Louisiana Forest Products Laboratory

An Overview of Log Yards in Louisiana

by

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Abstract

Federal and state regulatory agencies set water pollution standards for use in general stormwater permits. In order to help these agencies understand the nature and composition of log handling and storage facilities, a questionnaire was sent to log yards in the state of Louisiana requesting information on items that may relate to pollutants in stormwater runoff. Twenty-five percent of the yards were used for storage only. Soil type (sand, silt, clay) was fairly evenly distributed. Yard size averaged 7.1 hectares with an average capacity of 42,000 metric tonnes. Seventeen percent of the surveyed yards handled chips. None handled shortwood. Two-thirds of the yards stored fuel, lubricants or solvents on-site. Seventy-two percent of the yards had a stormwater pollution prevention plan in place, and an equal number of yards utilized sprinkler systems to extend log storage time. Fifty-eight percent of the yards have runoff water collect in a ditch before leaving the premises.

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The nature of any pollutants developing in the surface water runoff from log concentration and storage yards may seem rather mild compared to the pollutants developed in some other industries, but there is concern among environmental regulators that pollutant levels may be high enough to warrant attention. Industrial wastewater discharge already requires permitting by the Water Pollution Control Division of the Louisiana Department of Environmental Quality. Regulators are currently developing standards for a "Log Yard General Stormwater Permit." To set standards for this industry sector, a better understanding of the types and levels of possible pollutants is needed. In addition, it would be helpful to both regulators and industry to have an overall description of log yards in the state, such as the number of yards, size, activity level and other factors that could affect stormwater runoff quality or quantity.

The forest products industry is the second to third largest industry in Louisiana (10), depending upon the measurement criterion used, providing more than 25,700 manufacturing jobs and an estimated 8,000 additional jobs in the harvesting and transportation of timber (12). Forestry is by far the largest agricultural crop in the state, producing $3.8 billion in revenues (including value added) of the total $8.6 billion agricultural revenues (13). Despite this, it is a relatively low-profile industry with little statewide public awareness or understanding of its standard procedures. To improve public understanding of the industry, especially among regulators and policy makers, a description of log yards was created by asking industry officials to supply data on yard size and other relevant details.

Literature Review

Although many studies have been done on log yards, most of them are proprietary or not of scientific merit, so literature on log yards is scarce.

There is a text book on log yard operations, but it contains no quantitative description of the industry and devotes only one paragraph to water quality (9).

Washington's Department of Natural Resources conducted annual surveys of the forest products mills in that state (4). The questions focus on mill productivity. There were questions about log consumption and inventory levels, but no questions pertaining directly to log yards. There are many published listings of forest products firms, and many of these listings contain references to mill size in terms of annual productivity or number of employees (2, 8, 11, 15, 16, 17, 19, 21, 23). One pulp mill directory lists the volume capacity of some log yards (16).

Although there has been considerable attention by industry and environmental regulators on the topic of stormwater runoff, much of it concerns urban runoff. Surprising little published data can be found on log yard stormwater runoff. A study in Oregon investigated the effects of log yards on water quality, but the yards were significantly different from yards found in the southern states (20). Each of the yards utilized stream water that flowed through the yard. There was no effort to measure stormwater runoff. Only one yard studied utilized stream water for a flow-through sprinkler system (no water recirculation; mills in Oregon are now required to recirculate the water).

Luppold (14) provides a useful summary description of the evolution of stormwater regulations in the United States and the permitting process. States can opt to set their own guidelines under the auspices of federal guidelines. While the paper contains many descriptions that are useful to all states, it excludes Louisiana in the state descriptions.

Objective

The objective of this study was to present a "picture" of the log yards in the forest products industry. Regulatory decisions concerning water quality and stormwater permits usually are made by individuals who are well-trained in environmental principles but have had little exposure to the forest products industry. It is hoped that the results of this study may benefit those who want to learn more about the industry. It is the intention of this paper to present some physical descriptors of log yards that could be factors in stormwater quality. Data on actual water quality is beyond the scope of this paper.

