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DEPARTMENT OF AGRICULTURAL ECONOMICS

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STUDENT WRITING EXAMPLES

FROM

AGRICULTURAL ECONOMICS 431
CASES IN AGRIBUSINESS FINANCIAL MANAGEMENT

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THE MAN WHO WRITES ABOUT HIMSELF AND HIS
OWN TIME IS THE MAN WHO WRITES ABOUT ALL
PEOPLE AND ALL TIME.

GEORGE BERNARD SHAW



A WORD FROM THE EDITOR

With each academic year, the classrooms of Texas A&M are graced with a new batch of fresh students. As educators, it is always an exciting prospect to watch as innovative ideas emerge from engaging class discussions, a student's quiet contemplation, or even in the critical challenging of the current educational canon. Sometimes these wonderful intellectual insights find their way into writing assignments. When this happens, these papers are not only educational, but inspirational, and deserve special recognition. It is in this spirit of esteem that we present to you these examples of student writing, from the Department of Agricultural Economics, which reflect the high academic standard that we at Texas A&M strive to exemplify.



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TABLE OF CONTENTS

Letter from the Editorv

From AGECE 431:
SYSCO by Blake Barger..... 3
Deere and Company by April Bonds..... 5
Parmalat by Kalynn Hodde..... 8
Parmalat by Stephen Mikolajczak.....10
YUM! Brands by Devin Watkins.....12

From AGECE 344:
Protecting Today’s Children to Become Tomorrow’s
Farmers by Matthew Britten 14
War of the Range by Stanley Otto Haferkemp24
Environmental Conflict in a Small Community:
Dairying in North Bosque, Texas
by Alexandra Lee32
Zoo Laws the Improve the Quality of Life for
Elephants by Danya Lewis42



BLAKE BARGER SYSCO

Sysco is a company that has catered to almost everybody; however, the majority of people are unaware that they are actually eating products produced by Sysco. Sysco is the market leader in the food retail industry, and they are always exploring new ways to increase their share of the market. One way to do this is by installing state-of-the-art data base called Business Intelligence (BI) from Business Objects. After the presentation from Business Objects, I am convinced that the best package for Sysco would be the “Volume Discount” option. Because Sysco has held a relationship with Business Objects since 1995, I feel that the rapport between the two companies is strong enough for Sysco to trust in the BI software. After analyzing the appropriate data, Sysco can expect a 4% increase in sales in the first year alone.

First, in order to make this recommendation, I was forced to evaluate Sysco’s financial data. Sysco’s current ratio, which measures liquidity, is a solid 1.36, up 18% from last year’s figure of 1.16. Sysco’s ability to meet their short-term financial obligations is very stable. In asset management, Sysco’s asset turnover decreased .92% from 3.66 times by to 3.6286 times; regardless of the trend, Sysco is still turning their assets over 20% more than the industry average. In terms of debt management, Sysco’s debt-to-asset ratio is 66%, down 1% from 2004’s figure of 65%. This debt ratio is relatively conservative, and shows that Sysco finances projects without going into debt. Another great stat is

Sysco's price to earnings ratio. At 24.44 times, a 16% increase from last year's figure, it also sits 11% above the industry average and shows that Sysco's investors are optimistic in potential growth. Finally, Sysco's profit margin dropped 17% from 3.175% in 2005 to 2.62%. Although they are still above the industry average, a 17% decrease is unacceptable. However, with the new technology, we can expect to see an increase.

The reason I believe that the "Volume Discount" option is the best is because with a company as large as Sysco, it will only have been a matter of time before more licenses would have been required. This option allows more people to access the data base which means more people will have an insight as to how the company is developing. The other options available are enticing, however, if a company as big as Sysco is going to invest this large of an amount of money, they might as well go all out. With the addition of consumer intelligence software as advanced as the BI software, Sysco will further distance themselves from the competitors, and as a result, increase income and their market share.

To successfully boost their sales by 4%, Sysco, luckily enough, does not have to raise any additional capital. After performing a proforma, the additional funds needed calculated was -\$370,074,000. Therefore, if Sysco can implement the new BI software, their financial data will also improve. After the 4% increase in sales, Sysco's current ratio will increase by .71% to 1.37; further increasing their ability to meet their short term debt obligations. As expected, Sysco's profit margin will also increase. With the 4% increase in sales, their profit margin is expected to increase by .02% to 2.63%. While it is not a drastic change, it is positive for the company, and it begins that upward trend. The debt to asset ratio actually drops by 2.2% to 65% after the 4% increase. This reduction is not big enough to garner any concern; Sysco is still in good standing regarding their debt management. Lastly, our asset turnover ratio does not change at all. Again, this is fine; Sysco is far superior at turning over their inventory compared to the industry average. Sysco has had a great career in the retail grocery sector. With the new BI software from Business Objects, they can continue their dominance and increase their sales, resulting in more people enjoying Sysco's products.



APRIL BONDS DEERE AND COMPANY

As you are well aware, high gas and diesel prices are limiting the operating income of our clients. We have responded with researching and developing tractors that can operate using biodiesel and have been offering farming tractors that use a mixture of biodiesel since 2001. Older John Deere tractor models absolutely cannot operate from biodiesel because of the nature of the fuel delivery system and the fuel rail. These tractors account for approximately 75% of tractors being operated today. Our R&D staff has developed a system to offset the fuel rail so that these tractors can use a mixture of biodiesel. Therefore, I believe that we should begin investing in facilities to begin manufacturing these fuel installations.

	2005	2004	2003	2002	% change
Liquidity					
Current Ratio	2.23	2.77	2.63	2.36	-5.6%
Quick Ratio	2.05	2.52	2.46	2.19	-6.3%
Inventory Turnover	7.10	6.79	7.87	6.99	1.6%
Asset Management Fixed Asset Turnover	2.61	2.56	2.40	2.21	18.0%
Total Asset Turnover	0.58	0.61	0.51	0.49	17.1%
Profitability					
Profit Margin	7.5%	8.0%	4.8%	2.7%	173.4%
ROA	4.3%	4.9%	2.4%	1.3%	220.3%
ROE	21.1%	22.0%	16.1%	10.1%	109.3%

Deere and Co. has operating strengths that have positioned us well financially. We are strong in the areas of profitability with a profit margin that has increased 173.4% in the past four years. Our return on assets (220.3%) and return on equity (109.3%) have increased drastically as well. We are also doing well managing our assets with a total asset turnover ratio of 0.58 and fixed asset turnover ratio of 2.61. Both of these indicators have also increased over the past four years. We are very liquid with a current ratio and quick ratio of 2.23 and 2.05 respectively. Although liquidity rates have decreased over the past four years, we are well above normal ranges.

	2005	2004	2003	2002	% change
Debt Management					
Debt Ratio	69.8%	66.0%	69.6%	70.6%	-1.0%
TIE	2.83	3.57	1.55	0.95	199.5%
Market Value					
P/E Ratio	9.9933	10.482	21.422	~	-53.3%

We have areas that will need improvement however. Our market value has decreased, indicated by a 53.3% reduction in price to earnings ratio. Our debt ratio is also extremely high at 69.8%. It has been decreasing over the past four years but still needs to be reduced further.

By investing in a manufacturing facility for \$2 million, I believe we can expect a net present value of future cash flows of \$7.1 million. Therefore, I believe that we should go forward with this plan. This will further strengthen our profitability and asset management but will not address the management of debt. This project would be financed through a small amount of debt and through the incoming cash flows of year 1 and 2, keeping the debt ratio in the 70% area. However, this could increase our market value slightly, which would be pleasing to our investors.



KALYNN HODDE PARMALAT S.P.A

Parmalat is a company that has been through the largest ups and downs a company can face. Now in the wake of the aftermath of one of the largest accounting frauds in business history, Parmalat is a company that is looking to turn things back around in the right way. I suggest that Parmalat follow its instincts and get back to its roots. I think that by refocusing their efforts on the Italian customers who launched Parmalat into such a successful company in the first place, Parmalat will see great rewards in the form of revenues. By dropping the international efforts that are not performing well, such as South America, and increasing its efforts in Italy by directing its products towards the original milk and fruit juice products, I think Parmalat could potentially see a 20 percent increase in sales in the next year. This, however, will be a pretty hefty task for the company. Based on the pro forma model, the total forecasted additional funds needed will be over €3.4 million, which will be financed using 50 percent notes payable and 50 percent long-term debt. I will show how Parmalat has fared in the past, and how this 20 percent sales increase will affect the company.

Parmalat's liquidity is one of the highlights for the company. In 2004, the company's current ratio was 1.017, and then jumped to 2.004 in 2005. This is a very promising 97 percent increase. According to these numbers, Parmalat is a very liquid company that is successfully increasing its current assets more than its current liabilities.

Parmalat is currently also fairing pretty well in terms of its asset

management. The inventory turnover was 4.981 times in 2005, but was not able to be calculated for 2004 because there were no inventories or cost of sales for that year. I believe that this is a promising financial area for the company. This shows that Parmalat rebounded well after returning to the market and was able to have a decent turnover.

Debt management is yet another area in which Parmalat has recently seen success. The debt to asset ratio compares a company's debts to its total assets. In 2004, their debt to asset ratio was an abysmal 98.3 percent, but this dropped by 83.5 percent to just 16.2 percent in 2005. This is an amazing decrease for the company, and is also a shining financial area.

I was not able to calculate an area of market value for the company because I could not locate data from either 2004 or 2005 in terms of stock price. However, I was able to look at Parmalat's profitability which is definitely one area where the company is struggling. The profit margin could not be calculated for 2004 because there were no total revenues that year. And in 2005, Parmalat's profit margin was very low at -11.56 percent. If Parmalat is looking to once again become a strong company, they will need to improve their return on sales dramatically.

Looking ahead, Parmalat has a long road to recovery in the milk industry. However, I believe that by returning to the products and customers that made them successful, Parmalat could again be a strong and successful company. Even with a 20 percent increase in sales, I expect Parmalat to still struggle a little in terms of profit margin. Their profit margin is anticipated to increase to -13.66 percent, which is an 18 percent increase. It will take time for this particular area to turn around. And after an amazing turn around, Parmalat's debt to asset ratio is expected to jump back up to 75.2 percent. However, the company will still be strong in terms of both asset management and liquidity. Parmalat's inventory turnover is expected to increase substantially to 8.215 times, which is a 65 percent increase. And the current ratio will decrease slightly, but still remain strong at 1.462.



STEPHEN MIKOLAJCZAK

PARMALAT S.P.A

Parmalat, founded in Italy in 1961, exploded from a local ham business to a global business with over 139 business units in 30 countries. In 1966, Parmalat invented UHT, ultra high temperature, milk. UHT milk has a shelf life of six months and an innovative Tetra Pak packaging. This results in the innovative concept of “milk in a box.” Parmalat can now charge a premium for a product which was previously a commodity. After bad accounting and poor decisions by upper management the business went bankrupt. However; it is now properly in the path to return to the global powerhouse it was only a few years before.

