

The Environmental Review Commission of the North Carolina General Assembly

Report on The Inventory & Ranking of Inactive Animal Waste Lagoons April 25, 2000

Purpose and Background

The 1999 General Assembly instructed the Department of Environment and Natural Resources (Department) to develop a list of inactive animal waste lagoons and to rank these sites according to the threat to public health, the environment and the State's natural resources. This task was completed jointly by the Division of Water Quality (DWQ) and the Division of Soil and Water Conservation (DSWC) through regional animal facility inspectors and operation reviewers.

Lagoons are defined by statute as a confined body of water that holds animal by-products including bodily waste or a mixture of waste with feed, litter etc. Inactive lagoons are further defined by statute as those which have not received animal waste for a period of one year or more. This inventory encompasses all types of structures types including holding ponds which contain liquid waste from swine, cattle or poultry operations.

Process for Inventory Development and Field Data Collection

The objective of the inventory was to identify the location and ownership of all inactive lagoons in the state. The process began with the development of a preliminary list of farms and other locations with potential inactive lagoons using departmental records and input from Soil and Water Conservation Districts. Department records included the 1993 animal operations registration data base, a listing of animal operations certified under the .0200 rule which have gone out of business and regional office records from 1995 lagoon inspections. This process is assumed to result in a thorough discovery of inactive structures, but the probability exist that some were missed. Inactive lagoons which were not listed in one of the departmental data bases and which the Soil and Water Conservation Districts were unaware were not addressed.

To verify sites on the preliminary list, DWQ or DSWC staff conducted field visits to each listed site this calendar year. Field visits either verified the existing inactive lagoons or allowed the removal from the inventory of operations which had never used liquid storage or which had already closed their inactive structures.

During the site visit, geographic coordinates were established for inactive lagoons using Global Position System (GPS) technology and data were collected as necessary for ranking the environmental risks. The methods of information collection were limited to visual inspection, use of GPS and/or physical measurements of the lagoon surface dimensions. The lack of boats and other equipment prevented the taking of sludge samples and the measurement of lagoon and sludge depths. No groundwater sampling was done in conjunction with the inventory.

Rationale for Risks Ranking

The inactive lagoon risk ranking addresses 3 means of pollutant transfer to the environment, all of which relate to water. Odor has not been a problem associated with inactive sites and is not included in this ranking process. Consideration was given to: 1) leaching to groundwater, 2) embankment breach and 3) discharge from overflow. Groundwater contamination of drinking wells poses a potential to affect human health. Surface water quality threats from a breach or overflow could impact human health, and fisheries and other natural resources.

The strategy for ranking inactive lagoons is based upon the following principles:

- 1) Nitrogen is the pollutant of primary concern because it is a) highly mobile in water, b) a limiting nutrient in many watersheds and c) has potential human health impacts in drinking water. Copper, zinc, and phosphorous, although also found in inactive lagoons are not as mobile and represent a lesser hazard.
- 2) The water column in inactive lagoons usually has relatively low levels of nitrogen as compared to active lagoons. This has been shown in limited testing by the NC Cooperative Extension Service (CES) and is supported by staff observations of tadpoles and fish in some inactive structures.
- 3) The primary remaining source of pollutants is in the sludge. Testing by CES and others has documented that sludge in inactive lagoon may contain high levels of nitrogen and phosphorus.
- 4) For purposes of this ranking, due to a lack of site-specific data, it has been assumed that the rate at which nitrogen is released from the sludge to move to groundwater is rapid. However, this is probably a very conservative assumption. Because the assumed faster loading rates increase the potential to adversely impact groundwater, this conservative factor may overestimate the risk to groundwater. CES has indicated that under the anaerobic conditions existing in the bottom of a lagoon, mineralization of the organic nitrogen may be expected to occur at a slow rate, causing a slower release of nitrogen than assumed under the worst case scenario.

The parameters used for ranking risks included the following:

Location in the floodplain	Lagoon liquid level
Surface acres	Embankment height
Distance to stream	Proximity to wells
Distance to high quality waters	Previous flooding
Appearance of lagoon liquid	Outside drainage area
Availability of application equipment and sprayfields	
Liner status	

The relationship between the rated parameters served as the basis for ranking of the individual risk categories. For example, a structure with a poor embankment condition and sludge near the surface that lies within 250 feet of a stream would receive a high rating for embankment breach. The basic ranking scheme is included in Attachment #1. Each category of risk (groundwater, breach and overflow) was independently evaluated and assigned a ranking of high, medium or low. The highest ranking for any of the three categories was taken as the overall ranking for the structure. Additional parameters such as sludge volume and groundwater samples would have been useful in the risk rating. However, data acquisition was limited by staff time and resources. The lack of additional field data has identified a need for further data collection and evaluation for inactive lagoons which received a medium-risk ranking.

The high-risk ranking was reserved for lagoons which pose an immediate threat of a significant adverse impact to human health or the environment.

A medium-risk ranking was assigned to structure that may not pose an immediate threat but that may have the potential for discharge. For structures receiving this ranking, further evaluation is needed.

A low ranking was reserved for inactive lagoons which do not appear to represent a significant hazard based on data collected.

