, however, this is one effective means of minimizing the cross-contamination risk from fecal contamination in the produce field.
  - Using the presence of fecal matter found on the ground in a field as an example, a grower could decide to establish no-harvest buffer zones, not to harvest the crop, or come up with other corrective actions that minimize risk of produce becoming contaminated.
  - If establishing a no-harvest buffer zone, the radius and size will depend on a number of factors which will have to be assessed by each grower. Factors to consider are: meteorological factors (such as a predicted rain event which could cause splash onto produce or high winds and dry conditions that could cause drift), how much fecal material is present, what the consistency is (watery, solid), and the extensiveness of the problem (whole field or one event).
- The farm food safety manager will have to use best judgement on the appropriate buffer size to ensure an acceptable level of safety is maintained.

**Corrective Actions:**
**What To Do If There’s Contamination**

1. Do not harvest any produce that may be contaminated
2. Determine if no-harvest buffer zones around the contamination are sufficient to reduce risk to allow harvest of the uncontaminated produce
   - Suggested no-harvest buffer zones vary from a 0-25 foot radius, depending on the crop, climate, contamination event, and harvest equipment
3. Consider other corrective actions that could reduce contamination risks

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**Notes:**

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20—Wildlife, Domesticated Animals, and Land Use

Additional Resources:

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Corrective actions address identified risks and are meant to minimize risks. Establishing these actions can help identify and put into place a long term solution for preventing the risk of contamination in the future.

Alternative markets that include a processing step, such as a heat treatment, can be considered if there are concerns about the safety of the crop or if the standards in the FSMA Produce Safety Rule cannot be met.

Deciding what to do with contamination that is found depends on many factors. Consideration of appropriate responses before a problem is encountered can be beneficial and help to avoid inadvertently making the problem worse.

- Removing contamination is complex because it involves people and moving the contamination around, so think critically about risks and benefits.
- Burying contamination is also an option, but would still require sanitation of the tools and handwashing.
- Flagging the contaminated area and not harvesting is an option, but can be an issue if using overhead irrigation since splash can continue to spread the contamination.

Notes:
- Workers are your front lines of defense: they are in the field harvesting product, so they can identify animal intrusion events and the presence of feces that can contaminate produce and equipment.

- Training provides the opportunity to share what is expected and answer questions so that everyone knows what their job is and can actively participate in the farm’s food safety program.

- If the field has had significant animal intrusion, workers need to notify someone at the farm such as the crew leader or farm manager.

- If workers are involved in establishing no-harvest buffer zones or removing contamination, they need to know exactly what to do AND how to properly clean and sanitize tools as well as wash their hands to reduce cross-contamination risks.

- § 112.22(b)(1) requires that persons who conduct harvest activities for covered produce must also receive training to recognize covered produce that must not be harvested, including covered produce that may be contaminated with known or reasonably foreseeable hazards; (2) Inspecting harvest containers and equipment to ensure that they are functioning properly, clean, and maintained so as not to become a source of contamination of covered produce with known or reasonably foreseeable hazards; and (3) Correcting problems with harvest containers or equipment, or reporting such problems to the supervisor (or other responsible party), as appropriate to the person’s job responsibilities.

- § 112.32(b)(3)(vi) requires workers to wash their hands at any other time when the hands may have become contaminated in a manner that is reasonably likely to lead to contamination of covered produce with known or reasonably foreseeable hazards.

Notes:
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- Documentation is important because it allows growers to review past issues and evaluate if practices are working.
- It also establishes a system for evaluating crops and allows workers to become comfortable with how assessments are done.
- To support the farm food safety program related to domesticated and wild animals, records should be kept of monitoring and other actions taken to reduce risks, such as the use of wildlife deterrents, even though the FSMA Produce Safety Rule does not specifically require that these records be kept.
- Pre-harvest assessments, animal monitoring, records of intrusion/contamination events, and any corrective actions should also be documented.
- Documenting worker trainings related to domesticated animals and wildlife does not need to be separate from other on-farm worker training, but it is highlighted here because there are specific things that should be included about domesticated and wild animal issues, depending on the situations that occur on each farm.
- Documentation of worker trainings must be kept, including the date of training, topics covered, and the person(s) trained, according to § 112.30(b).

25 Additional Information

- This slide is optional and provides an example of a monitoring log.
- There are many template recordkeeping logs available, so growers do not have to start from scratch.
- It is important to make sure the recordkeeping logs are working for the farm, so farm food safety personnel should modify them to meet their needs.
Summary

- Feces and urine from domesticated and wild animals can contaminate produce fields and water sources
- Conduct pre-planting and pre-harvest assessments
- Presence of animals in the environment does not necessarily mean that produce is contaminated
- If animal intrusion occurs, fields must be monitored during the growing season for evidence of contamination
- Steps should be taken to reduce risks from animals
- Co-management should be used to balance food safety and conservation goals
- Document all actions taken to reduce risks from animals and adjacent land uses