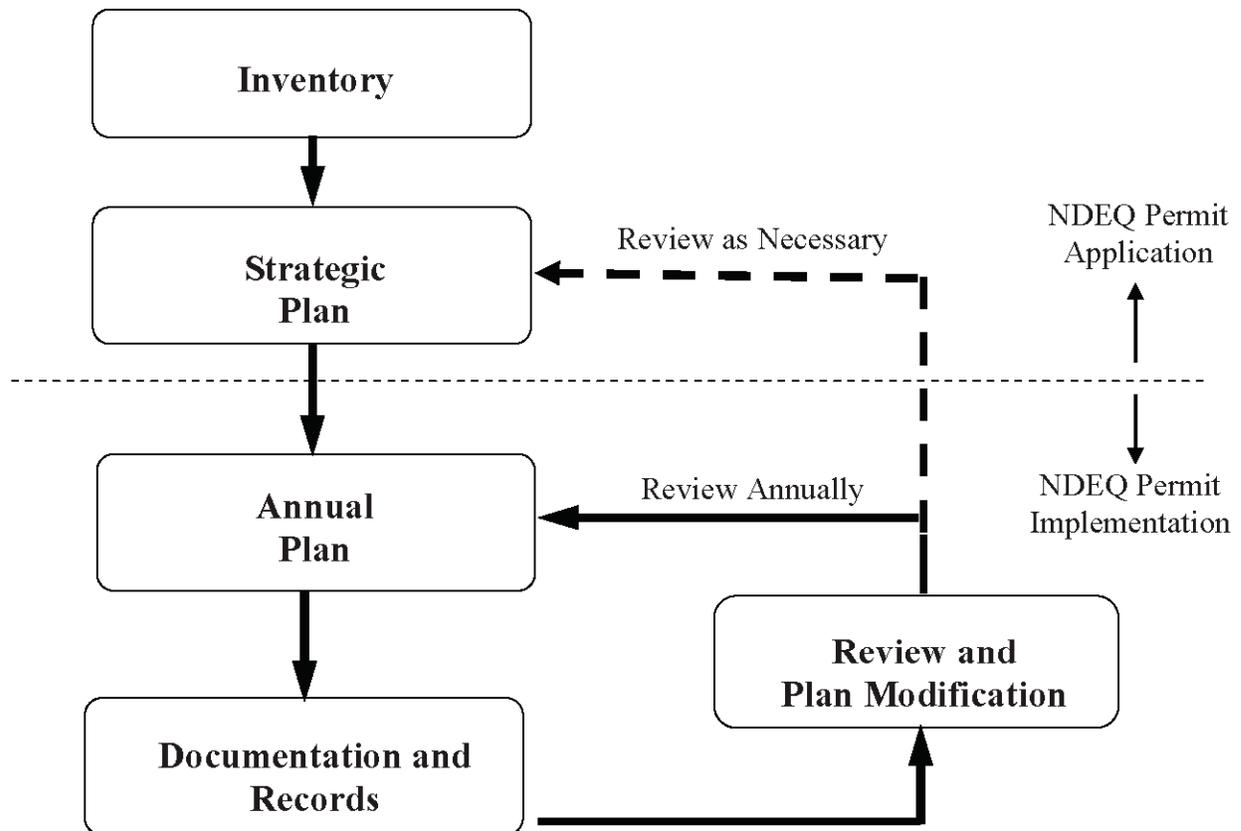


Nebraska's

CNMP

Odor Management Plan Workbook



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Nebraska's CNMP Odor Management Plan Workbook

March 1, 2003

**To assist Nebraska livestock producers in developing and using their
Comprehensive Nutrient Management Plan**

Project Partners

University of Nebraska Cooperative Extension
Upper Elkhorn Natural Resources District
Lower Elkhorn Natural Resources District
Lower Platte North Natural Resources District

Cooperating Agencies and Organizations

University of Nebraska – Lincoln
Nebraska Cattlemen
Nebraska Pork Producers
Nebraska Department of Environmental Quality
USDA Natural Resources Conservation Service

Financial Partner

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Special Thanks

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What is a Odor Management Plan?

What is the purpose of this workbook? This workbook focuses on odor management planning. It will assist a producer in the:

- assessment of an existing operation to identify current practices or technologies that contribute to an odor risk;
- identification of practices or technologies that may reduce higher risk odor concerns; and
- preparation of an odor management plan that should address the livestock facility's higher risk issues and be used to meet NDEQ Title 130 requirements.

An odor management plan should be considered one component of a Comprehensive Nutrient Management Plan (CNMP). Additional CNMP workbooks in this series address 1) manure application and 2) manure storage planning.

What is a CNMP? A Comprehensive Nutrient Management Plan (CNMP) is an environmental planning process that integrates planning of various environmental issues associated with livestock production. This workbook targets odor management planning.

Why is a CNMP Important? A CNMP is the environmental operating or management plan for a livestock or poultry facility. It is intended to encourage efficient management of nutrients in all aspects of a livestock system, environmentally and agronomically beneficial utilization of manures, and integration of nutrient management with other key environmental issues such as odor control or soil conservation planning.

Nutrients in manure, when managed incorrectly, represent the greatest threat to water quality from livestock production. However, if managed correctly, manure is an environmental and agronomic asset. Soils receiving agronomic rates of manure require less commercial fertilizer (conserving energy and limited phosphorus reserves), are higher in organic matter (contributing to greater soil productivity and water infiltration rates), and may experience less runoff, erosion, and nitrogen leaching. Thus, choices made relative to the management of nutrients within a livestock operation are absolutely critical.

How is a CNMP and an Odor Management Plan Related? An odor management plan is one component of a CNMP. The goal of using manure nutrients efficiently in cropping systems can be difficult to achieve if neighbors are experiencing odor related nuisances. A nutrient plan commonly requires manure storage and additional new land application sites, increasing the opportunity for neighbor exposure to odors. As a nutrient management plan is being assembled, it is important to review the impact of current practices on potential odor and dust issues as well as identify strategies for reducing nuisance issues.