This study was also the "front-end" of a larger study concerning the nature and levels of water quality parameters in log yard stormwater runoff. Collecting information on yard size, species handled, soil types and use of sprinkler systems would help develop an experimental design. The study of the water quality is still ongoing (7).

Methodology

A questionnaire was sent to each company known to have a log yard in the state of Louisiana; recipients were asked to fill out a questionnaire for each log yard owned or operated by that company.

Before mailing out the questionnaires, a comprehensive mailing list of the forest products industry was compiled. The Louisiana Forest Products Laboratory (LFPL) maintains a comprehensive mailing list of the forest products industry. The list was updated prior to sending out the questionnaires by cross-referencing with published data (15, 16, 19), telephone directories and with a list maintained by the Louisiana Department of Agriculture and Forestry, Office of Marketing (5). In addition, the LFPL list had been updated recently in other studies (6, 22). The entire mailing list contained 97 firms.

The responses to the questionnaire were entered into a database program. Latitude and longitude values were added for each location. Mapping of the sites allowed the authors to verify that all regions with a significant forest industry presence were represented.

Survey Instrument

The first questions concerned general descriptors: location, size of yard, soil type and species handled. Since a company may have log yards located away from the mill or mailing address, the location of the log yard was requested. Although "woodyard" is the term commonly used for this type of facility, the questionnaire used the term "logyard" to minimize confusion. Sometimes the term "woodyard" includes the outdoor space where sawn lumber is stored. Questions about a yard's typical high and low inventory levels helped indicate whether yard capacity was a good indicator of its size. The soil type

question was limited to simple answers (sand, silt, clay) because it was anticipated that few of the respondents would be very knowledgeable about soils. This question was included to see if certain soil types were preferred for log yards. It was anticipated that yards on sandy soil would have less surface water runoff and more infiltration, and this might affect pollutant parameter levels. Also, it was anticipated that yards with deep, sandy soils may not be appropriate for selection in future phases of the stormwater investigation because of perceived difficulty in collecting runoff water. Questions about species handled were included because it is unknown whether different species will affect stormwater quality in different ways. Also, specialists at the extension service occasionally get requests about where to obtain uncommon species, so by adding a detailed species list, the LFPL was able to assist them assimilate that information at virtually no additional cost (Figure 1).

Other questions were placed in the questionnaire about topics that concerned stormwater runoff quality more directly, such as number of discharge points and whether the respondent had a stormwater pollution prevention plan in place. The respondents were not asked to distinguish between a formal, legally submitted document or some other type of plan. Volumes of fuels, lubricants and solvents were requested to give regulators a better idea of the quantities of these chemicals that typically occur on the yards. Respondents were also asked if they had an impoundment or containment area around exposed tanks. Although these last two questions were open to interpretation (as is any question), it was anticipated that they would give some sort of concept about the extent to which the industry has already gone to assure that such chemicals are prevented from entering runoff water.

A question about where the runoff water goes immediately (ditch, absorbed in ground, holding pond or body of water) was included as a preliminary to give the project investigators a starting point in formulating methods of improving runoff water quality. Likewise, respondents were asked if they have a log sprinkler system. The effect of sprinkler systems on water quality was unknown. Since sprinkler systems use recirculated water, it was anticipated that dissolved solids might be objectionably high. Also, since water being sprinkled through the air is obviously in contact with oxygen, it was anticipated that oxygen demand parameters might be substantially different from that in normal runoff water.

All of these questions were brief and could have been expanded to extract more information. However, the authors deliberately limited the questionnaire to one page in an effort to encourage participation. Experience in other LFPL projects by the authors indicated that multiple-page questionnaires get extremely low response rates.

Before mailing, the questionnaire was reviewed by several individuals familiar with log yards, including a forestry extension service specialist, an industry official and an executive officer of the Louisiana Forestry Association. Interested individuals in the Louisiana Department of Environmental Quality also reviewed the form to verify that this was the type of information that they would like to know. No test questionnaires were sent out because the population was so small that it would have taken nearly the entire population to conduct an adequate test.

