



# STUDENT EXEMPLARY WORKS

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STUDENT EXEMPLARY WORKS

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## 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 College of Agriculture and Life Sciences, which reflect the high academic standard that we at Texas A&M strive to exemplify.

Thanks to all College of Agriculture and Life Sciences Faculty who participated in the Student Exemplary Works Publication Program

- Ted Friend
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- Marvin Harris

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- Jake Schaben
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- Amanda Dube
- Joe Kozlowski
- Diana Mato
- Mallory Wheaton
- Charlet Hubertus
- Mark Mitchell

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# Student Exemplary Works Publication 2007-2008

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**Austin Hawkins**  
**Analysis of Current U.S. Wheat Policy**

**Background**

Wheat can be traced back as far as the colonial time periods of the 1600s and 1700s, where both production and transportation costs exceeded the pocket books of those looking to make a profit. Since that time, the wheat industry has made giant leaps with new technology, fast food chains, and government involvement. By the 1980s, the wheat industry was booming with the wheat acreage area increasing to 82 million acres up from the low 48 million acres in the late 1950s. Average prices received by farmers in the 1980s

increased to as high as \$4.00/bu over a \$2.00/bu loan rate. The wheat industry seemed to be competing extremely well in the market until a sudden decrease in national acreage and a massive drop in prices below the loan rate terrified the U.S. wheat industry in the late 1990s after the 1996 Farm Bill was passed as legislation. This loss of wheat acreage was partially due to the new and enhanced genetic improvements of other products like corn, which has been used to create a new fuel called ethanol since the 1990's. The price drops in the late 1990s and early 2000s can be reflected by the World recession where little demand growth in major markets has pushed the prices downward (USDA/Gary).

### **Description of Current Policies**

The 2002 Farm Bill provides three ways to help wheat producers succeed in their professions. Wheat producers have access to Direct payments (DP), Counter-cyclical payments (CCP), and Marketing assistance loans (MAL). Each of these has different

features and affects wheat producers differently. Direct payments allow producers to receive annual fixed payments equal to the payment rate of applicable base crop multiplied by the payment acres times the payment yield for the farm,  $(DP(\text{wheat}) = \text{Payment rate}(\text{wheat}) \times \text{Payment yield}(\text{wheat}) \times [\text{Base acres}(\text{wheat}) \times .85])$ . (Farm and Commodity/usda) Basically, this is a program put into place by the government that actually places money by government check directly into the hands of producers in order to increase producer income.

<b><u>Direct payment rates</u></b>		
<b><u>Commodity</u></b>	<b><u>Units</u></b>	<b><u>Payment rate</u></b>
Wheat	Bushel	\$0.52
Corn	Bushel	\$0.28
Grain sorghum	Bushel	\$0.35
Barley	Bushel	\$0.24
Oats	Bushel	\$0.02
Upland cotton	Pound	\$0.07
Rice	Hundredweight	\$2.35
Soybeans	Bushel	\$0.44
Other oilseeds	Pound	\$0.01
Peanuts	Ton	\$36.00

(Usda/Farm and Commodity)

Counter-cyclical payments are coupled Direct payments, meaning they are payments directly linked to both the level of current production as well as the current market price. This program is available only to a select few commodities like wheat, corn, rice, and others when the effective price is less than the target price. Counter-cyclical payments can be calculated by first determining the Payment rate,  $(\text{Payment rate(wheat)} = \text{Target Price(wheat)} - \text{Direct Payment rate(wheat)} - \text{Higher of commodity price or loan rate(wheat)})$ , then by using the following equation one can determine the Counter-cyclical payment,  $(\text{CCP(wheat)} = [\text{Base acres(wheat)} \times .85] \times \text{Payment yield(wheat)} \times \text{Payment rate(wheat)})$ . (CCP/USDA)

<u>CCP Target prices</u>			
Commodity	Unit	2002-03	2004-07
Wheat	Bushel	\$3.86	\$3.92
Corn	Bushel	\$2.60	\$2.63
Grain sorghum	Bushel	\$2.54	\$2.57
Barley	Bushel	\$2.21	\$2.24
Oats	Bushel	\$1.40	\$1.44
Upland cotton	Pound	\$0.72	\$0.72

(CCP/USDA)

Lastly, the Marketing assistance loans allow producers to receive loans from the government through the Commodity Credit Corporation (CCC) at a commodity-specific loan rate per unit of production by pledging production as loan collateral. These loans can be paid back to the CCC three different ways: at the loan rate plus interest costs, by forfeiting the pledged crop to the CCC, or at the alternative low repayment rate (MAL/USDA).

<u>Marketing assistance loan rates</u>			
<u>Commodity</u>	<u>Unit</u>	<u>2002-03</u>	<u>2004-07</u>
Wheat	Bushel	\$2.80	\$2.75
Corn	Bushel	\$1.98	\$1.95
Grain sorghum	Bushel	\$1.98	\$1.95
Barley	Bushel	\$1.88	\$1.85
Oats	Bushel	\$1.35	\$1.33
Upland cotton	Pound	\$0.52	\$0.52
Rice	Hundredweight	\$6.50	\$6.50

(MAL/usda)

All three of these policy programs work towards the betterment of all the wheat producers across the United States. These programs place money into the pockets of producers in three different ways. Direct payments are used to increase the income among producers by placing money directly in the hands of producers. The Counter-cyclical payments pay farmers the difference between the Target price and the higher of the loan rate or market rate acting as a safety net for all producers. Marketing assistance loan programs allow producers to use government money to fund their operations with the intention of being repaid. All three

have advantages and disadvantages, but at least the government is noticing that the wheat producers of the United States are in need of help, money, and support to keep this major commodity active in the United States.

### **Policy Analysis**

Since the United States government is using Direct payments and Counter-Cyclical payments to place money into the hands of the wheat producers. The government knows that farm income will increase with Direct payments. Increasing domestic supply and consumption while decreasing consumer prices will be the ultimate goal of the Counter-cyclical payments which in turn will cause a gain to both the producers and consumers. It was explained earlier that Counter-cyclical payments can be considered a safety net system. As one can see from Figure 1 and Figure 2, if the market price ( $P_m$ ) is greater than the loan price ( $PL$ ) then the government distributes a Direct payment equal to the difference between the Target price ( $P_t$ ) and the market

price ( $P_m$ ). Assuming that the market price will drop unannounced at some point in time the loan price would then be greater than the market price. Therefore, this loan price now becomes a safety net for both the producers and the government alike. Figure 1 explains the reasoning behind the Counter-cyclical payment being established by the legislature. The amount the government is forced to pay out in Direct payments, and what little they have to purchase is well below the total amount the government and taxpayers would be forced to spend if this program did not exist.

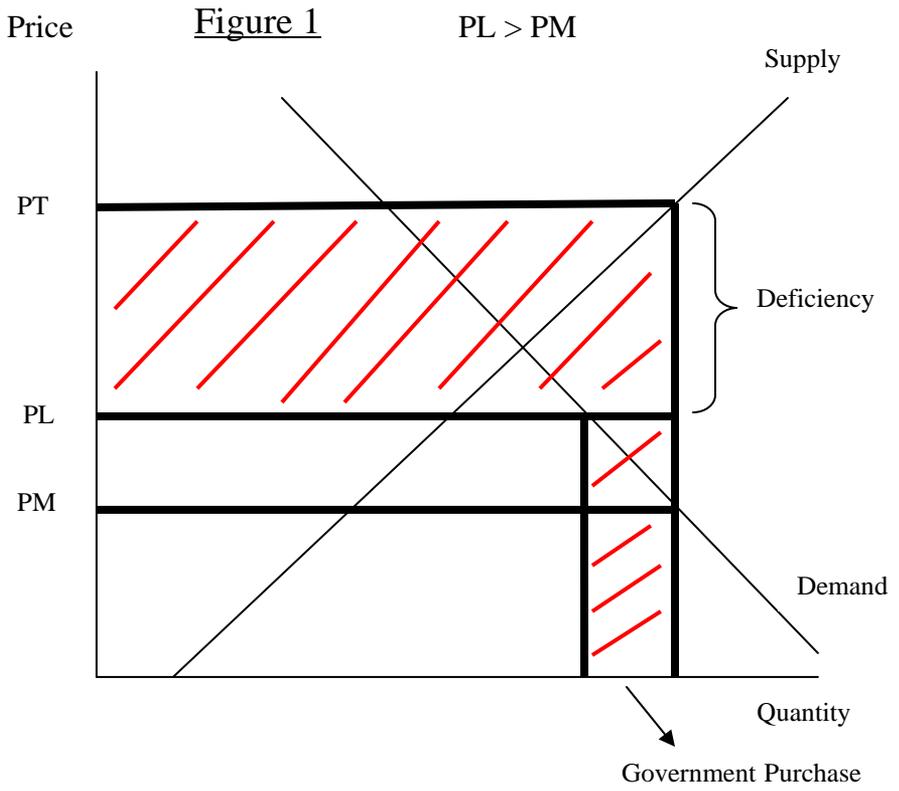
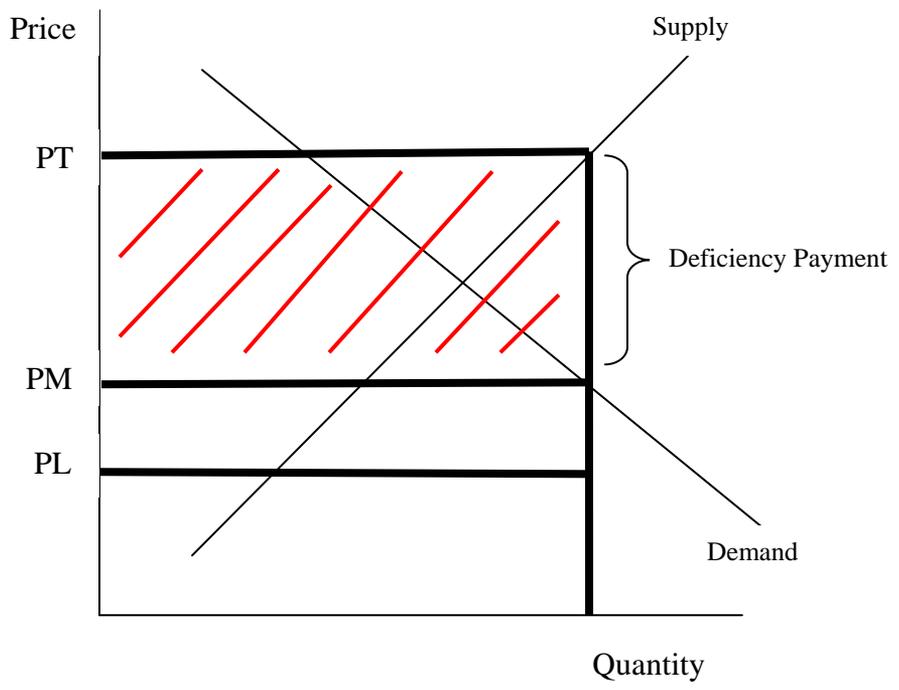