After reading *Parmalat SpA: An Impressive Milking System*, I have come to the conclusion that a new advertising and marketing campaign focusing on their other milk products will result in a five percent increase in sales for 2006. To support a five percent increase in sales, Parmalat will require 396.5 million euro. This will generate 1.37 million euro in net income. The result will show an increase of 30.7 million euro, a 105 percent increase. A large part of this increase in net income is because costs in 2005 are not present in 2006. This is because the cost of bankruptcy from a problem in 2005, and is not a factor in 2006.

For the calendar year 2005, Parmalat was doing well with regards to liquidity. Their current ratio was 2.00. In 2004 their current ratio was 1.02, showing an increase of 97.04 percent. The current ratio increased from 2004 to 2006. This shows they had more current assets of 801.9 million euro to their current liabilities, 400.1 million euro. Being a very liquid company, they can afford to pay off their debt with their excess current assets. If their sales increased by five percent, the

new current ratio is forecasted to be 1.56, a decrease of 29 percent. This reduction of liquidity is possible because some of their assets were sold due to bankruptcy in 2005. The projection is worse because they have sold the assets not required for further growth.

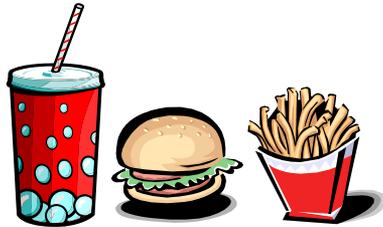
With regard to asset management, Parmalat is not doing well. In 2005 their inventory turnover ratio was 4.98 times per year. Fortunately, Parmalat is up from zero times per year in 2004. Parmalat had no sales or inventory in 2004, therefore resulting in no inventory turnover ratio. An increasing inventory turnover is possible because it shows Parmalat is selling product. My proposal will not affect the inventory turnover ratio because cost of goods sold and inventory will increase by an equal percentage.

Parmalat is also doing well with debt management. In 2005 the debt to asset ratio was 16.18 percent. This ratio decreased from 2004 when the debt to asset ratio was 98.33 percent. This difference is a negative 83.54 percent; meaning in 2005 Parmalat erased their debt from their books through bankruptcy. The projected ratio will increase by 6.6 percent to 17.32 percent because Parmalat will acquire more debt gaining an increase of five percent in sales.

In 2005 Parmalat decreased their profitability by 470.2 percent. Their return on assets was negative 1.17 percent in 2005. This is a decrease from .20 percent in 2004. The assets they have result in a less percentage of profit because the enormous cost of bankruptcy. Decreasing profitability is a concern for Parmalat. Fortunately, the projected return on assets will increase to .06 percent. This is a positive 105 percent. While profitability is still a concern, it is improving.

Another concerning sign is Parmalat's market value. Parmalat had a price to earnings ratio of negative 6.97 times in 2005. Price to earnings is better than 2004 when the ratio was negative 15844.16 times. Parmalat increased their price to earnings ratio by 99.96 percent. The drastic increase in price to earnings is a result of the earnings per share increase. Parmalat's price to earnings ratio will increase with my proposal to 148.71 times due to their net income per share increasing from negative .044 euro to a positive .0025 euro. As a result, the stockholders will begin to earn a positive return on their stock because the net income per share increased by 104.66 percent.

After looking at the case study on Parmalat, I believe the best point of attack is a new marketing and advertising campaign focusing on profitable milk products. Overall Parmalat is not doing well because of accounting and managerial mistakes. They need to focus on the strong aspects of their company. My proposal will direct Parmalat to the correct change.



DEVIN WATKINS

YUM! BRANDS

I believe Yum! Brands should expand deeper into the hamburger industry by buying out Wendy's International. This buyout will open many doors for Yum! Brands and will allow us to grow our business and remain a key competitor in the restaurant industry. Wendy's International is the third-largest hamburger chain, and due to the recent stress placed on their business caused by their rapid overseas expansion plan, this is a tremendous opportunity that we must capitalize on. By adding a well-known brand to our line-up, we will be able to effectively reach many more consumers with our products. This acquisition would also allow us to multi-brand more effectively. A well known hamburger brand would go well with most of our other brands, and some may have the potential to be fairly compatible in terms of auxiliary equipment. However, if this opportunity were to be acted upon, we must not act hastily and put any of our other brands in jeopardy. This acquisition should be carefully planned and executed so that we do not undo any of the progress we have made in growing our brands.

In the last couple of years, our company has revealed several weaknesses and several strengths in the area of financial management. I will expound on this using five key areas: asset management, profitability, liquidity, debt management, and market value. A surprising weakness of our firm is in the area of asset management. Our inventory turnover ratio dropped 35% from 94.6x (times per year) in 2003, to only 61.2x in 2004. This should cause reason for concern because of asset management's impact on profits. However, from the standpoint of profitability, our profit margin increased by 12% from 7% in 2003 to 8%

in 2004. This is also well above the industry average of 6.4%. Liquidity, on the other hand, causes reason for slight concern. Our current ratio dropped by 2% from 0.55x in 2003 to .54x in 2004.

Market Value is an important valuation of our firm to our stockholders and we delivered. Our price to earnings ratio grew 13% from 16.4x in 2003 to 18.6x in 2004. This comes close to comparing to the industry average of 19.5x and makes our company look very good comparatively. Also, in the area of debt management, our debt to equity ratio dropped by 36% from 4.02x in 2003 to 2.57x in 2004. This shows a drop in our outstanding debt and results in better financial leverage for our firm. However, the industry average in this area is only 0.8x; this shows that we have a long way to improve to be truly competitive.

On the whole, our company shows to be moving in the right direction. Most of our financials, while not the best in the industry, are moving closer and closer to industry averages. By acquiring Wendy's International, I believe that many positive changes will occur. For example, our inventory turnover ratio has decreased dramatically in the last year and Wendy's is significantly higher than ours. Perhaps we can learn how to be more efficient in that area and work to getting this ratio back up where it needs to be. By adding such a strong brand to our company, investors should be impressed further by our lineup of brands and be more inclined to invest, therefore raising the valuation of our stock.

Although there will be many risks in acquiring another company, I believe that the strengths of this acquisition of Wendy's International will turn out to be beneficial to our company. By doing this, we will be able to grow our company, both in terms of customers reached and overall profitability, thereby making our company a major competitor in the restaurant industry.



MATTHEW BRITTEN

PROTECTING TODAY'S CHILDREN TO BECOME TOMORROW'S FARMERS

I. Introduction

Farming is widely viewed as a hazardous occupation for both adults and young people. Farms have also been considered a place where young people work and play as well as develop other interests in life. Generations of farmers have passed on their values, beliefs, and work ethics to the succeeding generations by sharing activities on the farm. Farming today is a technologically advanced activity that has contributed to high crop yields. Even though technology has contributed to high yields, it is at the same time creating an environment that has become very hazardous to children.

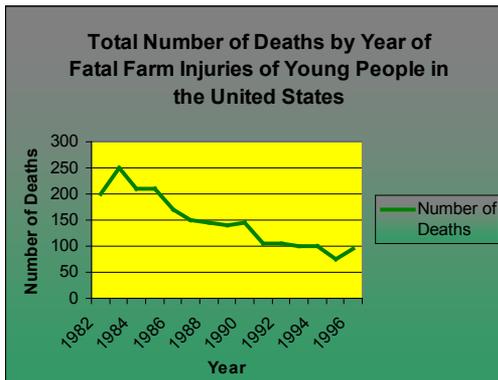
Agriculture is the second most dangerous occupation in the United States. Approximately 300 children and adolescents die every year from farm injuries, and 23,500 youth suffer from non-fatal trauma injuries.^{1c} The most common cause of fatal and non-fatal farm injury of youth is farm machinery. Tractor accidents accounted for one half of these machinery related deaths, followed by farm trailers, combine

harvesters, and forklifts.^{1c} Available statistics show that 10% of children with nonfatal injuries require hospitalization and one in thirty children, younger than age 5, with farm injury is hospitalized or dies.^{1d}

There is some evidence that farm injuries are slowly declining over time. Between 1982 and 1989, there were 181 individuals below age 20 who died from farm fatal injuries throughout the United States.^{1h} The number of deaths decreased to 103 annually between 1990 and 1996.^{1h} While the decrease in numbers is welcome news, the need to protect children suggests that the number of deaths be reduced to zero, so that all children can have a fulfilling and rewarding life.

II. Problem Statement

Despite the prevalence of farm injuries to children, there is little known about these injuries occurring and what legal measures are being taken to protect children of all ages. This paper has two main objectives. First, the paper examines how injuries occur and secondly discusses legal steps that are being taken to protect children.



III. Analysis

a. Nature and Sources of Farm Injuries

The most comprehensive source of statistical information on children farm injuries is the *Traumatic Injury Surveillance of Farmers Survey* (TISF) conducted in 1992 by the Agricultural Engineering and Department of Preventative Medicine, Ohio State University Extension. The discussion in this section of the paper is based on the data reported in the TISF. The 1992 Census of Agriculture reported 1.93 million farms in the United States. In 1991, there were 923,000 children under the age of 15 and 346,000 children, 15 to 19 years old, living on farms in the United States.^{1d} The TISF reported that of the 12,873 farm injuries among farm workers, ages 10 to 19 years old, 89.2% were males.^{1d} Farm injuries are the leading cause of death for children past the age of one. It has been estimated that 23,500 farm children are injured annually while playing or working on a farm.^{1g} Tractors and equipment are the major sources of these injuries with falls and encounters with animals being the second most common causes.^{1g} Figure 1 shows the percentage distribution of the various sources of injury to children based on the TISF.

Figure 1.

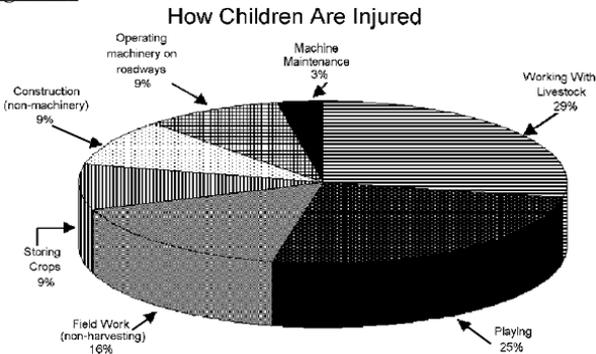


Figure 1. How children are injured (source: Carolyn S. Kern)

Children of all ages are susceptible to farm accidents. The following table and figure show the relationship between age, the average number of deaths per year and types of injuries suffered by children.

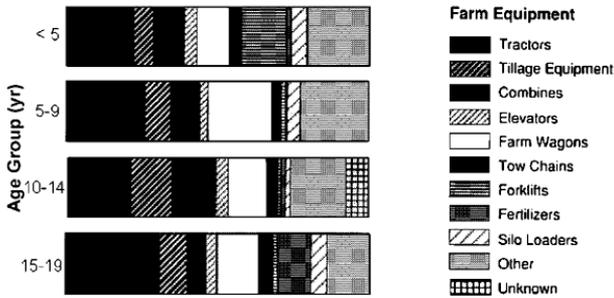


Figure 2. Proportion of childhood farm injuries in the United States, 1978-83

Table 1.