Each questionnaire was accompanied by a letter explaining the purpose of the project. The questionnaires were mailed on May 15, 1995.

Response

Of the 97 questionnaires mailed, 36 were completed and returned, and an additional 13 were returned as invalid (out of business, do not process logs, etc.). Several respondents duplicated the questionnaire and completed one for each log yard they operated. Of the 36 valid responses, about 20 were returned immediately. The remainder were obtained after prompting the respondents with telephone calls or personal visits.

The authors considered soliciting more firms to participate in the survey, but the respondents were reasonably representative of the industry. Any substantial improvement in the response rate appeared unlikely and would have required a much greater effort than was already expended. It also appeared likely that the sample would become biased toward large companies if more responses were actively solicited.

To validate whether the respondents were representative of the population, the respondents were compared to the non-respondents by descriptors such as size of closely associated operations, types of operations and species handled. A more comprehensive search of essentially the same records from which the mailing list was compiled revealed 129 companies in Louisiana that most likely had log yards. Sawmills, chip mills and pole peeler mills were under-represented by about 15%. Sawmills comprise about 56% of the population. Plywood and sawmill/panel mill complexes were over-represented by about 60%. Pulp mills were over-represented by about 30%.

The number of yards handling pine were over-represented while yards handling hardwood were slightly under-represented. The number of yards handling both species were closely representative. On 25% of the non-respondent yards, this information was unknown.

Respondents and non-respondents were compared on the basis of their associated mills' annual production, production capacity and number of employees. This information was obtained from published literature and, in a few cases, personal knowledge. F-tests for sample variances were all favorable at the alpha = 0.05 level. Of these, the annual production numbers are probably the best indicators because that information is the most complete (84% complete for respondents and 48% complete for non-respondents). Of the mills with incomplete data, there still appears to be good representation of small, medium and large volume operations.

The major flaw with using F-tests is that the sample and population were not normally distributed. There existed lots of both small and large mills, but relatively few medium mills. However, since the distribution was skewed only slightly toward the smaller mills, the F-test still had some validity.

The Kruskal-Wallis rank test is a better statistical test for variance comparison of non-normal distributions. This test was also favorable at the alpha = 0.05 level for annual production, shift production capacity and number of employees.

Results

Use of yards

One yard (3%) was not in use. Fifty-six percent of the yards were used for both storage and handling of logs (Figure 2). Twenty-five percent of the yards were used for storage only, while 19% were used only for processing (no appreciable storage of logs).

An alternative way to define whether a yard is designed for log storage is by looking for a sprinkler system. It is commonly known that, without any kind of treatment, pine logs in the Gulf Coast area stay in good condition for about 2 weeks after felling in the summer and up to 2 months in winter. Hardwood logs last about twice as long. Longer storage requires a water sprinkler system. Seventy-two percent of the yards had a sprinkler system, compared to the 81% who reported their yards to be used for storage or storage/handling.

Ground-related features

The log yards were most commonly located on clay soil (36%), followed by sandy soil (25%), silty soil (22%) and sandy clay (11%) (Figure 3). One yard reported a silt-clay, and one very small yard (0.4 hectare or 1 acre) was all concrete.

The average log yard size was 7.1 hectares (17.6 ac.) and ranged from 0.2 ha. to 46.5 ha. (½ to 115 ac.; standard deviation = 8.7 ha.) (Figure 4). Forty-seven percent of the yards had a paved portion. Area paved averaged 0.45 ha. (1.1 ac.) and ranged from 0.04 to 3.2 ha. (0.1 to 8 ac.).

The Logs

Forty-seven percent of the yards handled only pine, while another 14% handled over 90% pine. Twenty-five percent of the yards handled only hardwood logs, one yard handled 90% hardwood, and 8% handled 55% to 70% hardwood.