Figure 2

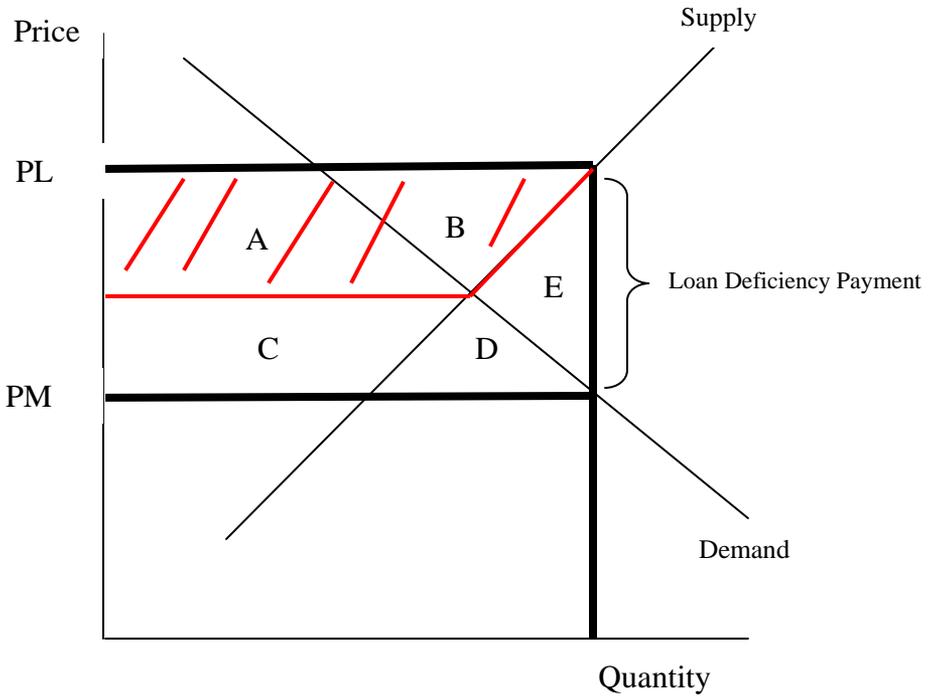
$$PL < PM$$



Marketing assistance loans are distributed among the eligible wheat producers to act as a short-term protection program in times of decreasing prices. The CCC uses what is known as a non-recourse loan. Non-recourse loans allow producers three options for paying the loan back. Producers put their production up for collateral. For example, if a producer has a low production year that puts him/her in a position of not being able to pay for the loan in cash, the CCC will take what the producer produced without recourse (WHS-Yearbook 2007). This program is designed for wheat producers to gain, not lose. In Figure 3, the marketing assistance loan that the government is paying is understood to be the difference between the price of the loan (PL) and the price of the market (Pm). Before the Marketing assistance loan (MAL) is placed, the total producer surplus equals C, but as soon as the Marketing assistance loan is established, the producer's total gain is the shaded area equal to A+B.

Figure 3

Marketing Assistance



## **Conclusions**

The policies discussed in the previous sections consist of the makeup and analysis of the Direct and Counter-cyclical payments as well as the Marketing assistance loan program. As mentioned throughout the sections above, the major advantage of the stated government policies are that they all produce a major gain to the wheat producers. Whether it is by increasing their income by handing producers a government check, paying producers a Direct payment from the differences in target prices, or allowing them to borrow money in times of need without recourse, the government is trying to help and support wheat producers in the United States. As explained in Figures 1-3, the Counter-cyclical payments and marketing loan programs provide the market with increased domestic supply and consumption as well as a decrease in consumer prices, which in turn is a gain to not only producers but consumers as well. One major disadvantage to all of the policy programs

explained earlier can also be observed with Figures 1-3. The one thing that all these programs have in common is that the government is spending enormous amounts of money to make these programs function. This money does not just appear in the pockets of the government, it comes from the taxpayers. The disadvantage to these programs is the amount of money it takes to make these programs work, which definitely does not go unnoticed by the taxpayers. The government's goal is to make wheat producers and taxpayers happy. The answer to this goal by government will not be easy, because although the support in the wheat industry is overwhelmingly needed and these programs attempt to solve these problems, the taxpayers do not want to be responsible for the gain to producers in these massive amounts. In order for the industry to grow it depends solely on how elastic the demand for wheat becomes, and how long the government can keep supporting these programs before having a new Farm Bill.

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**Janet Yen**  
**Ostrich Sand Consumption at the**  
**Wildlife and Exotic Animal Center: Breaking the**  
**Habit**

**Introduction**

Within the last couple of years, ostriches at the Texas A&M Wildlife and Exotic Animal Center had been suddenly dying. Upon examination of their carcasses, it was found that each of these animals carried a large quantity of sand within their systems. The diagnosis was impaction, which “is an accumulation of food or non-food items (sticks, metal, sand, etc) in the proventriculus with the subsequent blockage of the opening into the gizzard causing failure of food to move along the gastrointestinal tract” (Huchzermeyer, 1994). Though grits, small round stones, are often included in

ostrich diets to aid digestion, “they are usually worn down gradually, and are never excreted whole” (Aganga et al., 2003), thus the source of the impaction must have come from the environment.

Currently at the Wildlife Center, five ostriches are grouped together into three pens, and underneath the pens’ shelter and trap area, sand has been laid down where grass has been unable to grow. Within this trap/shelter area, sizable trenches can be observed where the ostriches have been pecking and eating at the sand. There are a number of reasons why the ostriches could be so fixated on ingesting sand, including boredom or insufficient diet-both common factors in stereotypical behavior (Friend, 2008). Whatever the reason, the Wildlife Center only perpetuates their unhealthy habit by regularly filling in the holes with more sand. This is done in order to prevent the ostriches from tripping and injuring themselves, therefore the only way to prevent further injury of any kind is to discover a means to halt

the ostriches from ingesting more sand. Sand impaction is a serious threat to many ostrich operations. In fact, “impaction is one of the major causes of debility and death in farmed ostriches (Mushi et al., 597).” The purpose of this study was to see how manipulating the birds’ environment could deter or distract them from their sand ingestion habit so that future injury or death can be prevented at the Wildlife Center and other ostrich management situations.

## **Procedure**

### *Animals*

Five ostriches at the Wildlife and Exotic Animal Center at A&M were the subjects of this study. The ostriches were split into three pens. One contained a single female, while the other two pens contained one male and one female.

### *Failed Attempts*

Several attempts to deter the ostriches from eating the sand were made prior to this experiment. The first attempt involved laying down cardboard while the second involved laying down garden mesh. Both of these ideas were ultimately scrapped due to concerns with the ostriches eating the materials. The third attempt was to place large rubber exercise balls in the birds' pens for enrichment. After two days the ostriches lost interest, therefore this method was deemed a failure as well.

### *Control: Original Pens*

In order to assess the extent of sand consumption by each ostrich, data was collected at the Wildlife Center everyday for a week (03/26/08-04/01/08). Observations were made with the ostriches in their original pens (see Figure 1) for about thirty minutes each session (5:00-5:30pm). The main concern



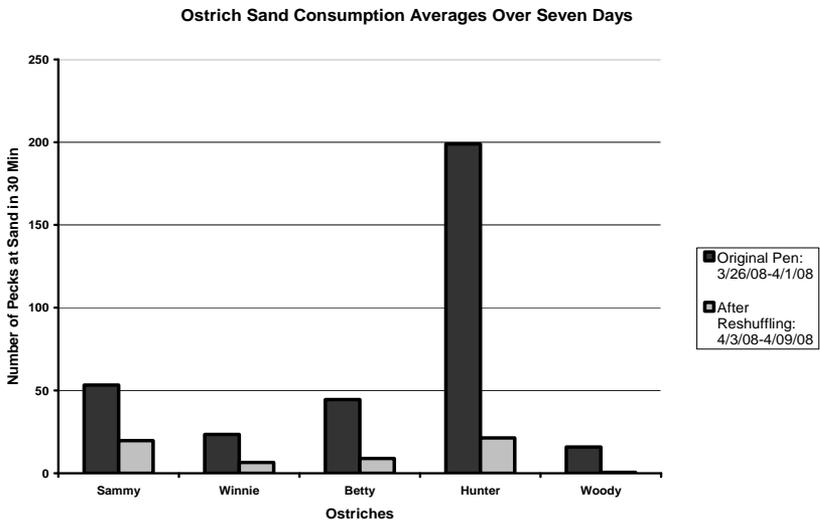
allowed them a chance to explore new surroundings, establish new boundaries with each other, and essentially be distracted from their old habits.

Behavioral observations were made for a full week after the pen reassignments (04/03/08-04/09/08).

Observations were made over a thirty minute period during which the number of pecks at sand was recorded for each subject. Observations were made from 5:00-5:30pm. It should be noted that Betty was the only ostrich not moved; however her environment still changed due to the introduction of two new animals to her pen.

## Results

Analysis of the data showed that there was a significant decrease in the average number of pecks at sand following the reassignment of ostriches to new pens (see figure 2). In all cases, the number of pecks decreased more than fifty percent. As opposed to their stereotypic sand eating behavior, more “normal” behaviors were noted during the thirty minute



**Figure 2: Sand consumption averages before and after pen movement.**

observation sessions even a full week after the move. Sand ingestion could be adequately classified as stereotypic or abnormal behavior because it was performed repeatedly and without a natural purpose (Friend, 2008). The Wildlife Center has two more groups of ostriches toward the front of the Center who also have sandy areas in their pens, yet they do not engage in this problematic sand eating behavior. This shows that excessive sand consumption is not a natural behavior for all ostriches.

On the other hand, the normal or natural behaviors exhibited by the ostriches after their move included grazing out in the grass area and displaying for one and another (courtship). One contributing factor to the decrease in sand ingestion was reestablishing dominance and boundaries. For example, Sammy and Hunter were parallel walking on opposite sides of the fence for at least two days. They each puffed up their feathers, stretched as tall as possible, and matched the

other's pace, step by step. Winnie, on the other hand, was placed into Betty's pen, so whenever Winnie wandered too close to Betty's location, Winnie was immediately chased off.

The most remarkable results came from a male ostrich named Hunter. In his original pen, he averaged 198.86 pecks at sand over a thirty minute period, but after the move, his average dropped drastically to 29.21 pecks (Figure 3). This was due to his walking around the pen more, grazing out away from the sand, and occupying himself with Sammy, who was now directly next door. Even at the end of the week after the pen reassignments, Hunter's sand pecking habit was still much lower than when he was in the original pen (Figure 3).

Number of Pecks of Sand by Hunter Before and After Pen Movement

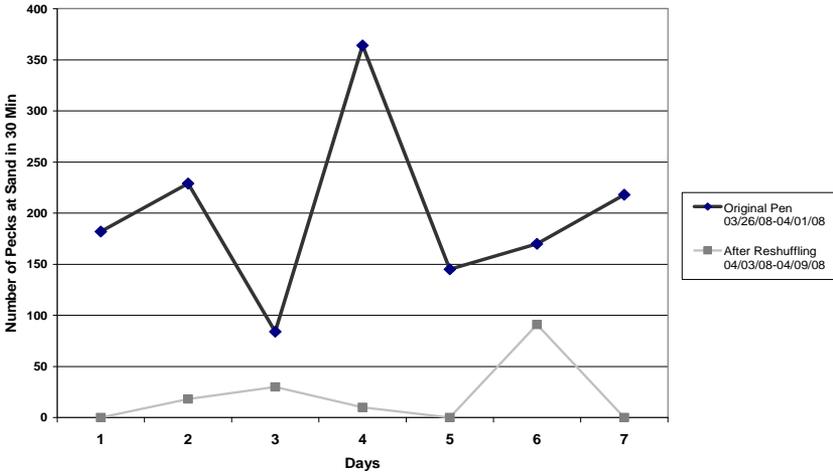


Figure 3: Hunter's daily sand pecking numbers

Sammy (Figure 4) and Betty (Figure 5) were the next most frequent sand peckers. Sammy averaged 53.29 pecks during the thirty minute observation period before the move and then decreased to 19.71 pecks. Betty, on the other hand averaged 44.57 pecks and then decreased to 8.86 pecks. Their individual charts show similar results to Hunter's. Their sand pecking rates remained less than what they were in their original pen one week after reshuffling.