<u>Age</u>	<u>Average Number of Deaths/Year</u>
<5	51
5-9	48
10-14	75
15-19	111

<http://www.cdc.gov/nasd/docs/d000101-d000200/d000137/d000137.html>

The types of injuries toddlers and preschoolers face (under age 5) are falls from tractors, silos, ladders, and hay holes as well as being kicked or stepped on by animals and ingestion of chemicals.^{1g}

b. Law and Regulations for Protection of Children

i. Case Law Source of Protection

Children are protected against injuries under both the common law and State statutes. One principle that has been consistently used by courts to resolve tort actions involving children is the “Attractive Nuisance Doctrine” which implies if a landowner has a reasonable expectation that children will be “attracted to the premises by a dangerous, artificial condition on the land, trespassing children can be treated legally as an invitee.”² An invitee is a person on a farmer’s property for a purpose related to the occupants business. By according children the status of ‘invitees’, the Courts are placing the highest duty of care on landowners, to make their premises safe. There are very few defenses available to a landowner when a child is injured on their land. For example, the “Obvious Danger Rule” which applies to adults injured on property is not applicable to children. The rule states that if the danger on land is obvious, there is no liability to trespassers, invitees, or licensees.

Farm assets such as machinery and equipment can attract curious children to the premises.² Fortunately for landowners, natural conditions on land such as bodies of water are not considered to be attractive nuisances so that a child trespasser would be treated in the same token as adult trespassers by most courts. The duty owed to adult trespassers consists of no intentional or malicious injury to the trespasser. There is also the “allurement limitation” to the Attractive Nuisance Doctrine. This limitation states that the doctrine does not apply if the child is trespassing on the land before noticing the object on the property which results in harm to the child. In a 1922 Kansas court case, *United Zinc & Chemical Company v. Britt*, the United States Supreme Court ruled that the Attractive Nuisance Doctrine should not apply to children whose ages ranged between eight to eleven, and who died after jumping into an exposed cellular hole containing sulfuric acids.² The United States Supreme Court stated that the children were trespassing at the time the “pool” was discovered.⁴

In another Kansas case, *McGaughey v. Haines*, the plaintiff, a four year old and his stepbrother went on a neighbor’s, Haines’ land, and played on the 1955 Massey-Harris tractor which was connected to a bright, new, red colored disk. Both the tractor and the tandem disk were attractive to the four year old boy. Haines’ employee left the tractor

in gear along with the key still in the ignition the previous night. The stepbrother played with the ignition key and then started the tractor. The four-year old fell and the disk passed over his body. The trial court ruled that the plaintiff's permanent injuries were caused by Haines and his employee for carelessly and negligently leaving the farm equipment near the plaintiff's home, with the key in the ignition of the tractor; thus, creating an attractive scenario for small children.³ The court treated the children as invitees, and concluded that, "the landowner must make and keep the premises safe and must warn of existing dangers."²

While courts have been quite protective of children under the common law, they have not relieved parents and adults of the burden to be cautious when children are under their care as explained in the case of *Sherry v. Massey-Ferguson, Inc.* In this case, a child, Jason went to visit his grandfather, Charles Foote. Jason sat on his grandfather's lap while he was moving hay bales with a front-end-loader. "Foote placed Jason on the fender of the tractor in order to operate the controls better. Jason fell off and suffered major head injuries when the right front wheel of the loader hit a hole."⁵ The plaintiffs sued Massey-Ferguson, a tractor manufacturer, stating that the tractor was defective because it did not have passenger seating and adequate warning stating not to carry passengers. The Plaintiff's theory was that "a manufacturer has a duty to design its products to eliminate any unreasonable risk of foreseeable injury."⁶ This theory was countered by the rule that, there is no duty for a manufacturer to warn someone of a risk of which that person is already aware.⁷ The Court ruled that the plaintiffs did not establish a duty to warn of the danger, and therefore found the manufacturer not liable for any injury caused. These cases suggest that the common law alone may be inadequate in providing full protection of children against farm injuries.

ii. Federal and State Sources of Protection

There are a few governmental initiatives to reduce, and if possible, eliminate farm children injuries. "The National Institute for Occupational Safety and Health (NIOSH) is funding a new national center for research, training, and education to prevent child agricultural injuries in the United States."^{1a} NIOSH was funded by Congress in 1990 under Public Law 101-517. The National Farm Medicine Center in Marshfield, Wisconsin, was awarded funds through NIOSH to build a center for research and training focusing on ways of preventing agricultural injuries to young people. Under a Cooperative Agreement with the National Farm Medicine Center, NIOSH is funding the new National Children's Center for Agricultural Injury Prevention

\$600,000 per year for five years.^{1a} Through this cooperative agreement, the National Farm Medicine Center will allow for timely information about childhood farm injuries, organize groups which implement recommendations for protecting youth on farms, and facilitate educator involvement based on training interventions of the agricultural young people.

One major outcome of the initiatives by NIOSH was the Surgeon General's Conference on Agricultural Safety and Health held in Des Moines, Iowa, in April 1991.^{1b} One year later, in April 1992, a Childhood Agricultural Injury Prevention Session was held at the National Farm Medicine Center in Wisconsin. There, the National Committee for Childhood Agricultural Injury Prevention (NCCAIP) was created. Over several months, this committee which consisted of people ranging from farmers to researchers developed new recommendations to prevent agricultural injuries based on current injury data. In the mid 1990's, NIOSH implemented a National Childhood Agricultural Injury Initiative, the purpose of which was to "develop a better understanding of the sources of injuries, and to identify effective prevention strategies for all children exposed to agriculture production hazards."^{1b}

iii. Adult Responsibility

The *Sherry v. Massey-Ferguson, Inc.* case suggests that adults and those who care for children could play a major role in preventing farm tragedies. Some have suggested the possibility of incorporating child safety camps with tractor safety, animal safety, and first-aid safety.⁸ Some common farm safety practices include using seat belts while tractors are in operation, ensuring protective guards are kept in place on equipment, providing rollover protective structures, (ROPS), and being aware that methane gas, carbon dioxide, hydrogen sulfide, and ammonia are present in manure storages and unventilated grain silos.⁹ Parents and caregivers of children should practice the basic rule that 'if there is no seat, then there is no rider, know where children are before starting machinery, large animals are not around small children, and children should not play on silos.¹⁰

Researchers from Ohio State University have offered some specific suggestions for preventing farm injuries to children. For example, one may not have a child as an extra rider, keep ladders out of reach, store chemicals locked, and provide a fenced play area away from farming activities. For children of school age, (ages 6 to 11) their injuries occur through falls from barns, auger amputations and entanglements, tractor roll-overs and suffocation in grain. To prevent

these injuries, one should restrict play areas, evaluate the child's physical and mental maturity, have protective devices on equipment, namely Roll-Over-Protective Structures (ROPS) along with proper Power Take Off (PTO) shields, implement warning decals on equipment, and discuss farm dangers with the children. Upon the adolescent years (ages 12 to 16 years old), the types of injuries which occur are tractor roll-overs, amputations from PTO, motor vehicle accidents (MVA) with farm equipment on roadways, and suffocation in grain bins. To prevent these injuries from happening, adults should evaluate the child's mental level for a given task, install protective devices on equipment, allow children to complete safety courses for operating farm machinery, and be a good role model while discussing farm safety with children. Considering all youths, parents and grandparents should assess the level of alertness of children, so that fatigue will not cause an accident. More time spent evaluating children before assigning tasks may save their lives.

IV. Conclusion

The presence of children on farms where there is minimal or no supervision is directly related to farm-related fatalities. Adults should know a child's level of potential development in their growing years in order to incorporate safety procedures. During infant's stage from birth until two years of age, a dependent baby is very active and mobile while exploring the environment through taste and touch.^{1c} Due to rapid physical change, their mastery of skills is not complete; therefore, falls are common. In order to combat this problem, parents should be aware of what children are doing at all times. Preschoolers, ages 3 to 5 years old, love to climb, move toward water and interesting noises, and moving parts. Preschoolers often think "magically" instead of logically; therefore, they believe if they want to do something they can.^{1c} Early school age children, ages six to eight years old, have short attention spans and can easily be distracted. Children at this stage attempt tasks which may not be appropriate for their abilities. During the middle years, nine to eleven years old, children are striving to develop personal achievements.^{1c} These children exhibit logical thinking which is not consistent. Parents may think that taller children are more able to perform adult tasks, but this is not the case. In a youth's adolescence years, age twelve and older, teens are often clumsy and have lack of coordination. This age group may resist adult supervision because of self-experimentation. Adults need to be aware of each age group's ability in order to take precautionary measures.

The analysis shows that preventing farm injuries to children entails a collective effort between industry, caretakers, government, and the courts. It is the responsibility of industry to build equipment and machinery that takes child safety into account. Parents and caretakers bear a heavy responsibility to keep children out of dangerous situations and to make their premises safe for use by children as they explore their environment in the formative years. The efforts by industry and caretakers need to be supported by government in terms of providing funding for research and public education about farm injuries to children and ways to prevent such injuries. Finally, the courts must be vigilant and punish behavior that poses a threat to the safety of children, especially behavior that shows clear failure to exercise caution. Young children are our farmers of tomorrow; consequently, we must protect them from injuries today.

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WAR OF THE RANGE

STANLEY OTTO HAFERKAMP

Throughout history, livestock, including cows, horses, pigs, sheep, and goats were allowed to roam freely throughout the countryside. Livestock were only fenced out of areas where they were unwanted, such as cropland or family gardens. Although time has changed how livestock can roam, this practice of open range can still be found in sparsely populated regions.¹ In some regions such as Western states in America, fence-out laws are common. However, in the Midwestern states fence-in laws are applied which makes the livestock owners responsible for confining livestock to certain premises. Early fences were often made of any material that was accessible by livestock owners, which were normally wood or stone. If fields that were going to be used for cultivation practices had stones scattered throughout them, the stones were removed and stacked on the edges of the fields. After time, enough stone was accumulated to have adequate fencing. In areas where timber was readily available, the timber was split to make long or split rail fences.

These materials made fence building time and labor intensive. It was not until the Industrial Revolution that fence building would

¹"Rangeland". <http://en.wikipedia.org>. Dated Viewed: 17 November 2006.

change. The Industrial Revolution brought about the invention of barbed wire. It did not take long for barbed wire to become widely used for fence building. For the first time there was an answer to fence building that was economically feasible and practical for fencing livestock in open range. Along with the benefits that barbed wire brought, it also brought about new sets of challenges. With landowners already wanting to have complete control over tracts of land, barbed wire only contributed to range wars. These range wars were typically found in the American West states and divided ranchers and farmers over grazing rights. The conflicts opened the debate on the issue of who ought to bear the responsibility for providing adequate fence.²

II. Problem Statement and Objectives

The aim of this paper is to identify and analyze the circumstances under which a particular fence law would be applicable in an area or region of the United States. As the discussion will show, the determination of which fence laws should be applied to a particular region depends critically on the economic and social characteristics of the region. As the United States was being settled, the English common law that livestock should be enclosed was also established in the United States. However, as the country progressed, states with vast grazing areas implemented a fence-out rule.³ Upon the implementation of a fence-out rule in these areas, livestock owners or ranchers are allowed to let their livestock roam the land and not be held responsible for damages caused by the free roaming of livestock. The fence-out rule places the responsibility of keeping livestock out on the farmer and also the financial burden of building a fence. The fence law is efficient because it protects the animal producers and crop growers at least cost.