Sixty-four percent of the yards handled longwood logs (generally 6 to 18 meters, or 20 to 55 feet long). Sixty-one percent of the yards handled cut-to-length logs (generally in multiples of 8 feet plus trim), and 17% handled wood chips (Figure 5). None of the surveyed yards handled shortwood (logs less than 8 feet long).

Total capacity of the yards averaged 42,000 metric tonnes (46,600 U.S. tons, or about 1,600 truck loads) and ranged from 363 tonnes (14 truck loads) to 209,000 tonnes (8,000 truck loads). A typical low inventory was about a quarter of the yard's capacity. In the southern states actual inventory levels are weather-dependent, with the lowest inventory levels usually occurring in late winter, when logging conditions have been difficult for a while. Any yard may dip to zero inventory level occasionally. Nevertheless, 25% of the yards reported a typical low inventory of zero, indicating that it was not uncommon for them to run out of logs.

Fifty-three percent of the yards reported typical maximum inventories to be at capacity. This typically happens in the late summer and fall of the year, when logging conditions normally are favorable. Eleven percent of the yards reported typical maximum inventories to be far less than capacity.

Stormwater runoff

Seventy-two percent of the yards reported having a stormwater pollution prevention plan in place.

Sixty-one percent of the yards reported storing fuels, lubricants or solvents on the yard (Table 1). Seventy-two percent of the respondents had an impoundment or containment area immediately around exposed fuels, lubricants and solvents. Several yards did not report volumes of fuel storage, etc., yet they reported having containment areas. Since these yards were associated with mill sites, it is possible that they were describing fueling locations away from the log yard itself. One yard reported underground fuel storage with test wells to monitor any possible seepage into the groundwater.

Respondents were asked where the stormwater runoff goes immediately and given four possible responses (Figure 1). Although the respondents were asked to check only one answer, multiple answers were received anyway because stormwater often leaves a yard in multiple directions. The response rates are shown in Table 2.

On 64% of the yards, the stormwater gathered into discharge points before leaving the site. One yard reported sheet discharge in addition to 2 discharge points. The average was 2.4 discharge points per yard (Range = 1 to 5).

Summary

While most yards featured both storage and handling of logs, 25% of the yards were used exclusively for storage. Almost three-quarters of the yards utilized sprinkler systems for long-term storage. Log yards were found on virtually all soil types.

Yard size averaged 7 hectares (18 ac.). One-half of the yards had a 0.4 ha. (1 ac.) paved portion. Sixty-one percent of the yards handled almost exclusively pine species. The rest handled mixed hardwood species and some pine. Seventeen percent of the yards handled or stored wood chips. Virtually none of the yards handled shortwood.

Almost three-quarters of the yards had a stormwater pollution prevention plan in place. About two-thirds of the yards stored an average of 10,882 liters of fuel, 2,051 liters of lubricants and/or 85 liters of solvents (3,000 g. fuel, 564 g. lubr., & 23 g. solv.).

Two-thirds of the yards had their stormwater runoff gather into 1 to 5 discharge points before leaving the site. Over one-half had the water enter into a ditch.

Discussion

The authors know from conversations that at least three of the respondents who reported having a stormwater pollution prevention plan in place have yards that recirculate all of the runoff and have never been known to overflow. The yard personnel attributed this to high evaporation rates from sprinkler systems. Some yards add water to their sprinkler systems constantly. Since the stormwater never leaves the premises, it is unlikely that they need or have stormwater permits.

Some two-thirds to three-quarters of the log yards in the state have given serious thought to stormwater pollution prevention. Still, the solution to the problem may not be simple in all cases because some yards do not have enough adjacent property to gather

the stormwater and treat it before it leaves the premises. Keeping a yard clean of debris may or may not make a difference in parameters such as oxygen demand but may give rise to questions about soil erosion.

Ditches with vegetation and holding ponds are reputed to be effective treatments for organic matter pollution problems (1, 3, 18, 24, 25). Since a substantial portion of the yards already utilize ditches or recirculating ponds, there should be some opportunities to test some of these facilities for their effectiveness in reducing stormwater pollution parameters. Since some yards have installed screens to prevent bark from washing off with the stormwater, their effectiveness would be relatively easy to assess.