Number of Pecks at Sand by Betty Before and After Pen Movement

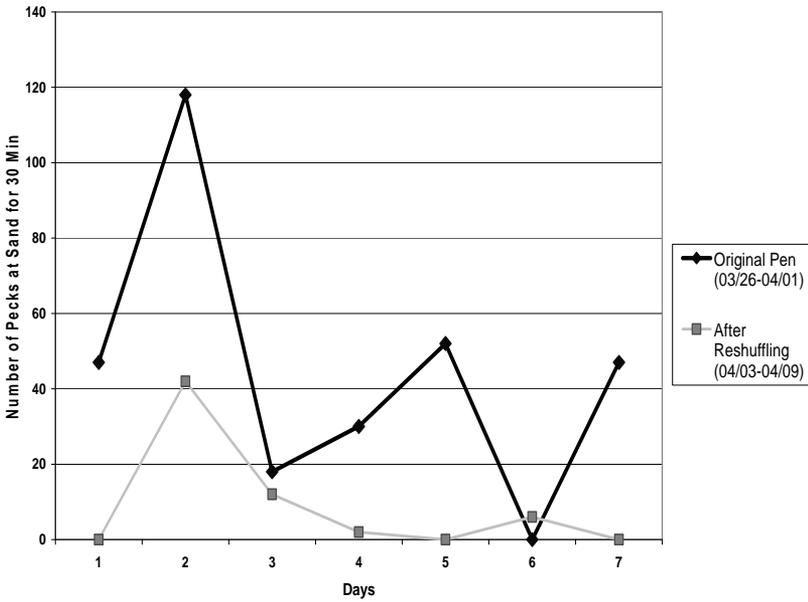


Figure 4. Sammy's daily sand pecking before and after the move.

Number of Peck at Sand By Sammy Before and After Pen Movement

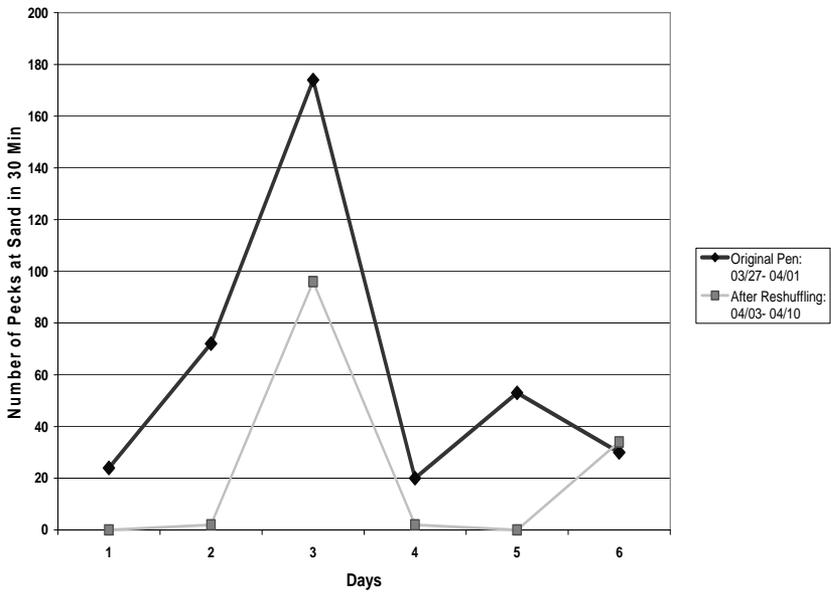


Figure 5: Betty's daily sand pecking before and after the move.

### Discussion

Overall, manipulating the ostriches' environment did have a significant effect on the participants. In all cases, the sand eating behavior decreased by more than fifty percent. After one week, the pen reassignments still seemed to have an effect on their behaviors. One study found that if ostrich chicks were provided with enriching items such as cones,

cabbages, and sticks they were more likely to explore and less likely to peck at fixtures in the pen (Christensen and Nielsen, 2004). In other words, they were less likely to engage in stereotypic behaviors which include sand pecking and ingestion, among other things. Though there was little research to be found on ostrich enrichment in general, it was suggested by Aganga et al. to grind up the ostriches' feed so that when it was offered in meal form, "the birds [could] spend more time pecking at the meals, and therefore develop fewer behavioral disorders (Aganga et al., 2003). Because ostriches "spend 70-80% of daylight feeding," (Aganga et al., 2003) capitalizing on this aspect of the ostriches' natural behavior could also potentially help alleviate the Wildlife Center's ostrich problem.

Although this project seemed to decrease the ostriches' desires to consume sand, more time and more trials (reshuffling the ostriches again) are needed to verify this study's results. In addition, one week of

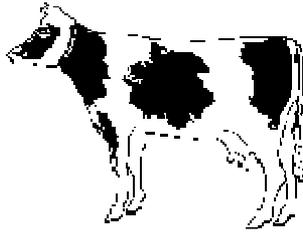
observation cannot be translated to long term success; therefore the ostriches would also need to be watched for longer periods of time. Finally, the number of ostriches observed was small. Before applying this method of decreasing sand ingesting behavior to other ostrich operations, testing on more animals would be recommended. Along with the limitations of this study, a couple of changes could also be made to increase the quality of research. Mainly, Betty was originally planned to be moved to the third empty pen. Unfortunately, at the point when she was ready to be moved, she and the other ostriches were getting too agitated and worked up. In order to maintain the safety of all people and animals involved, the decision was made to leave her alone. This action unintentionally created an additional variable.

Sand ingesting behavior has certainly been a problem for the ostriches at the Wildlife Center and in other ostrich management operations. This study should

encourage further research on working with the animals to correct this problem.

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**Jake Schaben**  
**COOL and the Cattle Industry**

The agriculture industry of today is centered on many commodities. Corn, soybeans, and rice, among others, all play an important role in the industry. One of the largest sectors in agriculture is the livestock sector. Like other commodities, livestock is influenced in many ways by policy passed by Congress. Gaining an understanding of how the cattle industry is affected by agricultural policy helps individuals more thoroughly appreciate the industry as a whole. Before understanding how some of these policies affect livestock, and more narrowly the beef industry, a brief overview on the current status of the industry is helpful.

## **Background of the Cattle Industry**

The cattle industry has grown and evolved into one of the backbones of American agriculture today. From beginnings that included more corruption than organization, the industry today has evolved into a politically strong and well organized group.

In a highly competitive food market, beef has done well against rival industries such as pork lamb, and poultry. Other industries, like poultry, have the advantage of much lower input cost and quicker growth in animals. The beef industry has had to overcome these lower cost competitors by promoting its product as higher in quality and taste. Competition has not only arisen from other livestock sectors, but now cattlemen find themselves competing with the energy industry from feed inputs. The ethanol industry has introduced new concerns for cattlemen as grain prices have increased. Grain is a key input in feed for the cattle industry.

Production of beef has increased in the past four years, as shown in Table 1, and is larger than any other livestock sector except broilers (chicken). Prices of market ready beef steers are at a four year high, and are projected to increase in 2008. More beef is imported than exported in the United States.

According to USDA's Economic Research Service, in 2007 the retail value of the beef industry was \$74 billion. In the United States alone, 28.1 billion pounds of beef were consumed in 2007, another 1.4 billion pounds were exported. Prices in 2007 set an all-time record at \$4.16 a pound (USDA).

### **Current Policies Affecting the Cattle Industry**

Several current agricultural policies affect the cattle industry either directly or indirectly. Policies directly affecting the industry include trade issues, country of origin labeling, and animal identification. Indirectly affecting the cattle industry are policies on ethanol production and land conservation. These

policies, whether they affect the market directly or indirectly, have the potential to greatly change the face of the beef industry.

After the scare of BSE (more commonly known as “Mad Cow” disease) in the United States, many importers of American beef closed their borders to US beef. Closed borders meant less demand and ultimately a lower price received by producers. Since this event, some countries have only partially opened their borders while others have kept them closed. Japan, a large importer of U.S. beef, has been one of these countries slow to reopen trade lines. The United States government has been working with these nations to once again allow American beef into their countries. Congress has also been working to find ways to increase demand in domestic markets.

To potentially differentiate American beef from imported beef, Congress passed a mandatory Country of Origin Labeling (COOL) policy as part of the 2002 farm

bill. This policy requires that, among other products, beef, pork, lamb, and fish sold in the United States have a label determining its county of origin (USDA). Although an implementation date of September 30, 2004 was established, the policy is still only voluntary. Implementation of a mandatory policy has been pushed back until September 2008. Effects of COOL will be discussed in detail later.

Ethanol policy in the United States was not intended to affect the livestock sector. Ethanol production has been subsidized by Congress which has created a huge demand for corn, a key ingredient of ethanol. This outward shift in demand has greatly increased the price of corn to never before seen highs. Corn, a major input in most livestock industries, can have an effect on the profitability of these industries if prices are high. As grain prices rise, so do feed prices which increase the cost to produce of livestock. As a result, either higher meat prices will be needed to

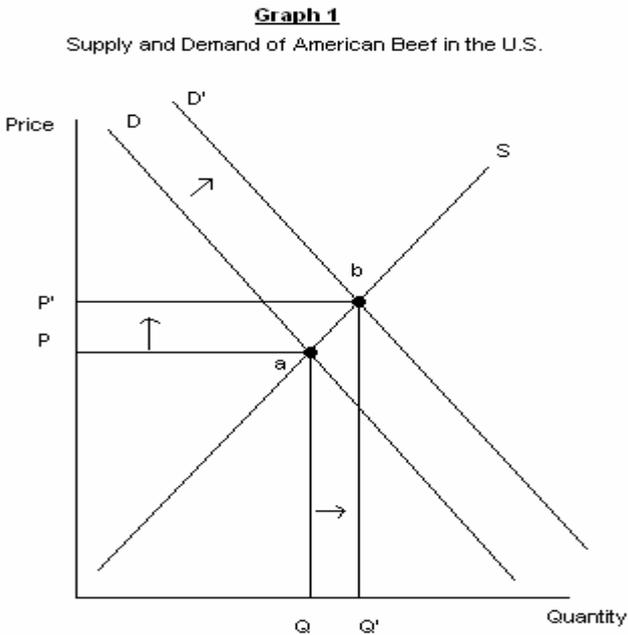
combat this higher cost or an alternative feed source will need to be found.

### **Policy Analysis of COOL**

With the implementation of a mandatory Country of Origin Labeling, many outcomes are possible. According to Dr. C. Parr Rosson, an International Agricultural Economist at Texas A&M, U.S. products can be affected in one of many ways. American products may have a higher demand as consumers favor U.S. products. Another possibility is American consumers may actually prefer to buy foreign goods. In this case, differentiating domestic products would actually decrease demand of domestic goods. A third outcome is that neither American nor foreign products are preferred more than the other (Rosson).

If American products are actively sought out by consumers in the U.S., demand will shift out. The market effects of such a shift can be seen in graph 1. As demand shifts out (D to D'), price of American beef will

rise above current levels ( $P$  to  $P'$ ). The equilibrium point will move from point  $a$  to point  $b$ , causing quantity supplied and demanded to increase ( $Q$  to  $Q'$ ). Both producer and consumer welfare will increase. Producers will be able to sell more product at a higher price, while consumers will be able to buy more of the products that are in high demand. In this case, both consumers and producers win.