What are the NDEQ Title 130 rules related to odor management? According to Title 130, "Class II, Class III, and Class IV facilities (facilities with more than 1,000 animal units) applying for a construction or operating permit after the effective date of these regulations shall provide, with the permit application, a plan describing Best Management Practices to minimize odors from the livestock operation, the facility and the disposal of livestock waste. At a minimum, the plan should describe the following BMP items:

- 007.01 Considerations given to the location of the livestock operation, facility and application area;
- 007.02 Selection of size and type of facility to minimize odors, and facilitate management of waste;
- 007.03 Management procedures to be incorporated in operation of the facility;
- 007.04 Methods and scheduling procedures to minimize adverse odors or control frequency of odor during application times; and

007.05 Any other planned methods or procedures to be utilized by the livestock operation to reduce offensive odors.”

How Is The Nebraska CNMP Organized? To implement a CNMP, a five-step process is suggested:

- **Inventory.** Inventory records define current livestock or poultry numbers, land application sites, and available land application equipment required for an NDEQ permit.
- **Strategic Plan.** The Strategic Plan targets long-term planning of issues required for an NDEQ permit.
- **Annual Plan.** The Annual Plan addresses planning processes that must be reviewed annually. The Odor Management Plan does not include an Annual Planning component.
- **Documentation and Records.** Sample records can be used to verify that a management plan has been successfully implemented and meets NDEQ record keeping requirements. No records are required for odor issues, but two recommended records are provided.
- **Review and Plan Modification.** This final section summarizes information that may be used in modifications to either the Strategic or Annual Plans. Regular review of your farm’s odor risk using the enclosed assessment tools can contribute to the review and modification of your farm’s odor plan.

The forms for completing and implementing the Odor Management Plan component of a CNMP are organized into this five-step process (see Table of Contents).

Regulation vs. Good Stewardship? This document follows procedures accepted by NDEQ as part of their permit application and record keeping requirements. Those worksheet or record keeping forms marked with the Nebraska Department of Environmental Quality symbol (*Figure 1*) contain information that is mandatory for an NDEQ permit application or for permit maintenance inspections. At a minimum these planning tools (or comparable tools supplied by the producer or his/her advisor) are critical for ensuring compliance with Nebraska regulations. Those worksheets or record keeping forms marked with the “Good Stewardship” (*Figure 2*) symbol suggest recommended planning procedures for your farm’s economic and environmental benefit, but are not required.



Figure 1. Nebraska Department of Environmental Quality symbol.



Figure 2. Good Stewardship symbol.

Additional Information:

1. Nebraska Wind Summaries for Odor Management Planning, available online at <http://manure.unl.edu/wind/wind.html>.
2. Livestock and Poultry Environmental Stewardship curriculum (lessons 40-44):
 - Lesson 40: Emissions from Animal Production Systems
 - Lesson 41: Emission Control Strategies for Building Sources
 - Lesson 42: Controlling Dust and Odor from Open Lot Livestock Facilities
 - Lesson 43: Emission Control Strategies for Manure Storage Facilities
 - Lesson 44: Emission Control Strategies for Land Application
 These are available from MWPS. Orders can be placed through your county Cooperative Extension office or online at <http://www.lpes.org/>.
3. An electronic copy of the contents of this workbook and individual forms can be downloaded from <http://cnmp.unl.edu>.

Summary of Odor Management Plans and Records Required by Nebraska Department of Environmental Quality

The table below summarizes the primary worksheets contained in this workbook. It indicates which components of an odor management plan are required by NDEQ as part of a permit application for a Livestock Waste Control Facility permit. The table also identifies a University of Nebraska form or record that may be useful. If you wish to track planning processes or record keeping processes that have been implemented, you can check each one off below as it is implemented.

Forms and Planning Procedures:	Reference		NDEQ Permit Application		Records	
	Page #	Form #	Required	Completed	Required by NDEQ	Currently Used
Inventory:						
Community Siting	5	1	<u>YES</u>	_____		
Stewardship Assessment of Odor Risks	7	2	<u>NO</u>	_____		
Strategic Plans:						
Odor Management Plan	21	3	<u>YES</u>	_____		
Annual Plan						
No Relevant Forms						
Documentation & Records						
Producer Record of Odor Complaints	27	4			<u>NO</u>	_____
Neighbor Record of Odor Observations	28	5			<u>NO</u>	_____
Review & Plan Modification						
Producer Record of Odor Complaints	27	4			<u>NO</u>	_____



Instructions for Community Siting Information (Form 1)

Purpose: This map will provide a general picture of the rural community in which this livestock operation is or will be located. It can be used in reviewing relative locations of odor sources and potential receptors (neighbors, public facilities, etc.) within your community. The map must be large enough to include all facilities and land application sites.

Instructions:

General

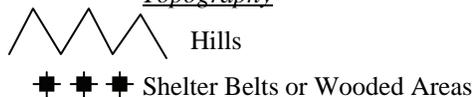
1. Indicate "North" on map. Label the northeast section on the map with its section number.
2. Identify the location of all livestock and waste control facilities on your site near the center of grid, including confinement barn, open lot, manure storage, compost sites, and mortality holding or disposal sites (see legend below).
3. Identify the location of all land application sites, etc. (see legend below).
4. Identify location of all neighbors within two miles of livestock facilities including homes, schools, churches, businesses, and recreational facilities, etc. (some may need to be drawn outside the border of this map).
5. Mark location of shelterbelts, hills, or other sudden changes in topography that might encourage dissipation of odor (see legend below).
6. Draw arrow to indicate the prevailing wind direction for a) summer, b) time(s) of year when manure is land applied, and c) early spring (if treatment lagoon is part of operation). See Additional Information below for viewing prevailing wind data for 28 Nebraska weather sites.
7. Circle any homes or public facilities that are at an elevation below a potential odor source (high-risk locations).

Legend

Livestock Facilities

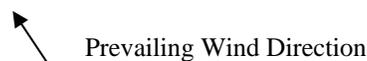
	Confinement Barn
	Open Feedlot
	Manure Storage
	Compost Site
	Mortality Holding or Disposal Site
	Land Application Site

Topography



Community Facilities

	Residences
	Public Facilities (School, Church, etc.)
	Businesses
	Recreational Facilities
	Community Facilities at Lower Elevation Than Odor Source (higher risk)



Additional Information:

1. Nebraska Wind Summaries for Odor Management Planning are available online at <http://manure.unl.edu/wind/wind.html>.



Form 1. Community Siting Information

<p>← 1 mile →</p>			



Instructions for Stewardship Assessment of Odor Risks (Form 2)

Purpose:

The goal of this assessment package is to help a livestock or poultry producer confidentially evaluate environmental issues that relate to outdoor air quality. Based upon this risk assessment, resources may be focused to address higher risk issues.

Instructions:

1. For each issue listed in the left-hand column of the worksheet, read across to the right and circle or check the statement that best describes conditions on your farm.
2. Complete this assessment for the following topics:
 - Community and Neighbor Issues
 - Animal Housing Issues
 - Manure Storage Issues
 - Land Application Issue
3. Note the odor control technologies labeled with ❖. These technologies have been demonstrated to provide significant odor or dust control benefits.