Texas implemented a fence-out law because there are more cattle producers; therefore, it provides the least cost approach for protecting both the farmer and the rancher. This fence-out rule was applied in most states for quite some time. As time has progressed back to old English common law, most areas reinstated the fence-in rule. With a fence-in rule, the farmer or property owner bears “the right to be free of the livestock of others; thus ranches are liable for damages their animals cause to neighboring property”.⁴ Both fence-in and fence out rules are Pareto optimal. Pareto optimal is a condition such that, “given

²“Agricultural Fencing”. <http://en.wikipedia.org>. Dated Viewed: 17 November 2006.

³Hart, J.F. “Colonial Land Use Law and Its Significance for Modern Takings Doctrine.” *Harvard Law Rev.* 109(1996): 1252-300

⁴Terence J. Centner and Ronald C. Griffin. “Externalities from Roaming Livestock: Explaining the Demise of the Open Range” *Journal of Agricultural and Resource Economics* 23 (July 1998): 71-84.

a set of alternative allocating and a set of individuals, a movement from one allocation to another that can make at least one individual better off, without making any other individual worse off".⁵

It must be noted that the Pareto criterion allows for changes, such that as conditions change the preferences to either fence-in or fence-out may change. For example, land that has been traditionally ranch land may change to non-ranch use. Altering from one rule to the other rule may lead to legal challenges by opposing parties.⁶

III. Discussion

When fence-in is applied, the rancher is expected to provide a fence that will retain his livestock from entering the neighbor's property. Upon entry of the livestock, the rancher maybe held liable under the fence-in rule for any damages caused by livestock. If damages incur, the neighbor can use the courts to enforce the rule. When fence-out is applied, the rancher is not expected to provide a fence that would contain their livestock. Instead of confining their livestock, they now have the right to let their livestock roam and attain free forage. Under fence-out rule, a property right is granted to the rancher that does not hold him accountable for any damages caused by the livestock unless the neighbor has built a fence.⁷ Economic theory is useful in explaining the relationship between fence rules, especially in deciding whether a fence-in or fence-out rule should be used and in which area to implement these rules.

a. *Economics of Fence Laws*

The discussion assumes that there is only one neighbor or farmer and only one rancher. The activities that the farmer and the rancher will engage in are decided based on the two "polar rules"⁸ of fence-in and fence-out. Depending on which rule applies, management decisions will be affected from the perspective of both the rancher and the farmer.

b. *Fence-Out*

Under fence-out, there are two important components that will influence the rancher's management decision. These two components are key to the profitability of the rancher. One component is based solely on the rancher's decision, free of any actions taken by the farmer. The

⁵ "Pareto". <http://en.wikipedia.org>. Dated Viewed: 17 November 2006.

⁶ Centner and Griffin, *op. cit* note 4.

⁷ "Rangeland". <http://en.wikipedia.org>. Dated Viewed: 17 November 2006.

⁸ Centner and Griffin, *op. cit.* Note 4.

rancher has to decide what the stocking rate should be for the ranch. The second component to measure profit for the rancher is intertwined with decisions made by the farmer. This second component will be a combination of three factors: (1) the weight gained by the livestock from the addition of forage attained off the ranch, (2) any costs that might be assessed to the rancher for damages to the farmer for livestock passing through sturdy fences built by the farmer, and (3) “any transaction costs incurred by the rancher as a consequence of the rancher’s interdependence on the farmer”⁸. Thus, profit can be determined by the ranch through analyzing stocking rates, evaluating how much of the farmer’s property is fenced off from livestock, and the intensity of farming by the farmer. As long as the rancher is driven by profit, the rancher will choose a stocking rate that is profitable. Thus, it is safe to assume that the rancher will select any stocking rate except zero.

Since the farmer has some expectation of the stocking rate, the farmer has a decision to make regarding the profit of the farm. The farmer has to decide whether to farm or not to farm. If the farmer decides to farm, what to farm has to be decided as well as which area should be fenced off to keep livestock from entering the crop area. The amount of management decisions for the farmer can become quite extensive. To keep the example simple, assume that the farmer has to make two decisions: (1) the intensity of farming, and (2) the amount of property perimeter to be fenced⁸. For clarification, these two components are simulated and their effects shown in Table 1.

Table 1.

Components	F's Gross Profit	F's Expense	R's Expense	R's Stocking Rate
F Builds Fence (HFI)	High	High	Average	Low
F Builds Fence (LFI)	Low	High	Average	Low
F Does Not Build Fence (HFI)	Low	Low	Low	High
F Does Not Build Fence (LFI)	Low	Low	Low	Moderate

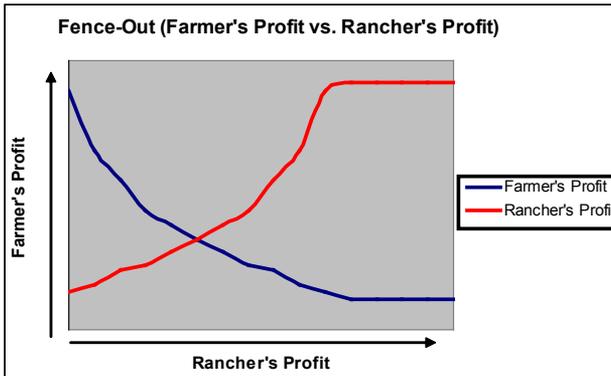
Ranking: Low, Average, Moderate, High
 HFI: High Farming Intensity

F: Farmer R: Rancher
 LFI: Low Farming Intensity

Additional cost must also be accounted for when analyzing the farmer's profit. First, the cost of the fence that the farmer will have to build should be estimated. This can be determined by using the unit cost (normally price per foot) and multiplying it by the length of fence. Second, there are three components that depend on the interdependencies of the livestock; (1) the value of the crop that could be lost from the livestock, (2) payments received by the farmer from the rancher for livestock passing through feasible fences, and (3) the farmer's costs for transactions due to the interdependence of the rancher. All of these components will be incorporated into the farmer's management and fencing decisions as well as the stocking rate that the rancher will select⁸.

Ultimately, the farmer's maximum profit level is determined by the amount of fence built by the farmer and the intensity of farming chosen by the farmer. Along with the decisions made by the farmer, the stocking rate chosen by the rancher also affects the profit level of the farmer. It is possible in the farmer's case that any farming at all could result in a negative profit due to the cost of the presence of livestock on the crops as well as high costs of building fence. Thus, the farming intensity would be zero under the fence-out rule. To summarize fence-out law the following chart (Figure 1), can be used to gain a basic understanding of the relationship between the farmer's profit and the rancher's profit.

Figure 1.



As cost of fencing and loss of crop goes up for the farmer, the profit of the farmer will decline to zero while the rancher's profit will increase. Once the farmer decides to no longer farm, the rancher's profit will level off.

b. *Fence-In*

To contrast fence-out, assume that fence-in is applied. When fence-in is applied, both the profit of the rancher and farmer change significantly. Foremost, let's determine how the ranch is affected by the fence-in rule. Management decisions on fence building as well as the cost now will burden the rancher. In addition to the change in fence obligations, transaction costs as well as interdependencies will also shift. The rancher will still be able to receive forage benefits from grazing from off-ranch properties but now, any damages incurred by livestock will be subtracted from the rancher's profit. Although transaction costs will be changed as well, it is difficult to determine whether this will increase or decrease profit due to the several facets or aspects associated with transaction costs⁸. For the farmer, now that fence-in is applied, the burden of the fence is no longer part of the profit. The farmer's profit will now include awards from the rancher for damages to the crop from livestock plus any change in transaction costs. Since the two rules complete flip-side of each other, the two will produce completely opposite profits for both the ranch and the farmer. The outcome of the fence-in rule is shown in Table 2 which is the opposite results from the outcomes reported in Table 1.

Table 2.

Components	F's Gross Profit	F's Expense	R's Expense
R Builds Fence (HSR)	Average	Average	High
R Builds Fence (LSR)	Average	Average	High
R Does Not Build Fence (HSR)	Average	Low	High
R Does Not Build Fence (LSR)	Average	Low	High

Ranking: Low, Average, Moderate, High F: Farmer R: Rancher
 HSR: High Stocking Rate LSR: Low Stocking Rate
 Note: R's expense stays high regardless of either fence cost or damage cost incurred by livestock.
 This also accounts for the farmer's profit remaining constant.

Conclusion

The two polar rules of fence-in and fence-out can be explained using the Pareto efficiency rule. The Pareto rule implies that no individual's position can be enhanced without at the same time harming another individual's position⁸. Under each rule, either the farmer or the rancher is privileged. When fence-out rule is applied, it is clear that the rule favors the rancher over the farmer. However, when fence-in is applied, the rules are reversed and the farmer now has the upper hand. For regions where one particular rule has applied for several years, both the farmer and rancher have adjusted to the rule to maximize profit. As economies change, the way the land is being used changes, which raises the question of which rule should preside over the land.

As time has shown, courts have imposed the rule that would benefit the majority. It allowed lands that were out of production to be used. The rules are efficient in the sense that land was used to the greatest potential. The rule makes the party who bears the least cost to build the fence. As land practices change, so has the majority. One would have expected that as land use practices have changed, the rule should change as well, but this is not the case. For the most part, farmland is tending to shift from a fence-out rule to a fence-in rule. Protecting farmland as well as land used for recreational purposes contributed to this change. Problems arose in states where ranchers are allowed to let livestock graze federal land. Livestock is claimed to be associated with destroying natural habit and beauty enjoyed by many citizens. Even though the majority is now in favor of the rule change, there will still be strong opposition to change from a fence-out to a fence-in. For the farmer, since the presence of livestock is removed and the cost of fencing is shifted to the rancher, the farm may again become profitable if not already. As for the rancher, stocking rates will have to decrease due to the loss of free forage from off-ranch properties plus lower profits due to additional fence costs.

Opposition to a potential fence-in rule change will not come from just one rancher as stated in the example, but from a large number of ranchers in the region. It is likely that ranchers will raise 'due process' and 'equal protection' protection challenges under the 14th Amendment. It is also likely that there would be several 'takings' challenges under the 5th Amendment⁴. All these challenges are likely to lead to protracted and expensive litigation. Lawmakers have to be cautious in any effort to change from a fence-out to a fence-in rule. Such a rule change must at a minimum be within the public interest approach to public policy-making as suggested by Mitnick². Moreover, the party that is granted the privileges under the new rule should be able to pass on their benefits to society.