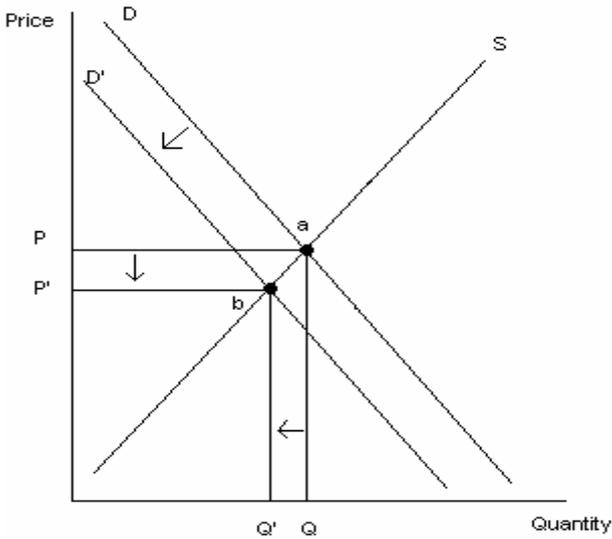
In a Country of Origin Labeling system, not only will products that originate in America be labeled so, but foreign products will also be classified by their country of origin. If consumers in America see a higher quality in the foreign products, they may prefer the foreign goods. Demand for foreign beef would bring along with it a decrease of demand for domestic beef. This could be possible, for example, if American consumers like Australian grass feed beef (or see it as a healthier choice) and pay a premium for such a product. Graph 2 illustrates such a situation. As demand for foreign products increase, U.S. product demand shifts back (D to D'). This causes a lower price (P to P') and quantity supplied and demanded (Q to Q') for American beef. In this situation, producer welfare in domestic markets drops as their products are in less demand and they must accept a lower price for the products they do sell. Higher exports of American beef may be likely, as the supply in other markets drops as more foreign beef is

imported into the United States. Some gains in producer welfare are likely from exports but they may not counter the loss of welfare in the domestic market. Consumer welfare for American beef, as shown on the graph, also drops but is supplemented by an increase in consumer welfare in foreign markets. If demand for American beef were to drop under COOL, producers could potentially be worse off and consumers would be better off.

As mentioned, another potential outcome of a mandatory COOL is that consumers in the United States are indifferent when choosing beef products in grocery stores. In this scenario, consumers buy products strictly on price, and in a competitive market there would be little difference in prices of foreign goods and domestic goods (Rosson). This would cause no important shifts in either market.

**Graph 2**

Supply and Demand of American Beef in the U.S.



### **Policy Conclusions of COOL**

Upon fully implementing a mandatory Country of Origin Labeling program, consumers and producers have the potential of being either positively or negatively affected. The intent of such a policy is to affect the markets for American beef in a positive way, but as

shown, that depends on the preferences of domestic consumers.

American consumers have the potential to benefit in all three scenarios. Their products will be labeled and personal choices can be made to fully optimize their welfare. Whether they prefer domestic or foreign goods, they will now have these products differentiated on store shelves. The only potential downside for consumers of such a policy is if Congress passes along the cost of implementing COOL to taxpayers.

The positives and negatives of COOL for cattlemen in the United States is a little more complicated because of the three different possible scenarios. Producers also have the potential to gain in the three situations. If domestic beef is preferred due to the quality and safety of the food, cattlemen have the potential to make huge gains. If foreign products are preferred, producers will have to rely on export markets

to make up for what they lose in domestic markets. This would create a little more uncertainty for beef producers. Again, the costs of this policy determine if producers gain. If Congress passes laws implementing COOL onto the cattlemen, large gains will be necessary to overcome the implementation expenditures.

Many different policies have shaped the cattle industry. A few policies include international trade and renewable fuels. With the implementation deadline approaching for a mandatory Country of Origin Labeling, COOL will once again be a major discussion in Washington, D.C., for months to come.

<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007 1/</b>	<b>2008</b>
Annual	Annual	Annual	Annual	Annual
24,548	24,683	26,153	26,415	<b>26,300</b>
20,509	20,685	21,055	21,942	<b>23,045</b>
195	187	185	183	<b>179</b>
34,063	35,365	35,752	35,949	<b>36,975</b>
5,454	5,504	5,686	5,937	<b>6,090</b>
85,441	87,097	89,483	91,061	<b>93,244</b>
6,365	6,411	6,494	6,409	<b>6,485</b>
84.75	87.28	85.41	91.82	<b>88-94</b>

cwt

104.76	110.94	107.18	108.18	<b>102-108</b>
52.35	54.36	47.56	52.12	<b>50-52</b>
96.69	97.76	77.31	84.93	<b>88-94</b>
52.51	50.05	47.26	47.09	<b>41-43</b>
74.10	70.80	64.4	76.40	<b>73-78</b>
69.70	73.40	77.0	82.10	<b>77-82</b>
82.20	65.50	71.8	114.4	<b>107-114</b>
460	698	1,145	<b>1,431</b>	<b>1,670</b>
3,679	3,599	3,085	<b>3,048</b>	<b>3,120</b>
180	180	190	<b>192</b>	<b>200</b>
2,181	2,665	2,997	<b>3,180</b>	<b>3,685</b>
1,099	1,024	989	<b>985</b>	<b>965</b>
4,784	5,203	5,272	<b>5,801</b>	<b>5,900</b>

442	570	546	<b>562</b>	<b>605</b>
8,506	8,192	8,763	<b>9,936</b>	<b>10,800</b>

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Demand Estimates and Supporting Materials.

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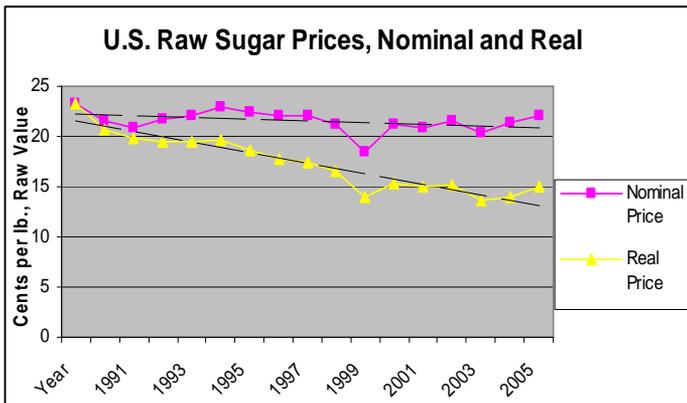


**Clayton Jacobsen**  
**Analysis of U.S. Sugar Policy**

**Background**

America provides a great market for sugar and sugar growers. We are the largest consumers of sugar and sugar containing products in the world, as well as one of the largest producers. A briefing of the commodity reveals that nearly all of the sugar processed in America comes from either sugar beets or sugarcane. More specifically, sugar beets account for approximately 54% of total sugar produced while sugarcane accounts for 46% (ers.usda.gov). Sugar is unique when compared to other commodities because it cannot be stored for any considerable amount of time. This becomes very important when examining policy related to sugar in that

the primary commodities of sugar beets and sugarcane are not the items that are governmentally subsidized. Instead, policy is focused on processed sugar, and thus, this case will focus mostly on sugar processors and refineries. This uniqueness is also relevant when we discuss the prices of raw sugar in that we are talking about processed raw sugar as provided by refineries rather than bushels of sugarcane or pounds of sugar beets. Also important for our discussion is the current price of sugar, which tends to range around \$.21-.22 per pound (see exhibit one, (sugaralliance.org)).



Sugar is grown in tropical climates and thus, is grown mostly in the four states of Texas, Louisiana, Florida, and Hawaii (ers.usda.gov). It is shipped by barge (mostly in Texas), train, or truck to refineries in Houston, Williamsburg, or other cities in America for the sucrose to be extracted and processed. Domino Sugar, Imperial Sugar, and other refineries such as these will be the focus of the majority of farm policy.

### **Description of Current Policies**

There are two main provisions where sugar policy is concerned. The first is the price support loan program. America's current loan rate for raw sugar is \$.18/lb. for sugar beets and \$.229/lb. for sugarcane and is issued to processors rather than sugarcane or sugar beet growers (ers.usda.gov). This, as mentioned earlier, is because these crops cannot be stored. In order to reduce the loss of sucrose, sugar cane and sugar beets must be processed hastily. Once the commodity is in raw sugar form, it can be stored, transported, sold, or

processed further. In order to qualify for government loans, sugar processors must provide the growers with a proportionate part of the loan payment so that the farms can still receive reasonable profits. The loan rate for in-process sugar is 80% of the original loan rate and applies to syrups, or sugar that is still in liquid form. Such issued loans are non-recourse and must be repaid after 9 months to the Commodity Credit Corporation (CCC) in processed raw-sugar form ([ers.usda.gov](http://ers.usda.gov)). When sugar is used as repayment to the CCC instead of money, a “forfeiture” has occurred.

One of the provisions of the most recent farm bill in 2002 requires that the costs to the Federal Government be minimized to the highest extent possible ([ers.usda.gov](http://ers.usda.gov)). Thus, a large incentive to minimize the forfeiture of sugar to the CCC is created because raw sugar is not as valuable to the government as money is. Another way practiced to reduce government costs is a Payment In Kind (PIK) method. This allows for the

USDA to accept bids from sugar processors for CCC inventories.

The second main provision in sugar policy is the tariff-rate quota (TRQ) import system. This import quota operates on a two-tier system. A lower tariff rate is issued on imports when they amass to a certain quantity volume. Once the amount of imports passes this level, however, a higher tariff rate is applied. There are some exceptions *and* restrictions to this tariff, however. For example, America has agreed to import at least 1.256 million STRV (short tons, raw value) of sugar from Uruguay in the Uruguay Round of the General Agreement of Tariffs and Trade ([ers.usda.gov](http://ers.usda.gov)).

To touch base on some recent changes to sugar farm policy, we will now focus on the 2002 Farm Bill and the new provisions it introduced. The 2002 Farm Bill terminated market assessments on sugar. These market assessments were mandatory monetary contributions charged to sugarcane and sugar beet growers for

advertisement, marketing, and policy charges.

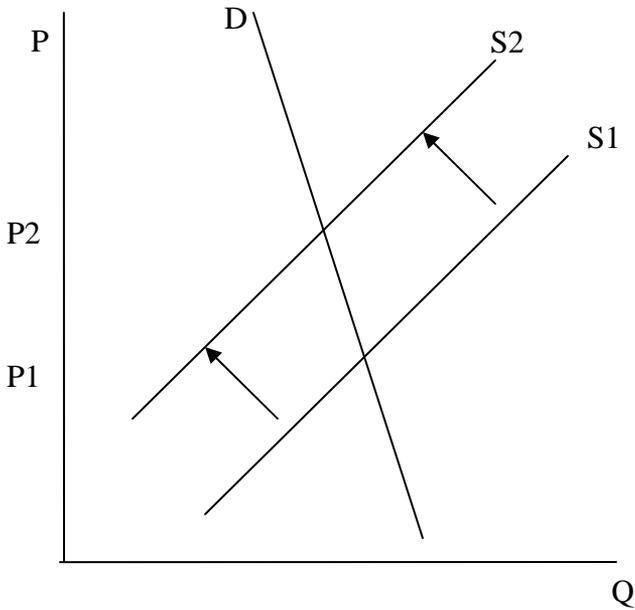
Previously, 1.375% of the loan rate was charged to growers of sugarcane and 1.47425% of the loan rate was charged to growers of sugar beets ([ers.usda.gov](http://ers.usda.gov)). Also terminated in the 2002 Farm Bill were forfeiture penalties. These penalties had required sugar processors to pay \$.01/lb. for sugar forfeited to the CCC for loan reimbursement ([websters-online-dictionary.org](http://websters-online-dictionary.org)).

### **Policy Analysis**

As is generally known amongst the agricultural public, the main goals of the 2002 Farm Bill were to maintain a reduced government cost system and to stimulate the farm economy. This is one of the reasons for the implementation of the PIK method for sugar. It costs money for the government to store sugar that is accepted by the CCC as reimbursement or bought from processors as surplus. When the government pays its debts to processors in sugar form rather than money, it

retains some of its monetary assets. At the same time, this allows for a reduction in the amount of sugar that is stored by the CCC and thus, a reduction of storage price.

While the PIK method applies to one of the major goals of the 2002 Farm Bill (reduced government costs), the tariff-rate quota import system plays a hand in stimulating demand and providing an adequate supply of sugar at a reasonable price. The TRQ reduces the amount of sugar imported into America, allowing for a reduction of total supply. This allows for a more domestic-oriented market and promotes a reasonable price for processors (see graph below).