4. Leave blank any categories that don't apply.

Additional Resources:

Livestock and Poultry Environmental Stewardship curriculum (lessons 40-44):

Lesson 40: Emissions from Animal Production Systems

Lesson 41: Emission Control Strategies for Building Sources

Lesson 42: Controlling Dust and Odor from Open Lot Livestock Facilities

Lesson 43: Emission Control Strategies for Manure Storage Facilities

Lesson 44: Emission Control Strategies for Land Application

These are available from MWPS by calling 1-800-562-3618 or by contacting your local Cooperative Extension office. Single lessons also can be viewed or printed from <http://www.lpes.org/>.

Note: Prevailing winds can be found online under “Nebraska Wind Summaries for Odor Management Planning” at <http://manure.unl.edu/wind/wind.html>.



Form 2. Stewardship Assessment of Odor Risks

Potential Odor Risk	High Risk	Moderate Risk	Low Risk or “Good Steward”
Producer Knowledge of and Response to Neighbor Concerns?			
<i>Do neighbors complain?</i>	<input type="checkbox"/> Several complaints within last year.	<input type="checkbox"/> Occasional complaints within recent years.	<input type="checkbox"/> Never.
<i>Have you asked your neighbors about odor?</i>	<input type="checkbox"/> No.	<input type="checkbox"/> Some neighbors have been approached about odors.	<input type="checkbox"/> All neighbors have been approached about odors.
<i>Do neighbors know who to contact (name and phone number) for an odor complaint?</i>	<input type="checkbox"/> No.	<input type="checkbox"/> Some neighbors.	<input type="checkbox"/> All neighbors.
<i>How are complaints addressed?</i>	<input type="checkbox"/> Complaints are ignored or not taken seriously.	<input type="checkbox"/> Complaints are taken seriously but responded to slowly.	<input type="checkbox"/> Complaints are taken seriously, acted upon quickly, and action is shared with a neighbor. ¹
Pro-Active Community Relations Efforts			
<i>Is regular contact maintained with neighbors?</i>	<input type="checkbox"/> No.	<input type="checkbox"/> Occasionally.	<input type="checkbox"/> Always.
<i>Are neighbors notified in advance of odorous activities (e.g. land application of manure)?</i>	<input type="checkbox"/> No.	<input type="checkbox"/> Occasionally.	<input type="checkbox"/> Always.
<i>Are neighbors and community leaders provided an opportunity to tour your operation?</i>	<input type="checkbox"/> No.	<input type="checkbox"/> Some neighbors and community leaders are provided tour opportunities.	<input type="checkbox"/> Yes, neighbors and community leaders are encouraged to tour facilities.
<i>Is farm owner or manager active in community?</i>	<input type="checkbox"/> Farm owner/manager do not live in local community OR farm owner/manager has no involvement in community.	<input type="checkbox"/> Farm owner/manager has limited involvement in community (e.g. school, service groups, 4-H).	<input type="checkbox"/> Farm owner/manager is active in community activities (e.g. school, service groups, 4-H).
<i>What is the general farmstead appearance?</i>	<input type="checkbox"/> Site shows signs of poor upkeep, weed growth, buildings in disrepair, or accumulation of junk.	<input type="checkbox"/> Appearance of facilities are well maintained but site appears sterile, “factory farm image.”	<input type="checkbox"/> Site is neatly landscaped and groomed. Exterior appearance of facilities is well maintained.
<i>Is manure storage or stockpile visible to public or neighbors?</i>	<input type="checkbox"/> Storage is located within clear line of site of neighbors or general public.		<input type="checkbox"/> Storage is remotely located or visually screened from view of neighbors and general public.

¹Forms 4 and 5 can be used to record complaints and resulting actions.

Form 2. Stewardship Assessment of Odor Risks (continued)

Potential Odor Risk	High Risk	Moderate Risk	Low Risk or “Good Steward”
Neighbor Locations (consider neighbors within two miles)			
Topography between neighbors and <ul style="list-style-type: none"> <i>Animal housing</i> <i>Manure storage or manure stockpiles</i> <i>Manure application site</i> 	<input type="checkbox"/> Neighbors are located at lower elevation or in valley below facility. <input type="checkbox"/> Neighbors are located at lower elevation or in valley below facility. <input type="checkbox"/> Neighbors are located at lower elevation or in valley below facility.	<input type="checkbox"/> Open, flat terrain. <input type="checkbox"/> Open, flat terrain. <input type="checkbox"/> Open, flat terrain.	<input type="checkbox"/> A shelterbelt, woods, or hill. <input type="checkbox"/> A shelterbelt, woods, or hill. <input type="checkbox"/> A shelterbelt, woods, or hill.
Prevailing wind direction relative to: <ul style="list-style-type: none"> <i>Animal housing</i> 	<input type="checkbox"/> Prevailing winds move air toward a residential community during higher odor risk seasons (commonly spring and summer).	<input type="checkbox"/> Prevailing winds move air toward some neighbors during higher odor risk seasons (commonly spring and summer).	<input type="checkbox"/> Prevailing winds move air away from most neighbors most of the time (commonly spring and summer).
<ul style="list-style-type: none"> <i>Manure storage or manure stockpiles</i> 	<input type="checkbox"/> Prevailing winds move air toward a residential community during higher odor risk seasons (commonly spring and summer).	<input type="checkbox"/> Prevailing winds move air toward some neighbors during higher odor risk seasons (commonly spring and summer).	<input type="checkbox"/> Prevailing winds move air away from most neighbors most of the time (commonly spring and summer).
<ul style="list-style-type: none"> <i>Manure application site</i> 	<input type="checkbox"/> Prevailing winds move air toward a residential community during time of manure application.	<input type="checkbox"/> Prevailing winds move air toward some neighbors during time of manure application.	<input type="checkbox"/> Prevailing winds move air away from most neighbors during time of manure application.

Additional options to consider. Check any of the following “Good Steward” activities that you have implemented:

- Maintain adequate separation distance of the facility site from neighbors:
 - ½ mile minimum¹. Greater distance would be recommended for neighbors downwind of facility along prevailing summer wind directions;
 - Double ½ mile minimum separation distance to communities, schools, religious facilities, and recreation areas.
 - Double ½ mile minimum distances for larger-than-average livestock facilities.
- Locate manure storage or lagoon near center of cropping area or other remote area instead of near livestock housing.
- Block visual line of site from neighbors and public roads to farm facilities.
- Develop a new shelterbelt or utilize an existing shelterbelt or hill downwind of livestock facility (along line of summer prevailing winds).