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ALEXANDRA LEE

ENVIRONMENTAL CONFLICT IN A SMALL COMMUNITY: DAIRYING IN NORTH BOSQUE, TEXAS

I. Introduction and Objectives of Study

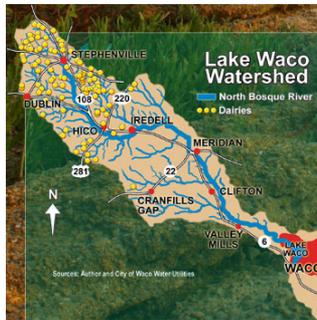
The North Bosque River, which supplies seventy-five percent of the water in Lake Waco, is considered impaired because of excessive phosphorus and bacteria levels, the source of which are upstream dairy operations.⁹ The high concentration of dairy cows in a small area threatens the watershed with waste loadings from 46,000 cows that contribute to the high phosphorus levels in the river.¹⁰ This stretch of river negatively affects numerous rural and urban communities that draw from the Bosque River as their main source of water for municipal, agricultural and domestic purposes.

The expanding city of Waco, Texas is challenged to produce a safe and clean glass of drinking water for its citizens. Other cities directly affected include Stephenville and Dublin (Erath County), and Meridian, Clifton and Valley Mills (Bosque County). The North Bosque River situation points to a common public policy problem that confronts several rural areas. This is the tension between protecting the environmental integrity of an area while not impairing the right

⁹City of Waco, Texas: North Bosque River watershed. <http://www.wacowater.com/bosque-river.html>. Visited 2 Feb. 2007.

¹⁰City of Waco, Texas: North Bosque River watershed. <http://www.wacowater.com/bosque-river.html>. Visited 2 Feb. 2007.

of citizens to carry on their legitimate economic activities to sustain themselves. On the one hand there is interest in passing environmental laws and regulations that do not adversely affect market prices and agricultural practices, so that dairymen throughout Texas would be able to earn a secure livelihood. On the other hand, livestock production has been identified as the main contributor to water pollution, especially around the area affected by numerous dairy farms in the North Bosque River.



II. Objectives of Paper and Brief History of Dairying in North Bosque

This paper discusses how a small rural community in Texas is struggling to deal with a major environmental problem. This section of the paper continues with a brief historical background to the source of the pollution problem in North Bosque. This is followed in Section III with a discussion of the regulatory context and general water quality problems in Texas. Section IV discusses the involvement of Texas courts in finding solutions to the problem, and conclusions and policy recommendations are presented.

Section V. *Ila. Brief History*

The dairy industry expanded greatly in the North Bosque River watershed during the 1980s. Erath County has remained the leading county in the state for milk production, with an estimated 41,000 dairy cows.¹² The North Bosque River flows a distance of 100 miles from above Stephenville, Texas into Lake Waco, which is a drinking water supply source for the City of Waco.¹³ Water quality in the Bosque

¹¹ Saleh, A., et al. *Application of SWAT for the Upper North Bosque River Watershed*. Transactions of ASAE, 2000, Vol. 43(5): 1077-1087. <http://asae.frymulti.com/request.asp?IID=3&AID=3000&v=43&i=5&CID=r2000&T=2> Visited 16 Nov 2006.

¹² *City of Waco v. Texas Natural Resource Conservation Commission*, 83 S.W.3d 169 (2002).

¹³ Siebert, John W. *A Risk Management Case Study: Dairying in the North Bosque Environment*, Sept. 19, 2001. AGEC 340 course pack.

River watershed has been degraded due to the enormous quantity of ill-managed animal waste that is produced by dairies in the region.¹⁴ In an effort to control the runoff, a study was conducted in 2000 to assess the effect of dairy production on water quality within the Upper North Bosque River Watershed (UNBRW).¹⁵ The area tested encompasses approximately 37,753 acres and included 94 dairies at the time of the study. A river basin model (Soil and Water Assessment Tool, SWAT) was applied in two phases. The results showed that nutrient loadings were consistently highest in the watersheds with the most dairy operations. In phase two, SWAT was executed by replacing the manure waste application fields with grassland to evaluate the effect of dairies. The results from this phase of study indicated that if dairy waste application fields were replaced by grassland, loading from the watershed could be reduced by about 33% for total nitrogen and 79% for total phosphorus.¹⁶ These findings illustrate the impact of cow density and area covered by dairy waste application fields on sediment and nutrient loading.¹⁷

III. Regulatory Context and Issues of Water Quality and the Clean Water Act (CWA)

A major concern for every segment of society, whether it is government, agriculture, industry, or the general public, is the quality of freshwater.¹⁸ Surface waters and groundwater are valuable resources; statistically, 80 percent of Texas' surface land mass overlies nine major aquifers, and groundwater accounts for 60 percent of the state's total water use, most of which is used for agriculture.¹⁹ This valuable resource serves many purposes, ranging from human and animal consumption, to waste management systems and recreation.²⁰

There has been a shift in focus of environmental laws from the protection of nature to the issue of public health; as a result, there has been delegation of authority to the states of federal water laws, not discounting preemption.²¹ The critical foundation of a state's power to qualitatively control pollution is that any state, in an effort to protect

¹⁴ *Ibid.*

¹⁵ Saleh, A., et al. *Application of SWAT for the Upper North Bosque River Watershed*. Transactions of ASAE, 2000, Vol. 43(5): 1077-1087. <http://asae.frymulti.com/request.asp?IID=3&AID=3000&v=43&i=5&CID=r2000&T=2> Visited 16 Nov 2006.

¹⁶ Saleh, *Ibid.*

¹⁷ Saleh, *Ibid.*

¹⁸ Amer El-Ahraf & William V. Willis, *Management of Animal Waste: Environmental Health problems and Technological Solutions* (1996) 8-10.

¹⁹ Schreiber, Colleen. "Texas Groundwater Law in Flux; Primer is Constantly Changing." *Livestock Weekly*. 12 Oct. 2006. http://www.texaswatermatters.org/pdfs/news_355.pdf.
27 Nov. 2006.

²⁰ Amer El-Ahraf & Willis, *op. cit.* Note 10.

²¹ *Ibid.*

public health and welfare, is entitled to exercise executive power with the support of federal laws. A need for regulation and monitoring of water quality at the national level resulted in the implementation of the Federal Water Pollution Control Act of 1972²², now referred to as the Clean Water Act (CWA). This legislation is administered by the Environmental Protection Agency (EPA), serves as the basis for many regulations and court cases hereafter, and has been adopted by all states in order to give them authority in enforcing water pollution laws.²³ In summary, the Clean Water Act (CWA) is “the primary federal statute regulating water pollution, with the goal of protecting the water resources of the United States.”²⁴ Its intention is to protect the water quality of lakes, streams, and other recreational waters in order to maintain wildlife and fisheries, and drinking sources.²⁵

Point and Non-Point Source Pollution

Regulation based on the CWA is needed since animal wastes from livestock operations are discharged into the nation’s waters, thus polluting them. The major problem facing Texas’s waters is balancing water quality and promoting animal industry, particularly confined animal feeding operations such as dairies. Statistically, the number of dairy farms in Texas decreased from 1,900 in 2002 to 1,700 in 2004.²⁶ However, as dairy herd size and amount of water drainage increase, and as environmental factors change, the source of contamination becomes more difficult to identify.²⁷

Contamination resulting from diffused areas in which no well-defined source exists is referred to as non-point source water pollution. Non-point sources are a universal problem resulting from a wide variety of land uses, the most relevant being agricultural production. On the other hand, if the sources of contamination can be identified and eliminated using “end-of-pipe” technology then there exists what is known as point source pollution.²⁸ Examples of this include city wastewater treatment plants, industrial operations, and large animal feeding operations.²⁹ The first step in establishing an agricultural water quality project is to identify the water quality impairment, the pollutant, and the source of the pollutant that is causing the water quality problem.³⁰

²²33 U.S.C.

²³Amer El-Ahraf & Willis, *op. cit.*

²⁴Joel M. Gross & Lynn Dodge. *Clean Water Act*. (2005).

²⁵*ibid.*

²⁶*Texas Almanac*. Dallas: *Dallas Morning News*. 2002

²⁷Kenneth L. Campbell and Dwayne R. Edwards. *Phosphorus and Water Quality Impacts*. [Agricultural Non-point Source Pollution: Watershed Management and Hydrology](#). Ed. William F. Ritter & Adel Shirmohammadi. (2001). 91-107.

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²⁹TCEQ, TSSWCB joint publication. “Reducing Phosphorus in the North Bosque River: Taking Action to Improve Water Quality.” http://www.tceq.state.tx.us/comm_exec/forgrs_pubs/pubs/qi/qi-306_1072021.pdf. 29 Nov. 2006

³⁰Campbell & Edwards, *op. cit.*

Phosphorus Overloading

Dairy operations in northeast Texas pose a major problem to water pollution because the specific source of the contaminants in the water cannot be identified; therefore, the pollution cannot be easily controlled. Some contaminants include acid rainfall, and run-off from plant residues, soil erosion, fertilizers, and manure land application. In the North Bosque River, the main nutrient leached into the water from these factors is phosphorus, which in excessive amounts can harm human and animal health, and decrease fish populations.³¹

Eutrophication can be defined as “an increase in the nutrient status of natural waters that causes growth of algae and other vegetation.”³² Excessive plant algae in the water alters its character, giving it a tainted taste and odor. In various tests performed on samples from the North Bosque River, phosphorus was shown to be the main nutrient that affected plant growth, the source of which is livestock manure.³³ Therefore, phosphorus was targeted because it is the limiting nutrient for controlling algal and aquatic plant growth in the watershed.

In an effort to reduce pollution in the river, a plan that involves preventing excessive run-off has been implemented.³⁴ For instance, surface water phosphorus concentrations from dairy manure were considered the primary source of water pollution in Goose Branch. Still considered impaired, this area rises at Lingleville, Texas, eight miles northwest of Stephenville in west central Erath County, and runs six miles southeast to its mouth on the South Fork of the Bosque River.³⁵ To address the complexities of manure management on each dairy farm, individual enhanced nutrient management plans (ENMPs) have been developed by local experts in conjunction with dairy operators. These plans focused mainly on changing farming practices to reduce the runoff of phosphorus from fields to surface waters.³⁶

³¹TMDL Nonpoint Source Pollution <http://asac.frymulti.com/request.asp?ID=1&AID=7578&CID=tmdl2002&T=2> 27 Nov. 2006

³² Campbell & Edwards, *op. cit.*

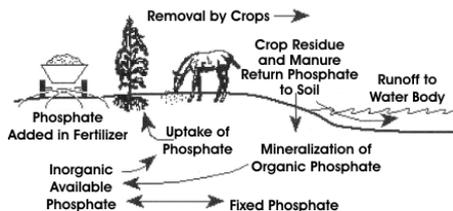
³³ *Ibid.*

³⁴ TCEQ, TSSWCB joint publication. *Op. cit.* Note 21.

³⁵ *Ibid.*

³⁶ *Ibid.*

The Phosphorus Cycle



Source: Busman et al., 1997.