Since a substantial number of yards store fuels and lubricants on site, oil and grease can be a problem on those yards. Since solvent volumes are very small (and typically stored in a building or lockable shed), it does not appear that solvents on log yards cause a significant pollution problem.

It must be remembered that most log yards are located on the same grounds as the mill with which they are associated. Items such as fueling sites and stormwater runoff are commonly shared by both mill and yard. Therefore, it was difficult for some respondents to report these items such as fuel volumes or discharge sites with respect to log yards only.

Most of the log yards in Louisiana have an active handling component. Thus, it would be logical to concentrate on these types of yards for initial stormwater studies. On these yards, the machinery constantly grinds the bark into smaller particles, which may be good for accelerating decomposition. However, this effect on pollutant parameter levels in the runoff water is unknown. These yards generally produce stormwater runoff every time it rains, so any effect they have on the water may be important.

Most of the log storage yards have sprinkler systems, which may give possible pollutants, such as dissolved solids, an opportunity to concentrate in the recirculation ponds. Stormwater runoff is seldom expected from yards under sprinklers, except in cases of extreme rainfall. The effect of overflowing ponds in those cases would be mitigated to some extent by the diluting effect of extreme rainfall. Also, the sprinkling effect of the water introduces oxygen into the system, possibly improving water quality that might otherwise have a low oxygen content. Analysis of water from these systems may be interesting from the standpoint of buildup of heavy metals and priority pollutants.

Conclusions

Most of the log handling/storage facilities are located on sites with milling facilities. There are virtually no shortwood yards left in Louisiana. Inventory levels are likely to range anywhere between zero and yard capacity over a year's time.

The managers of many yards have devised stormwater pollution prevention plans, indicating that they have either addressed the issue through stormwater permit applications, voluntarily taken measures to reduce runoff pollutants, or eliminated virtually any possibility of stormwater runoff from the sites.

Most of the stormwater runoff discharges into a ditch, which, if vegetated and long enough, is believed to be an excellent treatment for the type of pollutants expected in

this type of water. More needs to be known about how the sizes and features of ditches affect log yard stormwater quality. Meanwhile, priority attention should be given to developing and testing methodologies for yards that have runoff flow directly into a body of water or do not have enough land for a long ditch.

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Table 1. — *Volumes of fuel, lubricants and solvents stored at log yards.*

Material	Average Volume liters (gallons)	Range	
		Low	High
Fuel	6,637 (1,825)*	727 (200)	18,184 (5,000)
Lubricants	2,051 (564)	36 (10)	10,547 (2,900)
Solvent	85 (23)	18 (5)	200 (55)

*One yard reported 87,285 l. (24,000 g.); not included in this average.

Table 2. — *Response rates to the question, Where does the stormwater runoff go immediately?*

Ditch	58%
Absorbed into ground	25%
Holding pond	39%
Body of water	3%.

Please Copy and Submit a Separate Form for Each Logyard

Company Name:_____

Mailing Address:_____ Location of remote logyard/log processing facility:_____

_____ Parish:_____

_____

Type of facility (check all that apply):

☐ storage ☐ log processing ☐ combination of both ☐ other_____

acres in logyard/facility:_____ % paved:_____

Predominant surface soil type at logyard: ☐ Sand ☐ Silt ☐ Clay

Types of wood handled (check all that apply):

☐ longwood ☐ cut-to-length logs ☐ shortwood ☐chips

Total capacity (in tonnage or cord volume) of the logyard/facility:_____

What is your typical low (eg., May) inventory level? _____ units (tons etc)_____

What is your typical peak (eg., December) inventory level? _____ units (tons etc)_____

Species Handled: Percent Pine: _____% Percent hardwoods: _____%. Please Check:

☐ Pine	☐ Beech	☐ Sycamore	☐ Hickory	☐ Honey Locust	☐ Cottonwood
☐ Cypress	☐ Hackberry	☐ Maple	☐ Willow	☐ Black Locust	☐ Yellow-Poplar
☐ Red Cedar	☐ Cherry	☐ Walnut	☐ Sassafras	☐ Osage Orange	☐ Bkgum-Tupelo
☐ Oak	☐ Sweetgum	☐ Pecan	☐ Persimmon	☐ Other_____	

Do you have a stormwater pollution prevention plan in place? ☐ Yes ☐ No

What volumes (capacities, in gallons), are stored at the logyard?