¹ This number is highly subjective and should vary with size of odor source, topography, and climatic conditions. This setback is simply a starting point for a farm’s initial discussion and planning purposes. If your county has established setback distances, those values might be a substitute.

Additional options to consider (continued):

- Planted trees or other windbreaks around animal housing or storage to improve visual appearance or reduce public's line of vision of potential odor sources.
- Established and maintains good grass stand around perimeter of open lot, buildings, and storage not used for animal housing or equipment driveways.
- Regularly mows around facility.
- Establish and maintain good up-gradient surface water drainage away from animal confinement and storage.
- Driveways are graveled to minimize dust production and graded to encourage drainage.
- Neighbors are asked to monitor odor nuisance experiences and share information with producer.
- Other: _____

Additional options to consider. Check any of the following “Good Steward” activities that you have implemented:

- Facility is thoroughly washed down between animal groups.
- Flush tanks are covered or totally enclosed (if recycled lagoon water is used for flushing).
- Flush tanks have fill pipe extended to near bottom with anti-siphon vent (if recycled lagoon water is used for flushing).
- Spilled feed is regularly cleaned up.
- Mortality is composted in a bed of organic material (crop residue). ❖
- Mortality storage and incineration sites are separated from neighbors.

New technologies for reducing animal housing odors

- 10+ foot high windbreak wall down stream of ventilation fans.
- Exhaust fan ventilation air is directed up rather than horizontally through configuration of buildings or addition of upward facing elbow on outlet.
- Shelterbelt down wind of building ventilation air.
- Use biofilter for exhaust ventilation air (mechanically ventilated buildings only). ❖
- Spray vegetable oil over building surfaces daily at rate of about 1/8 gallon per 1,000 square feet. ❖
- Treat building air with ozone.
- Operate dry manure handling system such as bedded pack system (e.g. hoop housing) or high rise housing with heavy use of crop residues and/or drying floors.
- Use synthetic amino acids or other dietary strategies for reducing total dietary crude protein.
- Other: _____

❖ Technologies that provide significant odor or dust control benefits.

Form 2. Stewardship Assessment of Order Risks (continued)

Open Lot Animal Housing

If your farm includes multiple open lots, you may want to copy this assessment tool and complete a separate worksheet for each facility.

Potential Odor Risk	High Risk	Moderate Risk	Low Risk or “Good Steward”
Open Lot Design			
• <i>Corral slope</i>	<input type="checkbox"/> No slope or slope is toward feed apron or other feed areas.	<input type="checkbox"/> Slope is less than 3% away from feed apron or other feed areas.	<input type="checkbox"/> Slope is 3 to 5% away from feed apron or other feed areas. ❖
• <i>Adjacent pens</i>	<input type="checkbox"/> Pen to pen drainage is common.		<input type="checkbox"/> No pen to pen drainage exists.
• <i>Corral shape</i>	<input type="checkbox"/> Pens are irregularly shaped and not conducive to edge-to-edge manure removal.		<input type="checkbox"/> Pen shape allows edge-to-edge manure removal.
• <i>Corral surface</i>	<input type="checkbox"/> Corral soil is easily erodible and prone to rills and gullies.	<input type="checkbox"/> Corral surface is soil treated with stabilizer or constructed of firm, stable soil.	<input type="checkbox"/> Corral surface is concrete.
• <i>Drainage from corral</i>	<input type="checkbox"/> Downstream corral surfaces are part of the runoff storage pond.	<input type="checkbox"/> Downstream corral surfaces are prone to temporary flooding.	<input type="checkbox"/> Downstream corral surfaces quickly drain after a storm event.
• <i>Runoff control</i>	<input type="checkbox"/> Significant manure or run off is not controlled and regularly pools in areas around open lots.	<input type="checkbox"/> Some manure and runoff is not controlled and regularly pools in areas around open lots.	<input type="checkbox"/> All manure/runoff is contained within runoff control pond.
• <i>Vegetative barrier</i>	<input type="checkbox"/> No vegetative barrier is located downwind of corrals based upon prevailing winds during times of year of high dust or odor concerns.		<input type="checkbox"/> A dense shelterbelt or other vegetative barrier is located downwind of corrals based upon prevailing winds during times of year of high dust or odor concerns.
Open Lot Management			
• <i>Frequency of manure removal</i>	<input type="checkbox"/> Less than twice a year.	<input type="checkbox"/> 120 to 180 day intervals.	<input type="checkbox"/> Every 60 days or less during seasons of high odor or dust risk. ❖
• <i>Operator training in manure removal and pen management</i>	<input type="checkbox"/> No employee training is offered.	<input type="checkbox"/> Managers or some operators are knowledgeable in techniques of manure removal and motivation for this practice.	<input type="checkbox"/> All appropriate employees are trained in techniques of manure removal and motivation for this practice.
• <i>Pen surface management</i>	<input type="checkbox"/> Holes, pits, or depressions are not regularly corrected.	<input type="checkbox"/> Holes, pits, or depressions are corrected only at time of manure removal (commonly several months between manure removal).	<input type="checkbox"/> Frequent inspection of pen surfaces is made. Few holes, pits or depressions exist for collection of water. Wet areas are quickly corrected.

Open Lot Animal Housing (continued)

Potential Odor Risk	High Risk	Moderate Risk	Low Risk or “Good Steward”
Open Lot Management (continued)			
<ul style="list-style-type: none"> <i>Water leakage</i> 	<input type="checkbox"/> Overflow waterers and system leaks are not a priority.	<input type="checkbox"/> Inspections for overflow waterers and system leaks are infrequent.	<input type="checkbox"/> Regular inspections are made for overflow waterers and system leaks AND Problems are quickly corrected.
<ul style="list-style-type: none"> <i>Manure ridges at fence lines</i> 	<input type="checkbox"/> Removal of manure ridges is not a priority.		<input type="checkbox"/> Manure ridges are removed with each pen cleaning.
<p><i>During periods of dust problems, the following dust control measures are implemented:</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Cross-fencing to increase stocking density, ❖ <input type="checkbox"/> Daily watering or chemical resin application to access roads, <input type="checkbox"/> Daily watering of corral surfaces, ❖ <input type="checkbox"/> Dry manure and dust harvested frequently, ❖ <input type="checkbox"/> Topical application of crop residue on corrals. 	<input type="checkbox"/> No dust control measures are implemented.	<input type="checkbox"/> One to three dust control measures are implemented.	<input type="checkbox"/> At least four dust control measures are implemented.