Inventory and Ranking Results

The effort yielded an inventory of 745 farms with 1142 inactive lagoons across 76 counties. The inventory contains predominantly swine operations, but includes poultry and dairy operations, and includes both active and inactive farms. The surface area of these structures total 703 acres. The central coastal plain counties have the highest concentration of structures and the western counties have the fewest. The county with the highest number is Sampson with 120. Table I lists the number of inactive structures by county and the attached map displays the location of inactive lagoons based on GPS coordinate data. Attachment #2 lists ownership and other specific information.

The ranking process is not completed for about 6% of the structures, for which the Department is in the process of obtaining missing field data. Also, a further review of the data base by the field staff will be done to provide a final level of quality control.

Only a small portion of the inactive structures were ranked to be a high priority needing immediate attention, with 39 structures sites assigned a high-risk ranking. These high-ranked structures generally had been inactive less than 5 years and have dark liquid or excessive sludge. They also either have a poor embankment condition, were overflowing during the site visit or are high risk to overflow. A list of the inactive lagoons with a high-risk ranking are included in Attachment #3. Forty-three structures were ranked as low-risk. Many of these structures are empty. The ones still containing waste are in general less than .5 acres in surface area, have good embankments, are well managed and either have liners or are built in clay soils.

An overwhelming majority of the inactive lagoons in the inventory (93%) received a medium-risk rating primarily due to their potential to contaminate. This is a result in part to the uncertainty imposed by a lack of detailed understanding of the status and behavior of nutrients contained in inactive lagoons and limited data regarding actual levels of groundwater or surface water contamination.

Closure and Costs

The Department has adopted the NRCS standard for lagoon closure. This standard requires emptying a lagoon to the extent that “the depth of agitated waste material remaining in the lagoon structure at the time of closure may not exceed a maximum depth of more than one foot.” This standard further requires scraping and removal of the remaining material from the bottom if soil conditions can support equipment. Normally, closure is accomplished by agitating to mix the liquid and sludge. Application of the slurry is then made at agronomic rates to cropland or pasture by irrigation or tanker spreading. Alternative methods of closure (eg sludge removal) are now under consideration by the Department.

The cost of lagoon closure is expensive. The 45 lagoons which have been closed to NRCS standards using NC Agriculture Cost Share Program assistance averaged \$42,000 per acre of lagoon closed.

Recommendations

The purpose of ranking was to eliminate the need and expense to close all 1142 inactive lagoons. At \$42,000 per acre, the cost estimate for closing 703 acres is \$30 million over an estimated five-year period.

Because this is prohibitively expensive, and because it is in the public’s interest to collect additional data, the Department recommends a five-year phased assessment and close out approach. This plan calls for 1) immediate closure of all high-ranked structures, 2) funding for needed assessment to further evaluate the medium-risk sites and 3) not closing low ranked structures.

The cost estimate for closure of the 39 high-risk lagoons is \$1.5 million. This should be completed within one year and would require a special appropriation from the legislature. The cost estimate of assessments to evaluate medium risk structures, is \$2 million. Under this approach the Department, with the assistance of NCSU, would establish minimum criteria under which closure is required for medium-risk lagoons, and explore less expensive closure methods and standards. Medium-risk structures will undergo an assessment, performed by contractors employed by the Department, to be classified either high or low risks. High risks lagoons would be closed on an annual cycle as special appropriations are made available from the General Assembly, based on reports made by the Department.

The Department is developing recommendations to the General Assembly that will provide clear authority to implement this approach. This will include incentives to landowners to proceed with lagoon closure in conjunction with a Department program which will be based on a closure enrollment period of three years following completion of the assessment phase for medium-risk lagoons. Incentives are needed to promote landowners' early participation in the closure program and to identify additional inactive lagoons that this investigation may have overlooked. Landowners who do not enroll in the three-year closure program will not be eligible for incentives.

Aside from closure of presently active lagoons made inactive in the future due to waste treatment technology conversion, closure of inactive lagoons should be completed within five years, subject to continued appropriations from the General Assembly.

COUNTY	# of Inactive Lagoons	COUNTY	# of Inactive Lagoons
Alamance	4	Johnston	54
Alexander	2	Jones	14
Alleghany	3	Lenoir	36
Anson	8	Lincoln	7
Ashe	3	Martin	31
Beaufort	56	Montgomery	8
Bertie	17	Moore	1
Bladen	12	Nash	15
Brunswick	18	Northampton	23
Burke	3	Onslow	5
Cabarrus	1	Orange	8
Camden	14	Pamlico	1
Carteret	4	Pasquotank	2
Caswell	8	Pender	13
Catawba	6	Perquimans	13
Chatham	9	Person	3
Chowan	16	Pitt	13
Cleveland	2	Randolph	4
Columbus	36	Richmond	4
Craven	15	Robeson	31
Cumberland	37	Rockingham	1
Currituck	11	Rowan	17
Davidson	11	Rutherford	1
Davie	22	Sampson	120
Duplin	40	Scotland	8
Edgecombe	4	Stanly	19
Franklin	24	Stokes	2
Gates	24	Surry	5
Granville	5	Tyrrell	30
Greene	38	Union	34
Guilford	4	Vance	4
Halifax	2	Wake	14
Harnett	14	Warren	19
Haywood	3	Washington	26
Henderson	3	Wayne	22
Hoke	2	Wilkes	6
Hyde	31	Wilson	4
Iredell	5	Yadkin	7
		Total:	1142

Table 1. Number of Inactive Structures by County