The water quality problem must be addressed by identifying the positive and negative externalities, systems of which best management practices (BMPs) should be assembled by local farmers and technical personnel, based on knowledge of agricultural systems. Plans of action must be implemented to reduce point and non-point source pollution, to control the pollutant at the source, to slow the diffusion of the contaminant in the water, and to remedy the pollutant in the water resource by altering its chemical content.³⁷ Thus, land treatment in the form of BMPs is required, examples of which include conservation tillage, riparian buffers of trees and shrubs, nutrient management, and manure storage facilities (the most costly of them all).³⁸ These BMP systems should be installed at the area of the watershed that is most critical to the water pollution problem. In February 2001, in response to the need to address the high level of nutrients found in the Bosque River, a plan measuring the Total Maximum Daily Load (TMDL) of phosphorus discharge in the Upper North Bosque River Watershed (UNBRW) was applied to address the pollutants' various non-point sources.³⁹ According to the EPA, a TMDL is "a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources."⁴⁰ Currently, the TMDL annual average loading for phosphorus is 23,106.2 lbs/year and the potential phosphorus loading due to "exempted" lagoon discharges is 68,640 pounds.⁴¹ The incorporation of these systems was a result of the Rural Clean Water Program, a 10-year experimental agricultural pollution control program initiated in 1980, to further water quality set forth by the CWA.⁴²

³⁷ Campbell & Edwards, *op. cit.*

³⁸ *Ibid.*

³⁹ *Ibid.*

⁴⁰ EPA Office of Water: Intro to TMDLs, <http://www.epa.gov/owow/tmdl/intro.html> 26 Nov 2006

⁴¹ City of Waco, Texas: North Bosque River watershed. <http://www.wacowater.com/bosque-river.html>. Visited 2 Feb. 2007.

⁴² Campbell & Edwards *op. cit.*

IV. The Courts and Environmental Dispute Resolution

The Clean Water Act seeks to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.”⁴³ Citizens may bring suit against an individual or a governmental entity if it is believed this statute has been violated.⁴⁴ Such a lawsuit was filed in 1997, *Cross Timbers Concerned Citizens v. Saginaw* of the EPA,⁴⁵ where a citizens group unsuccessfully claimed that the EPA, USDA, and the NRCS had violated the CWA and National Environment Policy Act. The group relied on Section 404 of the CWA which prohibits CAFOs to discharge dredge or fill material into navigable waters without a permit.⁴⁶ In rejecting the group’s claim, the Court said that the government entities were exempt from any liability under the National Environmental Policy Act of 1969.⁴⁷ The plaintiff failed to state a factual NEPA cause of action because the EPA is exempt from claims regarding their discharge reports, which is supported by Section 511 of the CWA.⁴⁸ Furthermore, claims against the EPA, USDA and the NRCS were dismissed without prejudice for lack of subject matter jurisdiction.⁴⁹

In addition to regulating the discharge of pollutants under the National Pollutant Discharge Elimination System (NPDES), the CWA also regulates activities affecting the nation’s wetlands, oil spills and hazardous substances, storm water runoff, and sewage disposal.⁵⁰ The CWA prohibits the discharge of any pollutant from point sources, except in compliance with its stated provisions.⁵¹ The CWA defines “discharge of a pollutant”⁵² as “any addition of any pollutant to navigable waters from any point source.”⁵³ Therefore, operators of confined animal feeding operations (point sources), such as dairy farms, must obtain an NPDES permit and comply with its terms pursuant to section 402 of the CWA, which is conditioned upon effluent limitations.⁵⁴ Dairymen are held strictly liable for any related negative effects resulting from a failure to acquire the appropriate permits.⁵⁵ However, non-point sources are not required to obtain an NPDES permit prior to allowing pollutants to enter water sources, nor are they required to comply with effluent

⁴³CWA § 101(a), 33 U.S.C. § 1251(a)

⁴⁴ CWA § 404 (s)(1), 33 U.S.C. § 1344(s)(1)

⁴⁵ *Cross Timbers Concerned Citizens v. Saginaw*, 991 F. Supp. 563; 1997 U.S. Dist.

⁴⁶ CWA § 404(s)(1), 33 U.S.C. § 1344 (s)(1)

⁴⁷ *Cross Timbers Concerned Citizens v. Saginaw*, *op. cit.*

⁴⁸ *Ibid.*

⁴⁹ *Ibid.*

⁵⁰David M. Bridges, et al., *Federal Publications Inc. Texas Environmental Law*, (1990) 2216-232.

⁵¹ CWA § 502(6), 33 U.S.C. § 1362 (6)

⁵² CWA § 502(7), 33 U.S.C. § 1362 (7)

⁵³CWA § 502(14), 33 U.S.C. § 1362 (14)

⁵⁴ Donald B. Pedersen & Keith G. Meyer, *Agricultural Law in a Nutshell* (1995).

⁵⁵ John H. Davidson, *Little Waters: The Relationship Between Water Pollution and Agricultural Drainage*, 17 ELR 10074-10081 (1987).

limitations;⁵⁶ these sources were addressed under FWPCA “Section 208” Planning, governed by the state.⁵⁷ Regardless, as part of the NPDES program, all permit holders must routinely file discharge monitoring reports (DMRs) with state and federal agencies.⁵⁸

The Texas Commission on Environmental Quality (TCEQ) is the State government agency that administers the CWA in Texas.⁵⁹ TCEQ determines proper dairy waste management practices, and exercises considerable influence over dairy operations in the State. Under TCEQ rules and regulations, a dairy farmer must have a permit to engage in Confined Animal Feeding Operations (CAFO) since waste from dairies discharges into the river and pollutes it.⁶⁰ TCEQ must file TMDL reports that are submitted to the EPA to be used as part of the planning process in addressing problems associated with phosphorus sources identified in Texas.⁶¹ Dairy farmers have been uncomfortable with the CAFO requirements, especially since the permitting process could be lengthy and costly. The CAFO requirements were subject to a court challenge in 2002.

In the June 2002 the Texas Association of Dairymen filed action seeking declaratory judgment that TNRCC orders regulating future permits for CAFOs was invalid, stating that TNRCC’s interim policy of continuing to issue permits violated state regulation.⁶² (*City of Waco v. Texas Natural Resource Conservation Commission*). The court held that (1) the dispute had to be evaluated in terms of ripeness, not mootness, and (2) the question of whether federal regulation operated to prohibit TNRCC from approving any new CAFO permits until the organization adopted necessary pollution reduction measures was purely a legal inquiry, which would not be related to facts in connection with specific permit application, and (3) the facts underlying dispute were developed to make the dispute ripe for review.⁶³

Under Texas Environmental Law, TNRCC motioned to dismiss the city’s claim that its discretionary policy on permits for CAFOs was at odds with state law. The court ruled that the issue was ripe, since forcing the city to file an action against TNRCC would, in effect, allow the lake to be polluted while the proceedings occurred. Yet, the Texas Association of Dairymen and the City of Waco still filed for declaratory judgments against TNRCC, attacking the order to get future permits. The argument

⁵⁶ John H. Davidson, *Little Waters: The Relationship Between Water Pollution and Agricultural Drainage*, 17 ELR 10074-10081 (1987).

⁵⁷ FWPCA § 208, 33 U.S.C. § 1288

⁵⁸ Frank M. Thomas Jr., *Citizen Suits and the NPDES Program: A Review of Clean Water Act Decisions*, 17 ELR 10050-10055 (1987).

⁵⁹ Joel M. Gross & Lynn Dodge. *Clean Water Act*. (2005).

⁶⁰ Joel M. Gross & Lynn Dodge. *Clean Water Act*. (2005).

⁶¹ CWA § 1313

⁶² *City of Waco v. Texas Natural Resource Conservation Commission*. 83 S.W.3d 169 (2002).

⁶³ *City of Waco v. Texas Natural Resource Conservation Commission*. 83 S.W.3d 169 (2002).

lies in the economic effects of requiring dairymen to pay for costly permits, for this reduces the farmer's desirability and competitive reputation in a heavily populated dairying region.⁶⁴

V. Conclusions and Policy Alternatives

The basic issue facing state policy makers, residents of North Bosque, scientists, and stakeholders is how to treat and prevent phosphorus overloading of the Bosque River, and the costs and benefits of decreasing this negative effect on the water. The implementation plan for the Bosque River watershed calls for a mix of voluntary and regulatory measures.⁶⁵ The plan recommends developing enforceable standards, such as setting maximum contaminant levels (MCLs) that are enforceable using TMDL restrictions to protect human health.⁶⁶ The plan also recommends research and possible application of Integrated Pest Management methods on farms. This would involve precision application of pesticides, non-chemical practices, and biotechnology as a means for control. Furthermore, giving the farmer tax relief, providing extension agents to educate farmers on best available technology, legal bans, and a traditional system of altruism are all options for reducing detrimental run-off and tainted water resources.⁶⁷

Moreover, farmer-to-farmer information and education in extension should be used to help farmers learn new concepts and techniques from each other. Incentives are required to move farmers toward agricultural practices that are more sustainable in the long term, more profitable in short term, and lead to improvements in water quality. Examples of these may include available credit and capital, subsidies for waste treatment technology, and land tenure reform.⁶⁸

The federal government has also partially funded a "Composted Manure Incentive Project" in the North Bosque watershed to help reduce and transport manure from altruistic dairy farmers to compost facilities, which in turn, limits discharge and runoff of animal wastes.⁶⁹ This project is jointly managed with the State Soil Conservation Board and TCEQ, and provides rebates to customers of compost as well as a reimbursement for hauling the waste out of the watershed. (TCEQ is expected to take on permit oversight from the EPA in the near future.) In addition, water monitoring is helping to track improvements attributable to the removal of the waste.

⁶⁴ *City of Waco v. Texas Natural Resource Conservation Commission*, 83 S.W.3d 169 (2002).

⁶⁵ TCEQ, TSSWCB joint publication. "Reducing Phosphorus in the North Bosque River: Taking Action to Improve Water Quality." http://www.tceq.state.tx.us/comm_exec/forms_pubs/pubs/ci/ci-306_1072021.pdf, 29 Nov. 2006

⁶⁶ Donald B. Pedersen & Keith G. Meyer, *Agricultural Law in a Nutshell* (1995) 400-410.

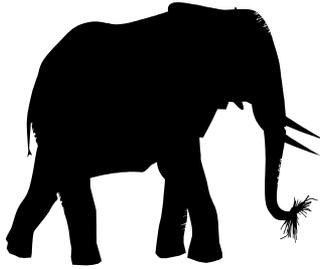
⁶⁷ Donald B. Pedersen & Keith G. Meyer, *Agricultural Law in a Nutshell* (1995) 400-410.

⁶⁸ TMDL Nonpoint Source Pollution <http://asae.frymulti.com/request.asp?JID=1&AID=7578&CID=tmdl2002&T=2>, 27 Nov. 2006

⁶⁹ TCEQ, TSSWCB joint publication. *Op. cit.*

The problem of water pollution in north central Texas has resulted in many laws and regulation plans changing dairy farming in the state. The number of dairy farms has dropped by 37% since 1992, yet the average herd size has increased by 50%.⁷⁰ Erath County dairymen face numerous dilemmas resulting from TCEQ permits for waste discharge and farm management, along with environmental risks, and farming costs. With the onset of agricultural companies such as Pilgrim's Pride, Sanderson Farms, and Cargill in Waco, population can be expected to increase, thus decreasing the number of rural dairy operations. The city of Waco and farmers could mutually engage in numerous projects to prevent the negative consequences of water pollution. One fact remains unchallenged - no option in dealing with the pollution problem in North Bosque would come without consequences and costs to society.