Additional options to consider. Check any of the following “Good Steward” activities that you have implemented:

- Keep outdoor lots as dry as reasonable by: ❖
 - providing good lot drainage, especially around waterers;
 - preventing up-slope water and roof water from entering the lot;
 - ensuring that all low spots within a corral drain quickly;
 - avoiding use of lot surfaces as part of the settling basins or for storage of runoff;
 - regularly filling and packing low spots to prevent mud holes.
- Frequent removal of old feed from bunk feeders and spilled feed on the ground.
- Construction of feeders to allow drainage of all precipitation.

❖ Technologies that provide significant odor or dust control benefits.

Form 2. Stewardship Assessment of Order Risks (continued)

Manure Storage

If your farm includes multiple manure storage structures, you may want to copy this assessment tool and complete a separate worksheet for each storage.

Potential Odor Risk	High Risk	Moderate Risk	Low Risk or “Good Steward”
<i>Relative risk associated with alternative types of manure storage system.</i>	<input type="checkbox"/> Formed manure storage, earthen storage basin, or undersized anaerobic lagoon.	<input type="checkbox"/> Properly-sized anaerobic lagoon, OR <input type="checkbox"/> Partially covered manure storage, OR <input type="checkbox"/> Open lot runoff holding pond, OR <input type="checkbox"/> Dry manure storage where liquids are separated and drained to separated storage or absorbed by bedding.	<input type="checkbox"/> Anaerobic digester treats stored manure, ❖ OR <input type="checkbox"/> Purple anaerobic lagoon, ❖ OR <input type="checkbox"/> Composted manure storage, ❖ OR <input type="checkbox"/> Manure is stored for less than one week before land application, OR <input type="checkbox"/> Properly covered manure storage. ❖
<i>Location of storage or lagoon relative to confinement animal housing (dusty ventilation air moving across storage or lagoon surface will pick up and transport additional odors).</i>	<input type="checkbox"/> Prevailing winds or ventilation fans direct building ventilation air across storage or lagoon surface.		<input type="checkbox"/> Manure storage or lagoon is remotely located from animal housing, OR <input type="checkbox"/> Prevailing winds or ventilation fans DO NOT direct building ventilation air across storage or lagoon surface.
Manure Storage or Earthen Basins Only			
<i>Manure surface.</i>	<input type="checkbox"/> Manure surface is exposed and does not form a crust, AND <input type="checkbox"/> storage is loaded above liquid surface.	<input type="checkbox"/> Storage is loaded below liquid surface, AND <input type="checkbox"/> Crust forms over only part of storage surface due to top loading, regular agitation, wind or other factors, OR <input type="checkbox"/> Crop residue cover is in place at least six months of year during periods of greatest odor concerns, OR <input type="checkbox"/> Manure surface is partially covered by crop residue, plastic membrane or other type of cover.	<input type="checkbox"/> Storage is loaded below liquid surface AND <input type="checkbox"/> Stored manure forms undisturbed crust over the entire surface, OR <input type="checkbox"/> Manure is held in enclosed manure storage tank or covered year round with crop residue, plastic ❖ membrane or other type of cover, OR <input type="checkbox"/> Surface aeration maintains oxygen concentration of 1 mg/liter or greater.
<i>Agitation during emptying.</i>	<input type="checkbox"/> Storage is aggressively agitated by stream of manure directed above manure surface.	<input type="checkbox"/> Storage is aggressively agitated by stream of manure directed below manure surface.	<input type="checkbox"/> No agitation used during storage emptying.
<i>Atmospheric conditions during agitation.</i>	<input type="checkbox"/> Wind direction and atmospheric condition are not considered.	<input type="checkbox"/> Agitation may be stopped when wind blow towards neighbor. Calm wind conditions exists, and during evening hours.	<input type="checkbox"/> Agitation is stopped when wind blow towards neighbor. Calm wind conditions exists, and during evening hours.

Manure Storage (continued)

Potential Odor Risk	High Risk	Moderate Risk	Low Risk or “Good Steward”
Anaerobic and Aerobic Lagoons Only			
<i>Signs of improved biological treatment of lagoon odors... Permanent pool management.</i>	<input type="checkbox"/> A permanent pool of 1/3 of the total volume or less is maintained.	<input type="checkbox"/> A permanent pool is maintained that is at least 50% of the overall storage volume.	<input type="checkbox"/> Markers are used to identify “Stop Pumping Point” for maintaining permanent pool <i>AND</i> permanent pool never drops below marker.
<i>Lagoon biological activity.</i>	<input type="checkbox"/> Lagoon is dark brown or black in color and shows few signs of active bubbling during warm weather.	<input type="checkbox"/> Lagoon is dark brown or black and is actively bubbling from spring through fall.	<input type="checkbox"/> Lagoon is maintained in aerobic state (1 hp of aeration capacity per 150 finish hogs, 50 beef or 30 dairy animals) ❖ <i>OR</i> <input type="checkbox"/> Deep purple or red colored lagoon. ❖
<i>Lagoon loading. Frequent loading is preferred to infrequent loading.</i>	<input type="checkbox"/> Lagoon is loaded less frequently than weekly <i>OR</i> Manure loading rates are highly variable.	<input type="checkbox"/> Lagoon is loaded at least weekly with fairly similar quantities of manure.	<input type="checkbox"/> Lagoon is loaded daily with fairly similar quantities of manure.
<i>Lagoon unloading. Infrequent pumping causes buildup of salts and ammonia that can become toxic to anaerobic bacteria.</i>	<input type="checkbox"/> Lagoon is pumped infrequently or not at all due to evaporation and seepage, generally matching liquid additions.	<input type="checkbox"/> Lagoon is pumped annually to permanent pool marker.	<input type="checkbox"/> Lagoon is pumped annually to permanent pool marker <i>AND</i> In dry years, lagoon is pumped below permanent pool marker and fresh water added to marker.
<i>Electrical conductivity (<8 mmho/cm).</i>	<input type="checkbox"/> No measurement <i>OR</i> Readings > 12 mmho/cm.	<input type="checkbox"/> Infrequent measurements <i>OR</i> Readings between 8 and 12 mmho/cm.	<input type="checkbox"/> Quarterly measurements <i>AND</i> Readings less than 8 mmho/cm.

Additional options to consider for anaerobic lagoons. Check any of the following “Good Steward” activities that you have implemented:

- For lagoon in planning stages:
 - lagoon is sized to meet NRCS design for odor control. ❖
 - solids are separated with settling basin or liquid solids separator.
- New lagoon is filled about 1/3 full with fresh water prior to loading with manure.
- For existing lagoon, organic solids loading has been reduced by separation of solids (settling basin or liquid solids separator) prior to lagoon.
- Manure discharge pipes extend below the surface of the lagoon.
- Black settled solids or sludge is not exposed during pumping.