- S1 – This is the total supply including unregulated imports
- S2 – This is the new supply after imposing regulation on imports
- D – The demand for sugar in America is relatively inelastic
- P1 – This is the price received by farmers prior to the TRQ
- P2 – This is the new post-TRQ price received by farmers (clearly higher)

One more thing to note about the farm policy introduced by the 2002 Farm Bill is the effect of the terminated forfeiture penalties and market assessments. Because of the elimination of forfeiture penalties, the support price for sugar was raised. This has caused the number of forfeitures to increase. Also, the mandatory marketing assessment fees are no longer a burden to sugar farmers. This could significantly decrease expenses and increase returns for both farmers and processors.

### **Policy Conclusions**

After having reviewed the policies and their effects on the market for the sugar commodity, we can now draw conclusions. The Payment-In-Kind methods, and other cost-reduction plans, have done a good job of decreasing government expenditures, which has accomplished one of the main goals of the 2002 Farm Bill. However, closer examination of the TRQ may reveal both positive and negative outcomes. While the

TRQ plan succeeds in stimulating the farm economy, it may not be so beneficial to domestic consumers and foreign producers. Sugar prices will have gone up in America and sales from exports from countries like Mexico and Uruguay will have gone down. This is not a big problem, though, since demand for sugar in America is relatively inelastic. People do not generally notice a minor penny increase in sugar when they are doing their weekly grocery shopping.

Overall, the 2002 Farm Bill and agricultural policy together seem to have aided the sugar market. Farm prices have gone up in the last four years and government expenditures have slightly diminished. Without government regulation, domestic farmers and processors would lose their current prices and many farms and refineries would go out of business. Much more sugar would be imported since other countries sell for lower prices. American consumers would benefit by experiencing reduced prices on sugar and other

commodities, but the economy in general would not be stable. As long as there is agricultural policy, we should see more stable prices and markets for both producers and consumers.

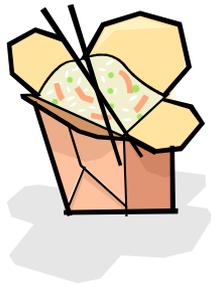
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**Cacey Corder**  
**U.S. Rice Policy Analysis**

Rice has always been an important food commodity for the United States as well as many other countries. Rice was first grown in China, and was brought to the United States by the settlers in the 1600's. Ever since then the market has continued to grow; now the U.S. does not just produce rice but also imports and exports it. Rice is now grown in many parts of the world

and in many other countries. Over the years there have been many policies implemented in rice farming (2).

### *Background*

Since rice was first introduced, the production, prices, and policies have been constantly changing. Rice was first produced in China, and when it was brought to the United States it was grown in the Carolinas and Georgia because of the low marsh land and rivers. By 1976, the port of Charleston was exporting 4,500 metric tons of rice (2). The Civil War put an end to the plantation era, and the destruction of hurricanes moved rice westward, but the high labor costs kept the market from expanding. In 1884, the machine era and rice production gave notice to the prairie land of southwestern Louisiana and southeastern Texas. The soils were able to hold up against use of heavy equipment, this allowed for the huge increase in mechanization that followed, which established today's major southern rice growing states. The states include

Arkansas, Louisiana, Mississippi, Missouri, and Texas

(2). American rice production has become the most advanced and efficient in the world due to the increases in technology. American rice only requires seven man-hours of labor per acre, while some Asian countries still require 300 hours per acre (2).

Even though the production of rice is not as high in the United States as it is in other countries it is still an important crop, but production has steadily increased throughout the years. It has gone from 3,500 pounds per acre in the 1960's to 7000 pounds per acre in 2004 (7). Almost 90 percent of rice consumed in the United States is produced there, and the U.S. is also one of the largest exporters of rice (2). The graph below illustrates the United States domestic use, exports, and the predicted numbers until the year 2015 in consumption (6).

### Rice: Domestic use and exports



Figure 1

Source: University of Arkansas Agricultural Division (6)

There have always been many policies involved in rice farming that have changed over the years. The target price was first introduced in the 1970's; this would allow a specific level of return per hundredweight (3). In 1986 Marketing Loans were put into effect, allowing farmers to repay their loans at a reduced rate when the world

price of rice fell below the loan rate (3). The prices, loan rates, and target prices are always changing to better support the farm price of rice. The target price depends on the market price if the market price goes up then the target price will decline (1). The market price is always going up and down; in turn this causes the farm price and other prices to change also. The table below shows the farm price, loan rate, target price, world price, and direct payments from 1985 to 2001.

#### *Description of Current Policies*

The current policies for rice were created in the 2002 Farm Bill, and include many programs such as direct payments, counter-cyclical payment, and marketing loan programs. The marketing assistance loan program is set to help the producers when market prices are low. With this program rice producers can repay nonrecourse loans at a lower rate than the original rate when the adjusted world price for rice is below the loan rate. The difference between the adjusted world

price and the national average loan rate for rice is the payment rate. The loan rates are fixed in legislation. The current loan rate for rough rice is \$6.50 per cwt (1). However, there are separate loan rates calculated for different classes of rice, long, medium, and short, that are used to achieve the national average loan rate. The 2002 Farm Bill no longer requires that producers enter into agreements for direct payments to be eligible for loan program benefits. All current rice production is eligible. There are two ways in which producers may receive the government payments, one way is marketing loan gains (MLG) and the other is loan deficiency payments (LDP). MLG is when producers repay their loans to the CCC at a rate lower than the loan rate, it is the difference between the loan rate and the repayment rate. With an LDP, instead of taking out commodity loans producers can choose to receive a payment when the adjusted world price is below the loan rate (1).

The Farm Bill also includes direct and counter-cyclical payments. Under the act, farmers have the chance to choose a method that is based on historic production, to determine base acreage for both direct and counter-cyclical payments. In the 2002 Farm Bill payment acreages are set at 85 percent of base acreage (1). The direct payments yields are \$0.52, the same as they were in the 1996 farm bill. Farm owners enroll yearly for counter cyclical payments; they then receive their direct or counter cyclical payments each year no matter what crop was planted on their cropland that year. Eligible landowners and producers that enter into an annual agreement can receive direct decoupled payments. The 2002 Farm Bill set the payment rates for rice at \$2.35 per cwt (1). Contract holders have counter-cyclical payments made available to them when the effective price is less than the target price. The target price for rice is \$10.50 per cwt. The effective price is equal to the sum of two things; the first thing is the sum

of the higher of the national average farm price for the marketing year, or the national loan rate, and the other one is the direct payment rate for the commodity. There is a minimum effective and a maximum payment rate. The minimum effective price is \$8.85, which is the sum of the \$6.50 per cwt loan rate and the \$2.35 per cwt direct payment. The maximum payment rate is \$1.65 per cwt, which is \$10.50 target price minus \$8.85. The product of the payment rate, payment acres, and the counter-cyclical payment yield is the payment amount (1).

There are also payment limits that are set for rice farmers. Direct payments have a limit of \$40,000 per person and counter-cyclical payments are set at \$65,000. MLG and LDP have a limit of \$75,000 per person. If a producer has an income over \$2.5 million, over a three year period, then they are not eligible for payments, unless more than 75 percent of adjusted gross income is from agriculture (1).

The current Farm Bill also has export programs and policies. Two of the programs are the Export Credit Guarantee Program (GSM-102) and the Intermediate Export Credit Guarantee Program (GSM-103) (2). GSM-102 covers private credit for up to three years, and GSM-103 covers private credit for three to ten years. The two programs assure United States exporters that they will be paid. There is also a Supplier Guarantee Program (SCGP), which issues financing. Under SCGP the CCC guarantees a short-term financing of up to 180 days that guarantees a portion of payments due from importers. Exporters extended payment directly to importers for the purchase of United States agricultural products (1).

The United States government has three programs that provide food aid overseas. These programs are called P.L. 480, the Section 416 program, and the Food For Progress (FFP) program. Low-interest loans are given to qualified countries that purchase

United States agriculture commodities by the USDA under the P.L. 480 section I. Recipients usually purchase rice on the open market under title I, and under title II the United States donates rice to the least developed countries. Donations of CCC owned surplus commodities are given to developing countries under the section 416 b, as well as allows the surplus to be used in the P.L. 480 title II program and the FFP program (1).

The Farm Bill also has many environment and conservation programs. The Land Retirement Programs comprise the Conservation Reserve Program, the Conservation Enhancement Program, Wetland Pilot Program, and the Wetlands Reserve Program. All of these programs are set to remove land from production. Other programs such as the Environmental Quality Incentives Program and the Conservation Security Program are given funding and support through the bill (1).

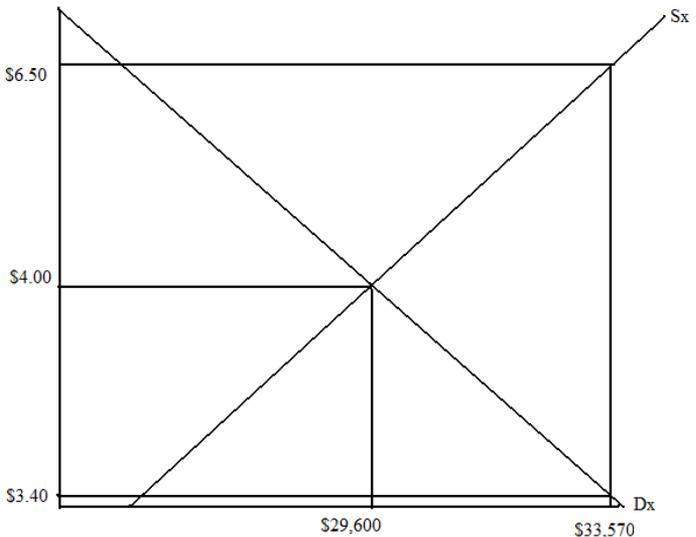
The 2002 farm Bill has already expired, but has been given an extension for a few more weeks. When the new farm bill comes out many of these programs and prices could change.

### *Policy Analysis*

One of the Government programs used in rice production is the marketing loan program. In this case the loan rate is set at \$6.50, the price of rice is \$4.00, and the current production is 29,600 cwt (4). To determine the new farm price we need to use elasticities. Assuming the elasticity of supply is  $-.72$  and the change in quantity is  $13.51\%$  we can determine the new farm price as being \$3.40. The loan deficiency is found by multiplying the loan rate. We can now determine the quantity supplied by using the elasticity by assuming that the elasticity of supply is  $.22$  and multiplying that by the change in price to determine a  $45\%$  increase so the quantity supplied is 42,920. After doing that we can

determine the loan deficiency payment by subtracting \$6.50 from \$3.24 and getting a payment of \$3.10. Last we can calculate the cost of the marketing loan program to the government by multiplying loan payment by the quantity supplied and getting \$104,377 million. The figure below shows the changes described above.

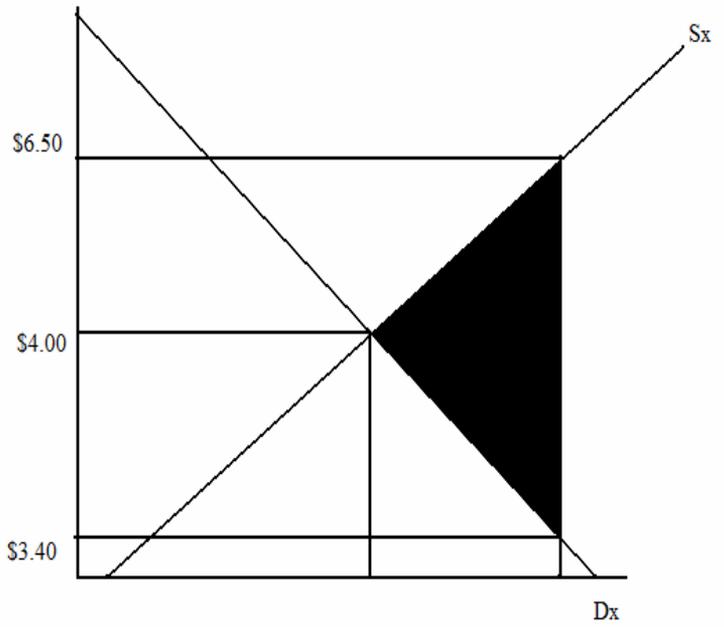
Figure 3 Marketing Loan Program



### *Policy Conclusion*

Once we have determined all the numbers in the graph from the above section we will be able to tell the effects that this program has on society. The domestic supply and consumption are both going to increase. Exports are going to increase while export price will decrease. The farm price per unit by the farmer will increase, and the consumer price will decrease. Live-stock numbers are going to increase, in turn causing their prices to go down. This program is one of the only ones where we are going to see the consumer cost decrease. Taxes are going to increase, unfortunately, this can be a very costly program for the taxpayers. The net society effects are going to be negative. The shaded area in the graph below shows the loss to society, this makes producers better off.