Fuels _____ Lubricants _____ Solvents _____

Do you have an impoundment or containment area immediately around exposed fuel tanks, lubricants and solvents? ☐ Yes ☐ No

Where does the stormwater runoff go immediately (check one)?

☐ Ditch ☐ Absorbed into the ground ☐ Holding pond ☐ Body of Water

Does the runoff water collect into discharge points before it leaves the site? ☐ Yes ☐ No

If so, the number of stormwater runoff discharge points:_____

Do you have a log sprinkler system? ☐ Yes ☐ No

Whom may we contact if we have further questions? Name:_____ Tel:(___)_____

Figure 1. Questionnaire sent to primary forest products industry.

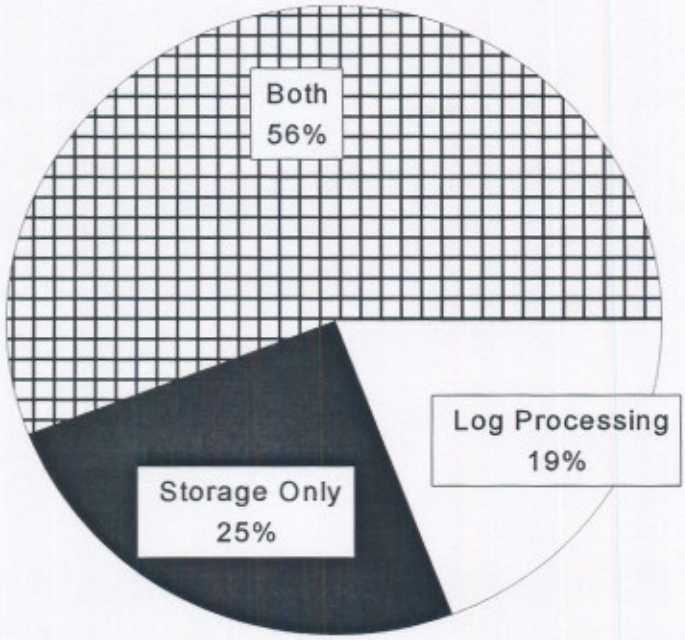

Figure 2. Type of log yard facility.

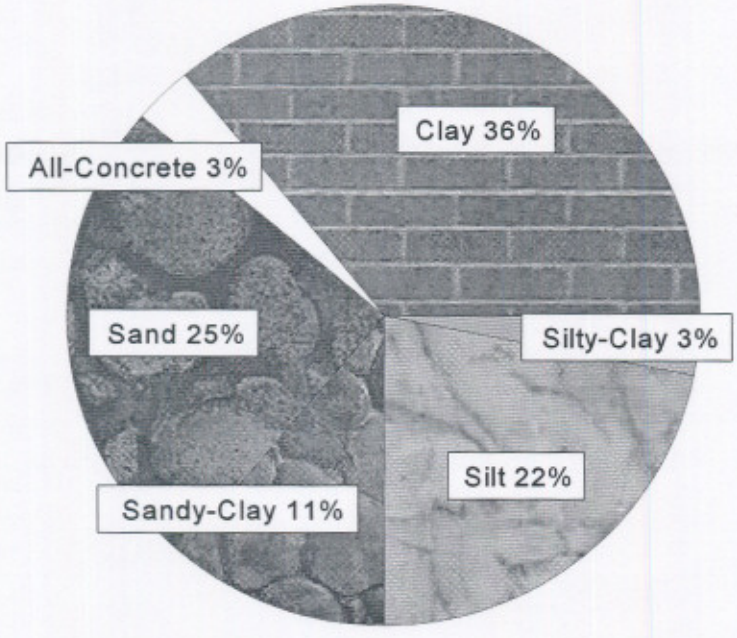

Figure 3. Type of soil on which log yards are located.