❖ Technologies that provide significant odor or dust control benefits.

Form 2. Stewardship Assessment of Order Risks (continued)

Potential Odor Risk	High Risk	Moderate Risk	Low Risk or “Good Steward”
Open Lot Runoff Holding Pond/Settling Basins/Filter Strips			
<i>Holding pond unloading</i>		<input type="checkbox"/> Holding pond is regularly more than half full.	<input type="checkbox"/> Liquid is dispersed through a grass filter strip, OR <input type="checkbox"/> Liquid is pumped out whenever ground will accept liquid without runoff. Pond is kept dry or with minimal liquid pool.
<i>Draining of settling basins or channels</i>	<input type="checkbox"/> Liquid pools in settling basin often remaining for several weeks.	<input type="checkbox"/> Liquid pools in settling basin often remaining for several days.	<input type="checkbox"/> Liquids drain from settling basin and a dry solid surface is observed within a few days after a storm event.
<i>Drainage of open channels for transporting runoff</i>	<input type="checkbox"/> Liquid pools in open channels often remaining for multiple weeks.	<input type="checkbox"/> Liquid pools in open channels often remaining for multiple days.	<input type="checkbox"/> All liquids drain from open channels.
Solid Manure			
<i>Stockpiled manure location:</i>	<input type="checkbox"/> Stockpiling often occurs near public roads, public facilities or neighbors, OR <input type="checkbox"/> Precipitation and seepage pools in vicinity of stockpile.		<input type="checkbox"/> Stockpiling is generally avoided and manure is directly land applied, OR <input type="checkbox"/> Stockpiling is done in remote locations away from neighbors AND <input type="checkbox"/> All precipitation and seepage drains away from stockpile.
<i>Stockpiled manure storage conditions:</i>	<input type="checkbox"/> Wet manure is commonly stock piled and never turned.		<input type="checkbox"/> Only dry manure (<40% moisture) is stockpiled, OR <input type="checkbox"/> Crop residue is mixed with stockpiled manure to achieve <40% moisture, OR <input type="checkbox"/> Stockpiled manure is turned weekly to encourage composting until no additional heating occurs.

Additional odor control technology options to consider. Check any of the following “Good Steward” activities that you have implemented:

- Ozone is injected in storage or lagoon surface.
- Proven biological additives or oxidants are added.
- Lagoon or storage is covered with a floating membranes, crop residue cover, or geotextile. ❖
- Anaerobic digester is installed prior to storage. ❖
- Surface aeration system is installed or oxidizing agents are used (i.e. potassium permanganate or hydrogen peroxide).
- Adjust manure pH above 8 (manure storage only) for reduced odor.
- Composting of solid manure. ❖
- Other: _____

Caution:
Manure or feed additives should be approached with caution. To date, most additives have either failed to demonstrate odor control benefits or have not been independently tested.

❖ Technologies that provide significant odor or dust control benefits.

Form 2. Stewardship Assessment of Order Risks (continued)

Land Application

Potential Odor Risk	High Risk	Moderate Risk	Low Risk or “Good Steward”
General Considerations			
<i>Relative risk of :</i> <ul style="list-style-type: none"> • <i>Spray irrigation</i> 	<input type="checkbox"/> Spray irrigation application of top water or slurry from manure storage, earthen basin, or undersized anaerobic lagoon.	<input type="checkbox"/> Spray irrigation of top water from lagoon designed according to standard engineering designs.	<input type="checkbox"/> Spray irrigation of top water from aerobic lagoon, purple lagoon, or lagoon designed for odor control (permanent pool twice as large as standard engineering designs).
<ul style="list-style-type: none"> • <i>Tanker or towed hose application</i> 	<input type="checkbox"/> Surface application of stored slurry manure.	<input type="checkbox"/> Surface application of slurry manure followed by same day incorporation, OR <input type="checkbox"/> Surface application with drop hose applicator.	<input type="checkbox"/> Immediate incorporation or injection of slurry manure, and no liquid remains on surface. ❖
<ul style="list-style-type: none"> • <i>Solid manure spreader application</i> 	<input type="checkbox"/> Surface application of wet solid manure.	<input type="checkbox"/> Surface application of relatively dry or heavily bedded solid manure.	<input type="checkbox"/> Surface application of dry or heavily bedded solid manure followed by same day incorporation, OR <input type="checkbox"/> Immediate incorporation of wet solid manure. ❖
<i>Have any advanced treatment technologies been implemented to reduce odor release during land application?</i>	<input type="checkbox"/> No dilution.	<input type="checkbox"/> Purple lagoon. <input type="checkbox"/> Anaerobic lagoon sized for odor control. <input type="checkbox"/> Independently documented manure additive.	<input type="checkbox"/> Anaerobic digestion. <input type="checkbox"/> Aerobic treatment. <input type="checkbox"/> Composting. ❖
Timing of Manure Application (for irrigation and surface application of manure)			
Odors associated with surface application of manure typically dissipate within a few hours after application, if good drying conditions exist. Thus the conditions during and shortly after land application have a significant impact on odor nuisances experienced by neighbors.			
<i>Wind direction. Odors travel in the same direction as wind. Very little lateral dispersal occurs unless calm conditions exist.</i>	<input type="checkbox"/> Wind direction is not considered and wind may be blowing towards neighbors.	<input type="checkbox"/> Wind direction is typically considered and winds blowing towards neighbors are avoided.	<input type="checkbox"/> Wind direction is always considered and winds blowing toward neighbors are avoided.

Wind Speed. Windy conditions are preferable to calm conditions. Windy conditions promote odor dilution with fresh air.	<input type="checkbox"/> Wind speed is not commonly considered and manure is commonly applied when winds are less than 5 mph.	<input type="checkbox"/> Wind speed is typically considered and manure is usually not applied when winds are less than 5 mph.	<input type="checkbox"/> Wind speed is always considered and manure is never applied when winds are less than 5 mph.
Time of day. Evening and night conditions produce cooling air and can trap odors at ground level, allowing odors to impact large areas.	<input type="checkbox"/> Time of day is not commonly considered. Evening or night application is common.	<input type="checkbox"/> Commonly applied during daylight hours before 5 p.m.	<input type="checkbox"/> Always applied during daylight hours after 8 a.m. and before 3 p.m.
Sky conditions. Sunny days are preferable to cloudy conditions. Such conditions dry manure and promote odor dilution with fresh air.	<input type="checkbox"/> Sky conditions are not commonly considered and cloudy sky conditions are not avoided.	<input type="checkbox"/> Typically applied on sunny days only.	<input type="checkbox"/> Always applied on sunny days only.
Weekends/Holidays.	<input type="checkbox"/> Weekends and holidays are not commonly considered.	<input type="checkbox"/> Weekends and holidays are commonly avoided.	<input type="checkbox"/> Weekends and holidays are always avoided or neighbors are known to be gone.