Figure 4 Net Society Effects



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**US Rice Prices**

<b>Year</b>	<b>Farm price</b>	<b>Loan rate</b>	<b>Target price</b>	<b>World price</b>	<b>Direct</b>
				<b>\$/cwt</b>	<b>Payments</b>
1985	6.53	8.00	11.90	3.62	3.90
1986	3.75	7.20	11.90	3.51	4.70
1987	7.27	6.84	11.66	5.99	4.82
1988	6.83	6.63	11.15	6.54	4.31
1989	7.35	6.50	10.80	6.05	3.56
1990	6.70	6.50	10.71	5.46	4.16
1991	7.58	6.50	10.71	5.95	3.07
1992	5.89	6.50	10.71	4.95	4.21
1993	7.98	6.50	10.71	6.07	3.98
1994	6.78	6.50	10.71	6.10	3.79
1995	9.15	6.50	10.71	7.71	3.22
1996	9.96	6.50	*	7.66	2.77
1997	9.70	6.50	*	8.45	2.71
1998	8.89	6.50	*	7.37	2.92
1999	5.93	6.50	*	4.49	2.82
2000	5.56	6.50	*	3.20	2.6
2001/	4-4.50	6.50	*	3.00	2.1

**Source:** Rice Situation and Outlook Yearbook/RCS-2001/Nov. 2001 (5).

\*Eliminated in 1996 Farm Act

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**Erica Castillo**  
**Observation of Nature: Insects will Forage on Bait.**

**Testable Hypotheses:** Insects will come equally to sugar-based and oil-based bait.

**Materials and Method:** Peanut butter (PB) and cookie crumbs (CC). PB was placed on three plates and CC on another three plates. A PB plate and a CC plate were placed one meter away from each other, at three locations. The three locations were approximately 3 meters from each other. The plates were placed outside at 9 A.M. and removed at 2 P.M. and the outside temperature was 90-93 F. Observations were made on the density of insects that were present at each plate and

what insects were present. These observations were made every two to three hours and data were recorded.

**Results and Conclusions:** According to the data collected, the insects that were attracted to either bait were ants. Both baits attracted ants, although not in equal numbers. At site one and three, more ants were at the plate with PB bait; however, at site two, more ants were present at the plate with CC bait.

**Data Collected**

<b>Peanut Butter Plate</b>	<b>Cookie Crumbs Plate</b>			
<b>Time Checked</b>	<b>Number of Insects at location: 1 2 3</b>	<b>Insects:</b>	<b>Number of Insects at location: 1 2 3</b>	<b>Insects:</b>
<b>9:30 am</b>	<b>70 50 70</b>	<b>Ants</b>	<b>0 20 60</b>	<b>Ants</b>
<b>11:30 am</b>	<b>70 30 80</b>	<b>Ants</b>	<b>40 80 40</b>	<b>Ants</b>
<b>1:30 pm</b>	<b>100 50 80</b>	<b>Ants</b>	<b>80 100 60</b>	<b>Ants</b>

The Chi-square test was used to examine the data. The observed data at each of the three were compared to the data that were to be expected if the  $H_0$  were true.

For the 9:30 A.M. observations, the total number of insects discovered at the six plates was 270. Equal distribution of the insects would mean 45 insects per plate. The average density at the PB plates and the density at the CC plates were compared. For PB, the average density is 63.3 and for CC it is 26.7. The data were now applied in the Chi-square test ((observed minus the expected) squared) divided by the expected,  $((63.3 - 45)^2) / 45 = 7.442$ . Consulting the Student's t table, the number falls between 0.05 and 0.025. From the statistical data in this calculation, the null hypothesis was rejected.

For the 11:30 A.M. observations, the total number of insects discovered at the six plates was 340. Equal distribution of the insects would mean 56 insects

per plate. The average density of PB plates was 60; and for the CC plates, 53.33. The data were applied in the Chi-square test  $-\frac{((60-56)^2)}{56} = .2857$ . In the Student's table, this number falls below 0.4. From the statistical data in this calculation, it is not possible to reject the null hypothesis.

On the last trial, at 1:30 P.M., the total number of insects discovered at the six plates was 470. Equal distribution of the insects would mean 78 insects per plate. The average density of the PB plates was 76.66; for the CC plates, 80. The data applied to the Chi-square test results in  $-\frac{((76.66-78)^2)}{78} = .0230$ . According to the Student's t table, the number falls below 0.4. From the statistical data in this calculation, it is not possible to reject the null hypothesis.

### Student Table

df/p	0.40	0.25	0.10	0.05	0.025	0.01	0.005
1	0.3220	1.000	3.077	6.3152	12.700	31.822	63.654

According to a study in which the diet of the fire ant was studied, ants are “considered oil-loving feeder[s], however, carbohydrates are essential ingredients”<sup>1</sup> in their diet. Glucose, fructose, sucrose, maltose, turanose and raffinose have all been determined to be an imported requirement of fire ant diet. It was noted in this study that a great amount of what was being taken back to the colony were carbohydrates.<sup>2</sup>

According to the data collected from this experiment, the null hypothesis can be rejected with statistical testing. The insects (ants) present were not present in equal numbers at the bait sites that were sugar-based and the bait sites that were oil-based. In all

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<sup>1</sup> Lofgren, C. S., Seawright, J. A., Vander Meer, R. K., “Specificity of the Red Imported Fire Ant (Hymenoptera: Formicidae) Phagostimulant Response to Carbohydrates.” *Florida Entomologist*. (Mar1995) v. 78 (1), p. 144-154.

<sup>2</sup> Lofgren, C. S., Seawright, J. A., Vander Meer, R. K., “Specificity of the Red Imported Fire Ant (Hymenoptera: Formicidae) Phagostimulant Response to Carbohydrates.” *Florida Entomologist*. (Mar1995) v. 78 (1), p. 144-154.

the observations made, except for two, the ants were present in higher numbers in the oil-based bait. This emphasizes the reason that ants are considered “oil-loving” feeders, although other studies may prove them otherwise. It is possible that more ants gathered at the oil-based bait by “additive independent discoveries” but even more likely that they did so by the “recruitment of workers.”<sup>3</sup>

Fire ant dietary needs (carbohydrates and sugars) can all be supplied by certain plants and seeds, making them a threat to crops that grow them. Fire ants have been reported pests of seeds of corn, peanuts, beans, and soybeans. They are a threat to crops that produce their dietary needs and require that action be taken by farmers. A risk assessment may be required in such a case. The risk can be measured as the potential

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<sup>3</sup> Lofgren, C. S., Seawright, J. A., Vander Meer, R. K., “Specificity of the Red Imported Fire Ant (Hymenoptera: Formicidae) Phagostimulant Response to Carbohydrates.” *Florida Entomologist*. (Mar1995) v. 78 (1), p. 144-154.

hazard times the exposure. That is, the risk or potential damage, can be calculated by multiplying the amount of pesticide that will be required times how effective the pesticide will be. There are models that can calculate these data by sampling an area. <sup>4</sup>

It is important to conduct studies to determine the dietary needs and preferences of ants, as they are becoming a threat to crops and require treatment. Crops, however, are not the only thing that fire ants are attacking; they are also a direct and immediate threat to human health. Ants are normally found outside, but they can infest the inside of homes, and it can be difficult to get rid of them. It is difficult to get rid of ants in an area when they are outside and even more difficult when they are inside a home. There are only few indoor treatments/insecticides for ants that are registered to be

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<sup>4</sup> Birt, Andrew. "Population Dynamics of Insects in Landscapes: Risk, Hazard, and Exposure." Sept. 2007. (seminar)

used indoors.<sup>5</sup> There have been several cases in which fire ant bites have been the cause of death for an individual, usually one that cannot avoid being bitten repeatedly, like someone who is handicapped, elderly (nursing homes), or an infant. <sup>6</sup> In such cases, humans have become the bait for the fire ants and are able to supply them with their dietary needs. But what attracts them to humans in the first place? These are important areas of study that have not been completed.

While fire ants continue to become indoor pests, the need for indoor pesticides and the reasons for their attraction to humans require further research.

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<sup>5</sup> deShazo, Richard D., Williams, David F., "Multiple Fire Ant Stings Indoors." *Southern Medical Journal*. (July 1995) v. 88 (7), p. 712

<sup>6</sup> deShazo, Richard D., Williams, David F., "Multiple Fire Ant Stings Indoors." *Southern Medical Journal*. (July 1995) v. 88 (7), p. 712

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**Amanda Dube**  
**Texas Coastal Wetland Conservation**

Various kinds of policy, at all levels of government, have been developed to protect plants, animals, water, and land. Without these policies, certain species would most likely be extinct, and other resources would be even more depleted than current levels. Unfortunately, certain valuable resources need further protection for their continued sustenance. Texas coastal wetlands are in need of such protection, especially on a state level. Without further policy to protect the wetlands, there is great risk in losing them. Defined as any area “including swamp, marsh, bog, prairie pothole, or similar area, having a predominance of hydric soils that are inundated or saturated by surface or

groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, the growth and regeneration of hydrophytic vegetation,” Texas wetlands, especially those along the coast, are extremely valuable in both an ecologic and economic sense (Texas Parks and Wildlife Department 4). In many cases, the economic profit to be gained in destroying wetlands is often seen as more important than the ecologic benefits of keeping them intact.

The coastal wetlands of Texas are of great importance for a variety of reasons, especially as a socio-economic asset. The list is almost endless when considering how wetlands affect economies. Over 30 % of the state’s population, who hold 70 % of the jobs in Texas, resides within 100 miles of the coast (Moulton et al. 7). Obviously, wetlands provide a rich fishery resource, and many of residents depend on the resource. Millions of pounds of fish and shellfish are caught in Texas coastal wetlands every year, contributing not only

to coastal economies, but also to the state and national economy (Texas Wetlands Conservation Program 26). Commercial fishing along the Texas coast brings in \$400 million each year, and provides 30,000 jobs for residents (Moulton et al. 6). This region is responsible for contributing a major portion of the nation's chemical, gas, and oil products, resources that have a major, often negative impact on the nation's economy (Moulton et al. 7). Even wetland-based recreation contributes greatly to the economy. Nationally, in 1991, millions of hunters and fishermen spent \$20 billion on fish and game stamps, leases, and equipment to bag or catch species that depend upon the wetland habitat (Texas Wetlands Conservation Program 27). In Texas, in 1991, 11,000 jobs depended on recreational fishing, and anglers spent \$400 million (Moulton et al. 6). In that same year, 30,000 to 40,000 waterfowl hunters spent \$300 million, most of which occurred in coastal areas (Moulton et al.

6). Wildlife viewers and photographers who visited coastal wetlands spent \$6 billion (Moulton et al. 6).