⁷⁰Siebert, *op. cit.*



DANYA LEWIS

ZOO LAWS THAT IMPROVE THE QUALITY OF LIFE FOR ELEPHANTS

I. Introduction

Several factors have combined to justify the development and operation of zoos around the world. These factors include population pressures that are threatening the habitats of some animal species, threats to certain animal populations, interest in generating revenues through tourism, and education about animal species. Despite these laudable goals, in years past, zoos have had the bleakest types of habitats for the animals in their care.

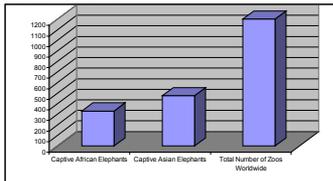


Table 1) This table shows the total number of captive elephants vs. the total number of zoos worldwide.

The areas where the animals were kept their entire lives were dark and ugly cages surrounded by concrete or tile and walls. Some of the problems facing zoos are best illustrated by the conditions facing captive African and Asian elephants. There are 1,200 zoos world wide,⁷¹ with a total of 806 elephants reported in captivity. There are three hundred and thirty one African elephants and four hundred and seventy five Asian elephants⁷² (Table 1).

⁷¹World Association of Zoos and Aquariums, (undated). Zoos and Aquariums of the World. Retrieved on March 25, 2007 from <http://www.waza.org/network/index.php?main=zoos>, World Association of Zoos and Aquariums (WAZA)

⁷²World Association of Zoos and Aquariums (undated). Factsheet. Retrieved on March 25, 2007 from <http://www.waza.org/virtualzoo/factsheet.php?id=115-001-001-001&view=Elephants&main=virtualzoo>

The main reason why elephants are kept in zoos is “in response to the decline in wild Asian elephant populations, captive breeding programs for the species face the challenge of creating self-sustaining zoo populations.”⁷³ The total population of elephants in the wild fell from 1.3 million in 1970 to 60,000 in 1989, and slightly rose to 400,000 in 2002.⁷⁴ (Figure 2).

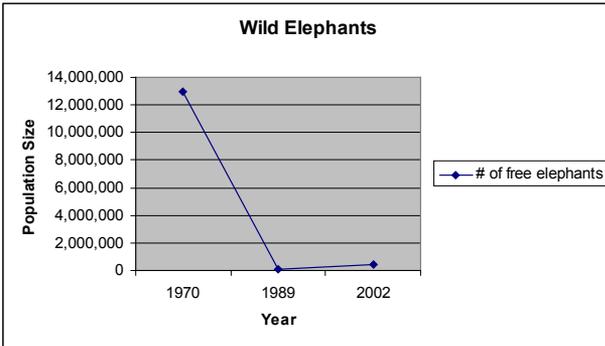


Figure 2) shows the drop in elephant population from 1970 to 1989, and the slight rise in 2002 due to elephant management and ivory trade regulations

II. Problems and Study Objectives

Zoos face both biological and management problems in the effort to protect elephants from extinction. One problem is the sex ratio of elephants. Zoo elephant population standards are set for adult female elephants because males are much larger, stronger, aggressive, and hence difficult to handle. However, in reproduction, there is a 50% chance of having a male elephant. Since these are not wanted, they are often kept alone in inadequate facilities. As explained by one researcher, the objective to create a sustainable environment for the elephant, “is frustrated by an imbalance in the sex ratio, low fecundity, high calf mortality, inadequate accommodation and the emergence of new diseases within zoo populations.”⁷⁵ To help stabilize the population there should be at least one or two male elephants per herd, but it has been reported “that there were 46 males (8 castrated) and 239 females in the North American population in 73 facilities in 1999.”⁷⁶ Both males and females together were only found in 23 zoos, which are only 31%

⁷³ Rees, P.A., (2003). Asian elephants in zoos face global extinction: should zoos accept the inevitable?, *Oryx*, 37:1:20-22.

⁷⁴ Wikipedia, (undated). Elephants. Retrieved on March 22, 2007 from <http://en.wikipedia.org/w/index.php?title=Elephant&oldid=104905892>

⁷⁵ Rees, *op. cit.* note 3.

⁷⁶ Schulte, B.A. (2000). Social structure and helping behavior. *ZooBiology*, 19, 447-459.

of all zoos; and this appears to be because of the higher needs of male elephants. To improve the conditions for keeping elephants, it may be necessary to raise and slowly implement the standards under which all new elephant exhibits are carried out. If zoos are able to keep more male elephants they would be able to have a more stable breeding program and the populations of the zoo elephants would be able to be more sustainable.

In addition to the biological problem, there is a policy/legal problem. It appears that the requirements for keeping adequate captive elephants' habitat are too lenient. Elephants are large animals that need more space to roam to stay healthy. It has been estimated that in the wild, "elephants can roam up to 50 miles a day."⁷⁷ The freedom to roam is simply not available when confined to a small area. In some countries, budget restrictions have discouraged compliance with the laws that are intended to protect the elephants. The basic objective of this study is to discuss selected problems facing elephants in zoos, and to recommend policy actions that could be taken to improve the conditions for these animals. The primary motivation for this study is my own interest in zoo management and the broader need to protect endangered animal species.

III. Selected Issues in Captive Elephant Management

a. Need for Strong Laws and Regulations

In addition to the general laws protecting against cruelty and prescribing the care of animals, all zoos, no matter what types of animals they have in their care, need to be registered and authorized by the Association of Zoos and Aquariums.⁷⁸ Every zoo in existence has to follow the guidelines of the AZA. Failure to follow the guidelines set out for each specific animal could lead to the removal of the animal and shut down of the zoo by the AZA.⁷⁹ There is also a regulation banning private zoos because they all need to be regulated the same way for the welfare of the animals.⁸⁰ Another important regulation zoos have to follow states that, "anyone who seeks to study or modify the lifestyle of elephants in anyway must have a special permit."⁸¹ This requirement was created because the Asian elephant is considered endangered.

b. Space and Habitat Requirements

Elephants kept in areas that are too small to permit easy movement develop very "painful arthritis and chronic foot infections."⁸² Illustration

⁷⁷ Roy, S. (2006). U.S. Zoos Violating Federal Law in Housing of Elephants. Retrieved November 11, 2006 from http://www.idaasa.org/news/currentnews/zoo_petition.html

⁷⁸ Association of Zoos and Aquariums (AZA), STANDARDS FOR ELEPHANT MANAGEMENT AND CARE, 2001(henceforth, AZA)

⁷⁹ *ibid*

⁸⁰ *ibid*

⁸¹ *ibid*

⁸² Roy, *op. cit.* Note 7.

one shows an elephant that has contracted a very painful bacterial infection because it has been kept in an area that was too small. The animals in these small cages can also get bored, and this could cause mental and physical problems.⁸³ To help address that problem of boredom, the newer habitats are larger and more natural environments, with objects the animals can use for stimulation and exercise. The new “stimulating environments enhance animal well-being by promoting activity and curiosity, resulting in improved physical and mental fitness.”⁸⁴ Another benefit of having larger, more natural enclosures is that “individuals of many species are living longer in modern zoos, behave more normally and are generally perceived to have a better quality of life than they did in the small, sterile, concrete and barred cages of the past.”⁸⁵



Illustration 1)
this picture is

of the painful foot infections elephants get when they live in areas that are too small.⁸⁶

Despite the knowledge of elephant’s physical problems, new concerns, and methods of care zoos have available to them, the AZA has lenient laws on how elephants are kept. A “minimum of 400 sq. ft,”⁸⁷ per animal is the requirement for the dimensions of the elephant’s indoor cage. The outdoor requirements for an elephant habitat is “1,800 sq. ft for a single adult individual and an additional 900 sq. ft must be added for each additional animal,”⁸⁸ The height of the enclosure has to be 20 ft. for the mature sized animals. If these numbers were translated to human space needs, they would be equivalent to a one hundred and fifty pound human spending his or her entire life in an area that is thirty three square feet. Illustration 2 shows a good elephant habitat with good runoff so their feet do not get infected and rot, which also gives them plenty of rocks and trees to use for rest and exercise.

⁸³ *Ibid.*

⁸⁴ American Veterinary Medical Association (AVMA), viewed 11/29/2006 <http://www.avma.org/onlnews/javma/dec02/021201k.asp>, 2006

⁸⁵ Hutchins, M. Variation in Nature: Its Implications for Zoo Elephant Management, *Journal of Zoo Biology*, 25:161–171, 200611.

⁸⁶ Roy, *op. cit.* note 7

⁸⁷ AZA, *op. cit.*

⁸⁸ *Ibid.*



Illustration 2) this is a picture that shows a good elephant habitat that provides the elephants with adequate room, as well as natural landmarks to stimulate the animal's exercise.⁸⁹

c. Elephant Living Conditions

Zoos are also required to monitor temperatures below 40° Fahrenheit, and are required to provide some form of shade when it is over 80° Fahrenheit.⁹⁰ While the elephants are indoors, they must have a ventilated area that is heated to at least 55° Fahrenheit.⁹¹ One could argue that the temperature requirement is lenient because these elephants come from Africa and Asia, so they are used to a warmer climate. The standard for the lighting for elephants is: “Natural daylight cycles are adequate for elephants.”⁹² Indoors, however, has to be very well lit during the day and dark at night to give the elephants a period of rest. On the inside of their enclosure the floors must have fast drainage and be able to dry quickly to prevent bacterial infections of the feet.⁹³ Another way to prevent foot infections and many other ailments is by requiring zoo keepers to clean the enclosures daily. The area perimeters that the elephants are contained in have very strict standards. The fences or “containment barriers”⁹⁴ must be strong enough and in good enough condition to hold up to the elephants tremendous weight and strength; the materials used for the barriers can be anything that is strong enough to contain the elephants. The doors and gates to the elephant enclosures also have to be very strong to ensure the safety of the zoo keepers and the elephants; “doors and gates must be engineered to withstand extreme force. If mechanical opening devices, such as hydraulic or electrically powered drives are used, they must be able to be operated manually or with a backup generator in the case of a power failure.”⁹⁵

⁸⁹ This picture came from adventurist.net, I found it on google.com.