Spray Irrigation Considerations

Type of spray nozzle	<input type="checkbox"/> High pressure, big guns applicators including end guns on center pivots. <input type="checkbox"/> High pressure spray nozzles on pivot or linear irrigation system.		<input type="checkbox"/> Low pressure drop nozzles that release liquid in close proximity to crop canopy.
Dilution with fresh water	<input type="checkbox"/> No dilution.	<input type="checkbox"/> Mixing of fresh to lagoon water at a ratio less than 3 to 1.	<input type="checkbox"/> Mixing of fresh to lagoon water at a ratio of 3 to 1 or greater.
Time of year for application (for anaerobic lagoons only)	<input type="checkbox"/> Spring (shortly after lagoon has become active) or winter (when lagoon is inactive).	<input type="checkbox"/> Late spring (after lagoon has been active for 2 months or more).	<input type="checkbox"/> Summer through fall (When lagoon has been active for several months).
Time delay between last lagoon loading and spray irrigation (for anaerobic lagoons only)	<input type="checkbox"/> Lagoon receives manure within few days of spray irrigation from lagoon.		<input type="checkbox"/> Manure flow to lagoon is stopped for two weeks prior to spray irrigation from lagoon. Time delay allows stabilization of solids and associated odors.

Additional land application odor control options to consider. Check any of the following “Good Steward” activities that you have implemented:

Wind direction is monitored during activities causing odor and appropriate land application sites are selected according to wind direction and location of neighbors.

Irrigation Application

Only top water effluent from lagoons with electrical conductivity less than 8 mmho/cm is used.

End gun use is limited during effluent application.

Other: _____

❖ Technologies that provide significant odor or dust control benefits.



Instructions for Odor Management Plan (Form 3)

Purpose

Based upon current strengths and weaknesses of your livestock or poultry operations current odor control activities, a plan can be developed to address some of the current high risk issues identified.

NDEQ Title 130

Title 130 requires development of “a plan describing Best Management Practices to minimize odors from the livestock operation, the facility and the disposal of livestock waste. At a minimum, the plan should describe the following BMP items:

- 007.01 Considerations given to the location of the livestock operation, facility and application area;
- 007.02 Selection of size and type of facility to minimize odors, and facilitate management of waste;
- 007.03 Management procedures to be incorporated in operation of the facility;
- 007.04 Methods and scheduling procedures to minimize adverse odors or control frequency of odor during application times; and
- 007.05 Any other planned methods or procedures to be utilized by the livestock operation to reduce offensive odors.”

Instructions

1. Review the assessment for practices, activities, or other issues that were identified as “Low Risk” or “Good Steward.” These responses are the Odor Management Strengths of your current livestock production system. In the *Odor Management Plan (Form 3)*, identify those strengths of your current livestock production system. Make special note of any odor control practices already implemented. ❖
2. Review the assessment for practices, activities, or other issues that were identified as “High Risk. These responses represent situations that may contribute to odor nuisances for neighbors. In the *Odor Management Plan (Form 3)*, identify those weaknesses of your current livestock production system.
3. Identify planned odor control activities that address high risk odor issues. Appropriate odor control activities might be identified by:
 - Noting Low Risk or Good Steward responses for issues currently identified as High Risk.
 - Reviewing technologies that have a very significant impact on odor reduction (see LPES lessons 41, 42, 43, and 44) to review most promising technologies.
 - Matching odor control technologies to components of your plan that included multiple High Risk responses in your assessment. For example, adding a cover to a manure storage when that storage was identified as having multiple high risk concerns would likely have significant odor control benefits.
 - Noting Low Risk or Good Steward responses that require only a change in management practice and little or no capital investment.
 - Make special note of any plans to install ❖ odor control technologies.
4. Repeat this activity for Facility Siting and Community Relations, Animal Housing, Manure Storage, and Land Application sections.

Suggested Resources

1. Livestock and Poultry Environmental Stewardship curriculum (lessons 41-44)
 - Lesson 41: Emission Control Strategies for Building Sources
 - Lesson 42: Controlling Dust and Odor from Open Lot Livestock Facilities
 - Lesson 43: Emission Control Strategies for Manure Storage Facilities
 - Lesson 44: Emission Control Strategies for Land Application
 These are available from MWPS by calling 1-800-562-3618 or by contacting your county Cooperative Extension office. Single lessons also can be viewed or printed from <http://www.lpes.org/>.
2. An electronic copy of the contents of this workbook and individual forms can be downloaded from <http://cnmp.unl.edu>.



Form 3. Odor Management Plan – Facility Siting and Community Relations

	Current Strengths and Weaknesses of Present Odor Management Efforts	Individual Responsible for Implementation
<p>Current Odor Management Strengths of Livestock or Poultry Operation (from Good Steward checklist or Low Risk column of assessment tool – <i>Form 2</i>)</p>		
<p>Current Odor Related Weaknesses of Livestock or Poultry Operation (from High Risk column of assessment tool – <i>Form 2</i>)</p>		
	Planned Technologies and Management Practices for Controlling Odors	Individual Responsible and Planned Date for Implementation
<p>Planned odor control activities (activities not currently implemented from Good Steward checklist or Low Risk column of <i>Form 2</i>. Especially those activities that would correct a High Risk issue).</p>		



Form 3. Odor Management Plan – Animal Housing

	Current Strengths and Weaknesses of Present Odor Management Efforts	Individual Responsible for Implementation
<p>Current Odor Management Strengths of Livestock or Poultry Operation (from Good Steward checklist or Low Risk column of assessment tool – <i>Form 2</i>)</p>		
<p>Current Odor Related Weaknesses of Livestock or Poultry Operation (from High Risk column of assessment tool – <i>Form 2</i>)</p>		
	Planned Technologies and Management Practices for Controlling Odors	Individual Responsible and Planned Date for Implementation
<p>Planned odor control activities (activities not currently implemented from Good Steward checklist or Low Risk column of <i>Form 2</i>. Especially those activities that would correct a High Risk issue).</p>		