Thousands of jobs depend on the health of coastal wetlands, and billions of dollars are spent on extracting and enjoying their resources, but the wetlands benefit people in other ways, which can have both direct and indirect economic impacts. One of the most important functions of coastal wetlands is to provide a natural barrier between the land and the ocean (Texas Wetlands Conservation Program 25-26). Healthy, intact wetlands can help save millions of dollars by lessening the effects of damaging winds and flooding because of hurricanes and other ocean-related storms (Texas Wetlands Conservation Program 25). Similarly, coastal wetlands can help prevent erosion (Jacob et al.). Vegetation found in wetlands helps hold the soil in place, slowing the effects of the constant contact with water and changing water levels (Texas Parks and Wildlife Department 9). In this way, developing coastal

wetlands for residential or commercial use can prove costly in the long run.

The economic importance of Texas coastal wetlands stems from and is closely related to the wetlands' immeasurable ecological and environmental importance. Hundreds of species are in coastal wetlands. In fact, 95 % of marine species found on the Texas coastline as well as those found in the Gulf of Mexico depend on the wetlands at some time (Allison). All types of animal live in coastal wetlands, including invertebrates, fish, shellfish, reptiles, amphibians, mammals, waterfowl, wading birds, and shorebirds (Moulton et al. 7). Many of those species, especially certain waterfowl, are endangered or threatened species that solely depend on the unique habitat coastal wetlands provides (Moulton et al. 7). Wetlands emit high levels of primary productivity because of their ability to hold nutrients, building the base for a large, energy-rich ecosystem (Texas Wetlands Conservation

Program 25). Since wetlands can hold nutrients and sediment well, they are necessary to trap pollutants from entering larger bodies of water (Texas Parks and Wildlife Department 9). Therefore, coastal wetlands act similar to a huge filter, preventing upriver, inland pollutants from entering bays and estuaries, and cleaning water that becomes groundwater (Jacob et al.).

The ways in which humans and fish and wildlife depend on coastal wetlands in Texas are indeed countless. This strong dependence most definitely warrants a respect for wetlands and a need for their conservation. Government agency studies comparing the status of coastal wetlands in Texas in the 1950s to the 1990s, said 5,400 acres of wetlands were lost each year in that time period (Moulton et al. 23). In 1995, 4,105,343 acres of coastal wetlands existed in Texas, but by 1992, that number was down to 3,894,753 acres (Moulton et al. 11). Human activity can account for most of the loss of coastal wetlands, directly and

indirectly, large part because of an evident increase in population size along the coast. Loss of coastal wetlands, particularly over the past 50 years, can be attributed to agricultural conversion of land, silviculture practices, urban sprawl, and rural development (Moulton et al. 22). Numerous “[alterations] of normal hydrologic flow,” including filling or draining wetlands, diverting or blocking channels, construction projects, and pollution, have taken their toll on coastal wetlands and their inhabitants (Texas Wetlands Conservation Program 31).

Fortunately, some policies have been developed to protect this valuable resource, and such efforts have been somewhat successful in slowing the rate of wetland destruction. Federal legislation, such as the Clean Water Act of 1948, the National Environmental Policy Act of 1969, the Emergency Wetlands Resources Act of 1986, and the North American Wetlands Conservation Act of 1989, has determined appropriate use and protection of wetlands across the United States (Moulton et al. 23).

No state mandated legislation is in place to specifically conserve Texas wetlands. The Texas Wetlands Conservation Plan, of 1997, and overseen by the Texas Parks and Wildlife Department, provides landowners incentives in the form of financial and technical assistance to conserve wetlands. However, the program is completely voluntary, and therefore only private landowners willing to participate are correctly or at least attempting to, manage wetlands on their property. A state policy is needed to protect coastal wetlands as a whole, for the sake of the wildlife that depend on them, and for the sake of human dependence on them.

One policy would be to implement a policy that requires that private property owners of coastal wetlands participate in conservation efforts, as deemed appropriate by scientists, while state agencies continue conservation efforts on state-owned land. In regard to Clawson's Analytical Framework, this policy would be both physically and biologically feasible. Management

practices, such as those outlined in the Texas Parks and Wildlife Department's Wetlands Assistance Guide for Landowners proved that coastal-wetland loss can be slowed and even prevented. Such results would undoubtedly benefit hundreds of species of all types of wildlife that rely on the particular habitat. The extent of conservation efforts would determine how much of coastal wetlands are restored, and therefore how many species could again live in the environment for which they are adapted.

When considering society as a whole, this policy would indeed benefit not only coastal residents, but residents throughout Texas, and to an extent, the United States. Because the coastal wetlands' primary role in the economics of industries, including fisheries, recreation, and forestry, their continued existence builds the base for thousands of jobs, upon which thousands of people rely for financial support. Additionally, the conservation of coastal wetlands benefits consumers who

use products derived from the wetlands. Improved wetlands would better protect coastal residents from strong storms, hurricanes, and flooding, which would save not only money, but also human lives. Landowners would attract more, diverse forms of wildlife to their property. However, if landowners were required to conserve wetland on their property, they would lose the use of that land for agricultural or ranching purposes, or development. Management policy would prevent them from using the land in certain ways and require them to expend their money and efforts in ways to improve the status of the wetlands on their property. Supporting necessary practices could prove too costly for some landowners, forcing them off the land, causing other economic hardships, or resulting in breaking the law.

In Texas, a policy such as this would most likely meet a lot of resistance since a high percentage of land is privately owned. Landowners have traditionally been able to use their land as they deem appropriate, and

believe that since they own of the land, they are entitled to do so. Wetlands have been converted into land used for agriculture, grazing livestock, or other types of development. Implementing a state law would increase regulation on land use, in addition to those outlined in legislation such as the Clean Water Act, limiting landowners' rights to their private land. An increasing portion of modern society, however, is recognizing the need to preserve and conserve land and natural resources. Such support would be needed for this policy to be fully effective.

Administering and implementing this law would probably prove difficult and painstaking. The hundreds of thousands of acres of Texas coastal wetland are owned by numerous landowners. Keeping track of whether or not each of those landowners was complying with the law, and were helping to conserve the wetlands would probably require more personnel and funding than is available to state agencies responsible for overseeing the

policy's implementation. Penalties such as monetary fines, or loss of property containing wetlands would encourage the landowner's honest participation, but proving the landowner's true efforts in conserving the wetlands on his property would be very difficult, and perhaps an inefficient use of time for enforcers.

According to Bonnicksen's Iron Law of Consensus, this policy would be successful, as long as landowners were able to actually conserve wetlands in their ownership. Protection of the wetlands would in turn sustain a diverse array of wildlife species that depend on such an ecosystem. Simply conserving the wetland environment increases the survival chances of species that depend on that specific environment, affecting and conserving an entire ecosystem. Although landowners would lose some acreage to conservation efforts, overall, other industries would benefit. Increased area for fish, bird, and game species to thrive in results in economic benefits to those involved in

fisheries and recreation outfitters. Landowners would probably see their property increase in value with higher quality wetlands present. Even those not directly involved in any industry reliant on wetland systems benefit from the protection offered by coastal wetlands in the form of storm and flooding protection.

This particular policy can be carried out in a way that respects all living things. Landowners are allowed to keep and enjoy their land while providing a suitable habitat in which wildlife can live. Conservation of wetlands would benefit not only fish, or only birds, but all sorts of aquatic, marine, and land-dwelling animals, as well as a variety of plant species. In this way, the policy upholds ecological sustainability in that by conserving and properly managing the wetlands, a natural ecosystem can flourish. However, the policy may not be easily sustainable from an economic standpoint. Certain landowners may be unable to manage their land as expected because of financial constraints.

In many cases, this policy would force landowners to choose between keeping the land and keeping their money. Such circumstances would most likely cause this policy to be unacceptable to some landowners. Although the conservation of wetlands would ultimately benefit everyone in the long run, some landowners would be at a disadvantage in being required to manage their land in a certain way. Negotiation would most definitely be required to make this policy work for all landowners.

Another possibility would involve implementing a policy through which private landowners could receive tax breaks, or additional funding for conservation efforts, based on the extent of measures taken to conserve coastal wetlands. This would be very similar to the Texas Wetland Conservation Plan, but would be mandatory instead of voluntary. Based on Clawson's analysis guidelines, this policy is identical to the previous one in regard to physical and biological feasibility.

Economic efficiency is similar in both cases, but economic equity does differ considerably. The second policy provides more assistance, especially on a financial level, for landowners to carry out appropriate management practices. Therefore, landowners, although under a new law, would have the resources necessary to follow the regulations. Those employed in industries dependent on wetlands still benefit in this scenario. The second policy is similarly acceptable in that wetlands are being protected for the betterment of society as a whole, but the different distribution of the financial burden would probably cause some resistance. If landowners were given funding and tax breaks, that money must come from somewhere else, such as other taxes. Nonetheless, the conservation of wetlands is of great importance to a growing number of people, making the second policy acceptable to society, at least when not considering how the funding is provided.

Both policies are similar in that they are difficult to enforce. Under the second policy, officials would have to observe and record not only how the landowner was managing wetlands on his property, but also that expenditures of received funding were justifiable. This, in turn, would require even more work for administrators, and would be challenging in ensuring that everyone was correctly utilizing the resources. However, since the second policy does include incentives such as tax breaks for managing wetlands, landowners would probably be more willing to cooperate since lack of funding can be the determining factor in how or if wetlands are managed.

The second policy is also similar to the first under Bonnicksen's requirements of protecting life-sustaining processes, benefiting all groups involved, and respecting humans and all living things. Compared to the first policy, the second policy probably benefits all groups to a greater extent due to the fact that the

landowners are provided with financial and technical assistance instead of being individually responsible for management practices. The policy protects life-sustaining processes and respects all living things by improving a necessary environment for use by all wildlife. Therefore, in the same way, the second policy is ecologically sustainable. However, from the landowners' perspective, the latter policy is more economically sustainable since his efforts can be compensated. Protecting the wetlands protects economic interests throughout the region, as long as the public is willing to assist in the costs of preserving the resource. This policy would be tolerable to landowners and residents of the region since the costs and benefits of conserving the wetlands are shared. All can contribute some sort of effort to the cause while also enjoying the economic and ecologic advantages of coastal wetlands.

Since both policies promote the mandatory protection and proper management of coastal wetlands,

either policy would be better than no policy at all. However, because of the economic implications in funding the management efforts, the second policy, in which government assistance is granted to landowners, would be the best to implement. The Texas Wetlands Conservation Program has seen success as a voluntary program, but scientific studies and “results indicate that vegetated wetlands...are resources that need additional conservation efforts” in order to survive human impacts (Moulton et al. 23). The second policy conserves coastal wetlands by providing financial and technical means to private landowners. In this way, more than state lands are protected. Since 97 % of Texas land is privately owned, management of that land is necessary but difficult (Texas Wetlands Conservation Program 33). Commonly, two main issues arise when landowners consider conservation efforts: “fear of ensuing regulations and a lack of funds to defray restoration costs” (Texas Wetlands Conservation Program 36). The

policy allows the experts to guide landowners in management while allowing landowners to become more involved in conservation efforts as well as educating them as to how valuable wetlands can be. With the policy, all landowners that have coastal wetlands on their property are forced to comply with certain management methods, without losing the continued use of their land. This policy, very similar to the Texas Wetlands Conservation Plan, would still allow farming, grazing, and recreational practices but in some cases in moderation or using different methods.

Under the policy, private owners would most definitely benefit by receiving aid to improve their land, but the general public would benefit, even if they never directly used the land. Conserving wetlands would create a more efficient storm and flood barrier, affecting people who are miles away from the managed land. Pollution and runoff that enters and contaminates certain water bodies on which humans are dependent

would decrease. Those who work in industries directly related to the health of coastal wetlands would especially be affected by such a policy. Since coastal wetlands are a rich fishery source, the proper management of the resource would have economic advantages resulting in more jobs for residents, and an overall better economic status and production of the region. Not only would humans benefit, but also, and perhaps even more, wildlife that depend on the wetlands. The destruction of this resource may provide new building sites and more developed land, but it inhibits hundreds of species' ability to live where they are adapted to do so. This policy would help ensure that wildlife can thrive in their natural environment, without completely voiding human rights to the land.