⁹⁰ AZA, *op. cit.*

⁹¹ AZA, *ibid.*

⁹² AZA, *ibid.*

⁹³ AZA, *ibid.*

⁹⁴ AZA, *ibid.*

⁹⁵ AZA, *ibid.*

d. Elephant Behavior

AZA requirements state that, “all facilities must have the ability to separate and isolate animals to address behavioral concerns or allow veterinary procedures to occur,”⁹⁶ and all of the area outside has to have a natural composition of materials such as soil and grass.⁹⁷

Illustration 3) Elephants like water of any depth.⁹⁸



It is important that there is adequate drainage in an area that is easy to clean so the elephants can eat in a clean, dry place. Sand or soil that is in the area must be accessible to the elephants for dust bathing, and they also need access to rocks or large tree stumps for rubbing and scratching.⁹⁹ Elephants also need standing water to bathe in and use for a cooling bath, so “elephants must have regular access to a water source, such as a pool, waterfall, misters/sprinklers, or wallow that provides enrichment and allows the animals to cool and/or bathe themselves.”¹⁰⁰ Illustration three shows how much elephants like water, and need it to survive, even if it is only a shallow pond. Dry moats, however, are not allowed because they can be dangerous for the elephants, and the moats must have shallow banks because “moats that are deep, narrow-sided, and hard-bottomed can be particularly dangerous.”¹⁰¹ To protect the animal the moats that are more than “3 ft (1 m) deep, less than 10 ft (3 m) wide, and/or hard-bottomed”¹⁰² must follow special animal protocols.

Elephants have specific needs that should be met to maintain a healthy way of life, but for female elephants especially, who depend on the interaction with others, it is important to provide the best care for the animal’s physical and mental well-being. Because they are so social there is a standard that says “Zoos should make every effort to maintain

⁹⁶ AZA, *ibid*.

⁹⁷ AZA, *ibid*.

⁹⁸ Macaskill, S., (2006). Wildlife pictures online, http://www.wildlife-pictures-online.com/elephants_epchob2.html, viewed 2/2/2007

⁹⁹ AZA, *Op. Cit*

¹⁰⁰ *Ibid*.

¹⁰¹ *Ibid*

¹⁰² *Ibid*

elephants in social groupings. It is inappropriate to keep highly social female elephants singly.”¹⁰³ The AZA also suggests that any zoo that has elephants should try to keep at least three female elephants at any given time, and every new elephant exhibit is required to have enough room for at least three elephants.¹⁰⁴

The most important elephant care standards of all are the ones that regulate how the elephants are treated by their caretakers. One could provide an elephant with the largest space but if it is abused, its quality of life would be as terrible as an elephant living in a small space. The standards that zoos are required to follow are based on how they treat the animals in different situations that the elephants would, or would not, experience in the wild. Some of these standards are: caretakers are not allowed to use any “electrical devices designed for use on livestock, such as commercially manufactured electric prods and shocking collars/belts,”¹⁰⁵ while training or handling the elephants in any situation unless it is an absolute emergency and the handler needs self defense or to protect the elephant from immediate danger.¹⁰⁶



Illustration 4) An elephant named Ambika laying down in a position that allows vets and trainers to examine him easily.¹⁰⁷

The elephants should be trained in a way that allows easy access and low risk to the trainers and caretakers, and that causes the least discomfort to the animal. Illustration four shows how “keepers have trained the elephants to lie down on command, should an exam of these tall animals be necessary.”¹⁰⁸ In order to make the training and behavior easier for the elephants and standardized for the trainers, the Principle of Elephant Management (PEM) created a “recommended list of commands and their corresponding behaviors that every elephant and elephant keeper must know so that basic husbandry and veterinary practices can be accomplished.”¹⁰⁹ When using the PEM guidelines, the

¹⁰³ *Ibid*

¹⁰⁴ *Ibid*

¹⁰⁵ *Ibid*

¹⁰⁶ *Ibid*.

¹⁰⁷ Smithsonian National Zoological park, (undated). Elephant Training.

Retrieved on February 4, 2007 from <http://nationalzoo.si.edu/Animals/AsianElephants/elephanttraining.cfm>, viewed 2/4/2007

¹⁰⁸ *ibid*

¹⁰⁹ AZA, *OP. CIT.*

elephants should get as close to 100% compliance as possible. The AZA set requirements of what zoo keepers and trainers are not allowed to do with the elephants, and these are: inserting anything into a body orifice unless by a veterinarian for training of medical procedures, “striking an elephant with anything more substantial than an ankus”¹¹⁰ but they are not allowed to use the hook end of the ankus or to hit anywhere around the eyes or any other sensitive area, nothing being used in training should harm the elephants, and no food or veterinary care can be withheld from the animal for inappropriate behavior.¹¹¹ Illustration 5 shows a common type of ankus used for elephant training. The only way zoos are allowed to use other methods of training then what is stated in the BEM is if the stated methods have all been tried and the elephant still has wrong or aggressive behavior.

Some of the other options are “transfer to a facility with more experienced staff or a different management system,”¹¹² and corporal discipline. Discipline is a very strong ethical issue, and may be considered abuse according to many people.

Illustration 5) this is a common ankus used by trainers to train elephants.²⁸



Social Interaction - Herds

The group composition of the elephant herds is very important because each animal has a different behavior, so they need to be arranged as safely as possible. When there are young in the herd, “the minimum age offspring must remain with their mothers is three years. Some flexibility is necessary in cases of maternal rejection and when infants cannot be reestablished in their social group.”¹¹³ The male elephants, six years old or older, must always be in a cage alone from the others because of their high aggression, but they still need to be in sight of the others so they can interact.¹¹⁴ Zoos also must be able to determine how compatible

¹¹⁰ A traditional tool used to train elephants; Association of Zoos and Aquariums. (AZA), *op. cit.*

¹¹¹ *Ibid.*

¹¹² *Ibid.*

¹¹³ *Ibid.*

¹¹⁴ *Ibid.*

each elephant is with the rest so they can determine where each animal belongs, and have the ability to successfully introduce new animals into a herd. The most important introductions the zoos have to make are “a new female to a herd and, if the institution is a breeding facility, females to males for breeding, newborn calf to its mother, and calf and mother to the herd.”¹¹⁵

To keep the herd in a good social niche, zoo keepers must “provide an opportunity for each elephant to exercise and interact socially with other elephants.”¹¹⁶ Another requirement was the “behavioral profile must be maintained for each individual elephant and updated annually.”¹¹⁷ This profile is to inform the zoo keepers, veterinarians and staff about the behavior of each animal, and will tell them about any aggressive tendencies an elephant might have.

f. Health and Nutrition

Elephants’ food must be high quality and nutritionally correct. Food must be provided in sufficient quantities to maintain animal health and appropriate weight. Hay and grain should be formulated to provide a complete diet as recommended by the Elephant SSP Nutrition Advisor.¹¹⁸ Other than the requirements for food, there are no specific standards of elephant nutrition. For the health of the elephants, a veterinarian must be on call at all times, but to make the medical examinations easier for the veterinarians and the elephants, each elephant must be trained to accept any type of medical treatment from mouth and teeth examinations to blood collections to wearing ear or leg vein catheters.¹¹⁹ All of this training is necessary because veterinarians are required to examine each elephant completely at least once a year. They also must have a weight assessment twice a year to be sure the elephant is keeping a healthy body weight.¹²⁰ The elephants must also have a daily inspection of any unusual activities that “should be recorded in the daily log at each inspection. Specifically, reports should include observations such as condition of urine and feces, eating and drinking patterns, administration of medications, and general condition and behavior.”¹²¹ The elephants also must have daily inspections of their foot condition and that information is recorded in a written protocol, as well as a “daily cleaning and inspection of each elephant’s foot.”¹²² Every zoo that has elephants in its custody must also follow all of the rules and regulations for testing and treating tuberculosis.¹²³

¹¹⁵ *Ibid.*

¹¹⁶ *Ibid.*

¹¹⁷ *Ibid.*

¹¹⁸ *Ibid.*

¹¹⁹ *Ibid.*

¹²⁰ *Ibid.*

¹²¹ *Ibid.*

¹²² *Ibid.*

¹²³ *Ibid.*

g. Reproduction

Reproduction is one of the main reasons for having elephants in captivity because they are an endangered species. The population rehabilitation programs call for scheduled captive breeding. Table 3 shows the birth and death rates of elephants in captivity from 1902 to 1996. Of all the elephants born in this time, only fifteen percent born survived and twenty-seven percent of those were killed by their mothers.¹²⁴ From these statistics, it is easy to see that elephants need help reproducing in captivity. Because of this, there are strict regulations for reproduction as well.

To be able to breed these animals the zoos have to give all elephants, between eight and thirty five years old, a reproductive examination before they are bred. This is to ensure that the elephants are in good health, and then an exam is required after breeding to make sure their health has not declined.

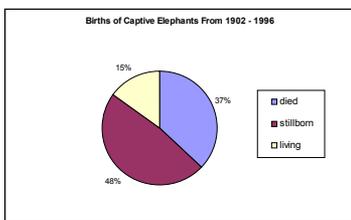


Table 3) This table shows the birth and death rates of captive elephants.¹²⁵

They also are required to have “hormone (progesterone or testosterone) values assessed through weekly (or bi-weekly)”¹²⁶ schedules, these levels are tested by taking blood samples. If there are animals that are known to have problems when reproducing, or are already reproductively active, then they are not required to have these exams. The ones that cannot reproduce do not need to have the hormone levels checked.

IV Conclusion

Current management and care of African and Asian elephants in zoos have been helpful in improving the quality of life of the animals. However, it appears that the regulations are not strict enough to protect the elephants from both physical and emotional problems. It might also be argued that more review and legislation is needed to improve the populations of the two species of elephants and to be able to

¹²⁴ Statistics came from Rees' *op. cit.*

¹²⁵ Stats came from Rees, *op. cit.*

¹²⁶ AZA, *op. cit.*

establish a stable captive elephant population. To remedy the situation, it is important for all zoos to have large enough accommodations for male elephants. The most important thing that needs to be changed in elephant care, are the sanctions and punishment that elephant keepers face for negligent care. Clearly, a message regarding animal care standards needs to be sent to caretakers by our society, or risk the continuation of animal abuse and neglect in the future.

The basic law that protects elephants in captivity is the *Animal Welfare Act (AWA)*, first enacted in 1966 (7 U.S.C. 2132 *et. seq.*).¹²⁷ The Secretary of Agriculture is authorized under the AWA, “to promulgate standards and other requirements governing the humane handling, care, treatment, and transportation of certain animals by dealers, research facilities, exhibitors, carriers, and other regulated entities.” Actual enforcement of the AWA has been delegated to the Animal and Plant Health Service (APHIS) under the U.S. Department of Agriculture. APHIS conducts scheduled inspections of licensed facilities to ensure compliance with AWA guidelines. Violations are subject to cease-and-desist orders and fines. APHIS also searches for illegally operated facilities and shuts down such unlicensed operations.

While there is some agreement that the AWA has improved the life of elephants in the U.S. more needs to be done. A major problem facing enforcement of the AWA is the public nature of the service it is intended to police. Zoos are basically public goods even though some nominal fee is charged for visits. Because it is a public good, it is of no major interest for private individuals to pay major attention to what happens at the zoos. Thus, the burden of policing the behavior of zoo keepers has fallen on non-governmental organizations and animal rights groups, such as ‘In Defense of Animals’ who pressure USDA/APHIS for stricter enforcement of the AWA. These organizations are poorly funded and are unable to sustain pressure on government agencies. It might be helpful if animal care issues are incorporated into school curricula to raise awareness and engage a broader public in advocating proper care of captive animals including elephants.

¹²⁷ Federal Register, (August 9, 2006). Proposed Rule: Animal Welfare. Vol. 71, No. 153 page 45438.