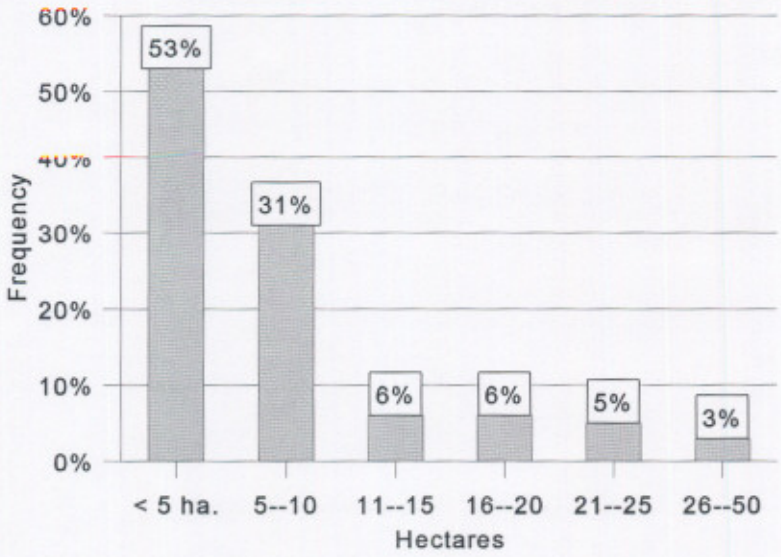

Figure 4. Size of log yards in Louisiana.

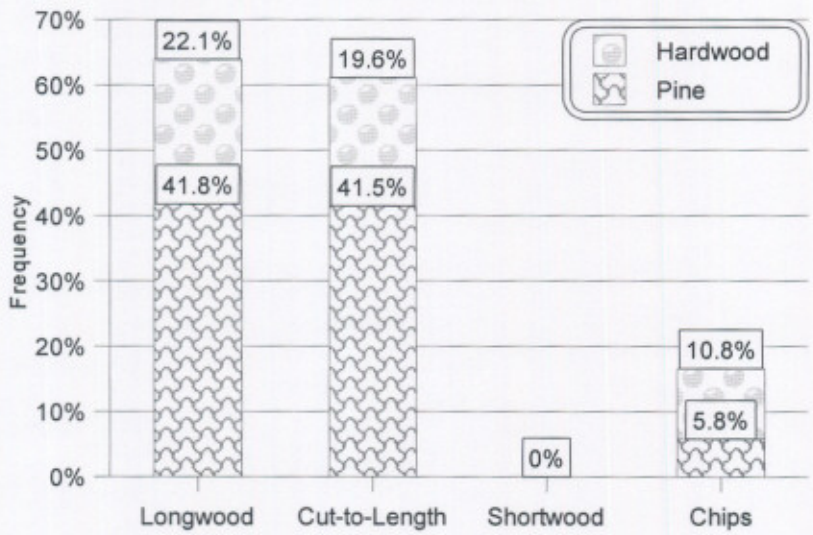

Figure 5. Type of logs held on yards. For example, 41.8% of the yards carried pine longwood logs. Totals are more than 100% because many yards carry more than one type of log.

Practicalities & Possibilities Statement:

There is a concern among environmental regulators that log handling and storage facilities may be creating pollution problems. If sensible regulations are to be formulated, a basic understanding of the facilities would be helpful. "An Overview of Log Yards in Louisiana" is a scientifically-based description of log handling and storage facilities with a slant toward stormwater runoff. While the description is limited to yards in Louisiana, other states in the southern pine region of the USA could expect to have similar profiles.