Form 3. Odor Management Plan – Manure Storage

	Current Strengths and Weaknesses of Present Odor Management Efforts	Individual Responsible for Implementation
<p>Current Odor Management Strengths of Livestock or Poultry Operation (from Good Steward checklist or Low Risk column of assessment tool – <i>Form 2</i>)</p>		
<p>Current Odor Related Weaknesses of Livestock or Poultry Operation (from High Risk column of assessment tool – <i>Form 2</i>)</p>		
	<p>Planned Technologies and Management Practices for Controlling Odors</p>	<p>Individual Responsible and Planned Date for Implementation</p>
<p>Planned odor control activities (activities not currently implemented from Good Steward checklist or Low Risk column of <i>Form 2</i>. Especially those activities that would correct a High Risk issue).</p>		



Form 3. Odor Management Plan – Land Application

	Current Strengths and Weaknesses of Present Odor Management Efforts	Individual Responsible for Implementation
<p>Current Odor Management Strengths of Livestock or Poultry Operation (from Good Steward checklist or Low Risk column of assessment tool – <i>Form 2</i>)</p>		
<p>Current Odor Related Weaknesses of Livestock or Poultry Operation (from High Risk column of assessment tool – <i>Form 2</i>)</p>		
	Planned Technologies and Management Practices for Controlling Odors	Individual Responsible and Planned Date for Implementation
<p>Planned odor control activities (activities not currently implemented from Good Steward checklist or Low Risk column of <i>Form 2</i>. Especially those activities that would correct a High Risk issue).</p>		



Instructions for Odor Management Plan Implementation Records (Form 4 and 5)

Purpose

Records may be used to identify odor control concerns, complaints, and potential odor sources.

NDEQ Title 130

Title 130 makes no requirements for livestock facility maintenance of records related to odor. All record keeping activities are strictly voluntary.

Potential Odor Management Plan Records

1. *Form 4. Producer Record of Odor Complaints.* This form may be used by producer for recording concerns raised by neighbors and actions taken to respond to concerns.
2. *Form 5. Neighbor Record of Odor Observation.* This form may be used by neighbors for recording odor observations. The timing and wind direction observation may assist in identifying the source of the odor (your operation vs. a neighbor's livestock operation or your manure storage vs. animal housing vs. land application site). The conditions under which odors are observed (time of day, weather conditions) may identify situations to avoid for practices that cause odors (agitation of a pit or land application of manure).
3. *Form 15. Monthly Manure Storage/Lagoon Inspection Checklist* (found in the *Manure Storage Workbook*).¹ This checklist includes several odor-related observations that assist in evaluating odors associated with a manure storage or lagoon. Regular observations of electrical conductivity are beneficial in evaluating functioning of an anaerobic lagoon. Values below 8 mmho/cm suggest that salts have not accumulated to a level that would impede anaerobic processes that reduce odor. Values above 8 mmho/cm suggest the lagoon may have more than normal odors and dilution of the lagoon may be necessary.
4. *Weather records.* Weather conditions (especially wind direction, wind speed, and air temperature) have significant impact on the distance and direction of travel of an odor plume. Knowledge of these conditions on days of an odor concern can be used to determine the odor source and the conditions under which odor plumes are impacting your neighbors. These conditions can be avoided in timing future practices that release significant odors (e.g. storage agitation, land application of manure). This information may be available from a local radio, television station, or extension office. Data can also be retrieved electronically from the High Plains Regional Climate Center (<http://www.hprcc.unl.edu>) for a modest fee.
5. An electronic copy of the contents of this workbook and individual forms can be downloaded from <http://cnmp.unl.edu>.

¹This workbook can be ordered through your local University of Nebraska Cooperative Extension office or downloaded at <http://cnmp.unl.edu>.

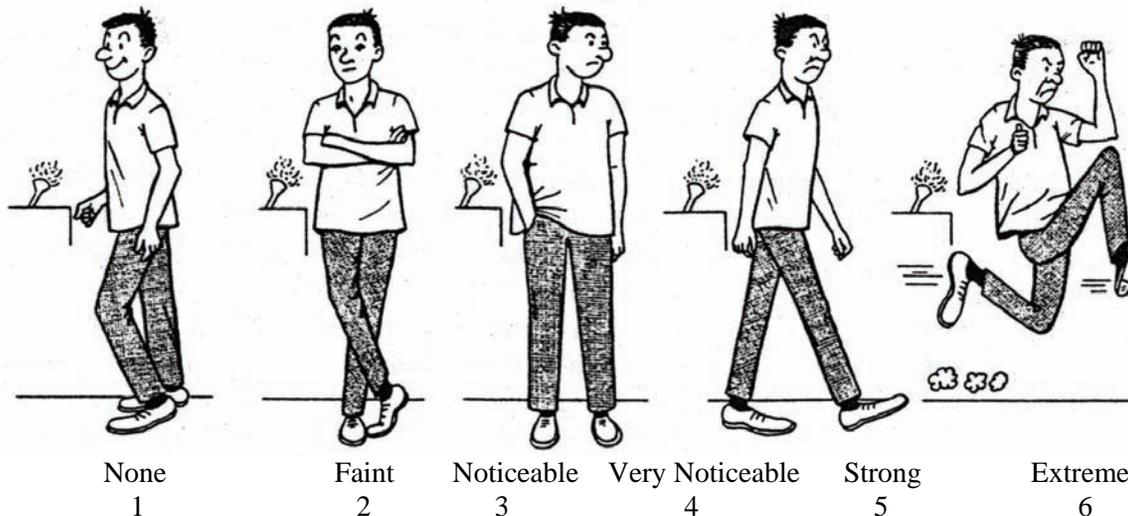


Form 5. Neighbor Record of Odor Observations

Name: _____

Location: _____

Intensity Scale for Odor Nuisance:



First Observed		Duration	Intensity of Odor Nuisance:						Temperature (°F)	Sky ¹	Wind ²	
Date	Time		None	Faint	Notice- Able	Very Noticeable	Strong	Ex- treme			Speed (circle one)	Direction Wind is from
		hrs.	1	2	3	4	5	6			1 2 3	
		hrs.	1	2	3	4	5	6			1 2 3	
		hrs.	1	2	3	4	5	6			1 2 3	
		hrs.	1	2	3	4	5	6			1 2 3	
		hrs.	1	2	3	4	5	6			1 2 3	
		hrs.	1	2	3	4	5	6			1 2 3	

¹**Sky Conditions:** SY...Sunny; PC...Partly Cloudy; MC...Mostly Cloudy; OC...Overcast; HZ...Hazy; NT...Night

²**Wind Conditions:** 1...calm or light breeze (0-5 mph) 2...moderate wind (5-15 mph) 3...strong wind (15+ mph)