A mandatory, collective effort in protecting wetlands would serve to benefit the whole of society. Despite high private ownership of Texas lands, coastal wetlands are a public good because of the protection they

provide to humans and wildlife. State agencies at this point can enforce management and conservation practices only on public lands. Therefore cooperation from the private sector is desperately needed to ensure the sustenance of such a valuable resource. A mandatory law that promotes management but also aids landowners in those practices would be most successful in conserving coastal wetlands. Despite the fact that it is a law, people would be more willing to comply and cooperate when the costs and benefits of conserving coastal wetlands are shared.

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## **Joe Kozlowski Fire Policy**

One of the most detrimental forest policies over the past century was the policy of fire exclusion. Buildup of forest fuels over time has created extremely hazardous scenarios for the occurrence of wildfire. The past ten years alone have seen lives lost, property destroyed, and landscapes altered from extreme wildfires on fire-dependant ecosystems that had lacked fire for so long. One of the most recent advances in wildfire protection and management was the 1995 Federal Wildland Fire Management Policy, which was reviewed and updated in 2001. The 2001 review found and amended problems with the 1995 policy, yet discrepancies and inconsistencies still exist.

One of the most common dilemmas involving wildland fire policy involves the Wildland Urban Interface (WUI). Although fuel reduction has been a high priority for many years, some areas require special treatment and cannot simply be burned to minimize the fuels. As urban areas continue to grow onto wildlands, more and more areas emerge that cannot be burned for management because of proximity of residences. One option proposed by the Fire Management Policy (FMP) is the use of mechanical treatments. These meet resistance from communities as they are viewed as excuses for logging. The public tends to dislike smoke of any sort, preventing the use of fire in semi-distant areas as well, unless conditions are perfect. The FMP provides means for educating the public on wildland fire safety and prevention and even encouraging FIREWISE homes, but implementation is lacking, and hundreds of homes are still at risk, if not lost, every year because of uncontrollable fire from fuel build up.

When a wildfire is started naturally, as long as it can be safely put under control, it will be used to satisfy management plans for the given area, as outlined in the FMP (Douglas et al., 2001). Policy states that fire “will be integrated into land and resource management plans and activities on a landscape scale, and across agency boundaries” (Williams et al., 2003). The problem in this section of policy lies within the requirement for interagency relations. Although such relations are in place and are “expected,” different agencies have different goals, to include private landowners. Simply analyzing the missions of the major agencies under the Federal Wildland Fire Policy exemplifies this. The Forest Service and the Bureau of Land Management have similar missions, seeking multiuse or “health, diversity, and productivity on public lands” (Williams et al., 2003). The National Park Service seeks to preserve natural lands, and the Fish and Wildlife Service aims to “conserve, protect, and enhance habitat” (Williams et al.,

2003). Another twist lies with the Bureau of Indian Affairs focusing on economic opportunity. So, as fire spreads across multiple boundaries and is sought after by multiple agencies, which management plan takes precedence? Blanket plans must be developed among and between agencies so as to allow for the fastest and most efficient means of suppressing or managing fire.

Federal Fire Management Policy calls for approved management plans to be developed for all areas with burnable vegetation (Douglas et al., 2001). This was implemented in the 1995 policy and was still nowhere near completion by the review in 2001. Not only is there a vast number of plans throughout the nation that must be developed, but they all must be approved and able to be understood by any authority who may arrive at the site to manage a wildfire. Many problems arise from such a “simple” requirement. Who is to enforce the completion of a management plan? By the time a private landowner completes a plan, the

circumstances of the land may have changed. Verbiage and methods may not be consistent or agreed upon between agencies and landowners. Policy states that there must be coordination on such borders, but it does not outline how.

In order to ensure efficiency of fire management, whether it is suppression or utilization, plans need to be established, understood, and agreed upon by all parties. Agency boundaries should disrupt management. Wildland urban interfaces present a dangerous means of fuel accumulation, for which policy outlines fire suppression when structures are threatened. Prior to the establishment of new “zones,” certain methods can be utilized to minimize fuels and risks.

Wildland urban interfaces need to be addressed. As plans are under development for an urban area in undeveloped land, reduction of fuel loads should be the first step. Burning the area to reduce fuels before structures are built will provide a safer starting point for

the community. High risk areas can then have precautions such as FIREWISE building codes made into requirements rather than into suggestions. Just as landowners were rewarded for timber production in the early 1900s, incentives could be established for homeowners in WUIs to reduce or maintain low fuel loads in the surrounding area. Incentives could include discounts on insurance, payment for brush that could be utilized for product (such as mulch), or some method of recognition. Maintenance of low fuel loads will not only help protect homes in case of wild fire, but also aid the surrounding ecosystem through less crowding.

Wildfire management across agency boundaries needs to be uniform in certain aspects. Policy requires that all landowners have a wildfire management plan approved, however because of changing goals between agencies, uniformity of intermediate management is lacking. Since different agencies will have different “best management practices” for their own land-use purposes,

a blanket plan should be put into place for certain aspects of management. This plan needs to include intermediate applications for all lands under all agencies, such as surface thinning in order to lower the potential severity of wildfires and, in turn, lower the threat to homeowners. Predominant ecosystem requirements should be the basis for the “blanket” plans. No matter the agency or landowner involved, each will have to meet certain uniform goals in addition to their own.

Under Marion Clawson’s policy framework, pre-build burns and homeowner incentives are physically and biologically feasible. The burn will help reduce forest fuels and mitigate future risk of wildfire. It will aid in clearing a site for construction while making the WUI zone slightly safer. The main factor of being able to perform the burn is conditions. As long as the burn does not harm communities, fuel, risk, preparation, and safety goals are all capable. Education for homeowners

about manual forest fuel maintenance is relatively simple to provide to communities. Basic methods of litter removal can be taught in order for the majority of the citizenry to take part. Incentives such as financial gains make results more likely to occur as well.

Economically, costs would be minimal for a properly maintained prescribed burn over a planned build site. Initial timber sale may provide an up front budget, yet in future years, the method of reward (if utilized) could soon become financially uncertain. Alternatives to cash as reward will need to be developed. Insurance cuts for safe practices are one example that could alleviate financial stresses for both sides, while still motivating homeowners to take part in such practices. Economic equity tends to lean more in favor of the homeowner. The government, insurance company, or other third party will bear most of the cost of potential reward. Provided the initial timber removal is sold and profits kept for reward within the community, the equity

will be more even. No matter the situation, the homeowner pays for the safer lifestyle through what he or she decides to put into it.

Culturally, a pre-burn may not be acceptable to communities already in existence depending on proximity and conditions, meeting resistance just like any prescribed burn. Aesthetics may not be “culturally acceptable” initially, but by the time a new community in the WUI is established, citizens should be able to enjoy a park like landscape with minimal remaining char. In order for community members to actively participate in maintenance of low fuel levels, it cannot be an elderly community, or one that will have little involvement outdoors. Most homeowners seeking a home closer to nature will be able to participate and may even enjoy doing so. Actions by homeowners will be helping the community and the environment.

Performed by the proper authorities under the right conditions, prescribed burning is very practical.

Proper dispersal of knowledge to the citizenry will make community involvement in the ecosystem practical.

Involvement of the citizenry will aid in maintenance therefore not requiring extensive crews to perform the task on a regular basis, adding to cost. Initial burnings and maintenance burns must be conducted by professionals, and with the proper prescription and conditions all establishment and management goals can easily be met.

Under Bonnicksen's policy framework, as long as a fire is not intense to the point where it destroys habitats, it will protect and even promote life sustaining processes. Although no Wildland Urban Interface (WUI) promotes such processes, maintenance of forest fuels will allow for less competition and more impressive forest lands in the surrounding area. Any consequences of these actions will be confined to local and not affect any regional or global system. Human well-being will almost undoubtedly be enhanced. A safer living

condition in itself is an enhancement, while involvement and labor outdoors enhances both physically and mentally. Some sort of financial reward option can provide economic enhancement to an individual or group. The prescribed burn may affect households if certain conditions are not met. Smoke and aesthetics are a negative; however if done under the right prescription, this can be avoided. Future aesthetics of an open stand could provide enhancement.

Any form of development will not show respect to all living things, but harm can be minimized in the process. Burning may harm some species if the site is not used to fire in many years, but some species may benefit. Ecologically, this alternative is not 100 % sustainable because of the restriction of burning near a WUI. However, continuous management of undergrowth and surface fuels can greatly help sustain the environment. Economically, a continuous reward will not be sustainable unless income is coming off the

land. An insurance or recognition option would most likely be more capable of sustainability over a longer period.

The uniform management alternative is physically and biologically feasible under Clawson's framework, although to a lesser extent. Lands that are already being managed for natural ecological processes and/or timber management are already conducting practices that moderate forest fuel accumulation. Other lands, such as those under the National Park Service, tend to refrain from major mechanical or chemical practices in order to preserve the natural resources. Although fuel load reduction can be performed via prescribed burn or other manual thinning methods, specific goals such as public enjoyment may be interrupted. However, such practices could be explained and utilized for their educational value.

For landowners who are not already involved in intermediate thinning and fuel load reduction, initial

cost will be at a premium. Fuel buildup over the years will require intensive thinning methods in order to return the land to a more ecologically manageable state. Even after the initial cost, there will be the new repeating maintenance costs. One possible option to lower these costs for some landowners is to coordinate with another landowner in the area who already has such a management plan to extend certain practices across the boundaries and split some of the costs.

Economic equity will definitely be skewed. As already mentioned, many agencies already manage their lands according to the proposed “blanket” management plan. Just as many agencies do not and will be required to spend fairly significant amounts up front in order to establish a base for the newly desired management.

Culturally there will be groups organized on both extremes. Some will be advocates, able to understand the positive future implications of today’s actions. Others will be adamant that “their park” not be altered in

such a way. Such ecological matters have always been delicate in society. If “too much” is cut on preserved land, society may see it as undue destruction. In reality, it is restoring the ecosystem to its former state while enhancing habitats for wildlife and plant life. Society tends to be more concerned with what they are getting out of the environment now rather than what it can provide.

The task of introducing certain “blanket” aspects of wildfire management is not easy. Many professionals will be required; public and private dollars will be spent. Over a short period of time, this plan is not practical because of the vast resource requirements. If planned for different regions operating over a longer period of time, the operation will be more practical. In addition, the task will require much public support, which, in some areas, may seriously set back or not allow such management.

According to Bonnicksen's framework, the "blanket" policy plan would definitely protect life-sustaining processes. Fuel reduction and a trend toward ecosystem restoration would restore numerous processes. Minimizing forest fuels across a landscape significantly aids in protection of human lives from wildfire as well. This plan will enhance human well-being, as well as the well-being of many organisms in the wild. Aesthetic value that is so treasured by society will be realized in a few short years. Respect for humans and all living things will be the end result; however getting there may not meet this part of the framework. Organisms may be killed or injured during certain processes. Plants will obviously be killed for the sake of management, yet all are being altered to enhance and protect what will remain.

Ecologically this plan is very sustainable. The methods will return ecosystems to past regimes and provide greater room and availability for establishment

of other dominant species. Economically however, some aspects may never leave the ground. Public funds will be required in many instances. One-time support for such an undertaking is hard enough to achieve, never mind continued spending for maintenance. There may not always be a reliable source for these funds either. The economic aspect of the “blanket” plan is most likely the most controversial and will be the reason for lack of support or sustainability of the project.

Although both of the alternative of WUI fuel load maintenance and the alternative of “blanket” management plans will aid in the reduction in wildfire risk, I would encourage the policy maker to focus on the former. Further analysis shows that although effective, “blanket” plans would be an enormous undertaking and almost unrealistic in this lifetime. WUI fuel load maintenance will aid in wildfire management around areas where lives and property are at stake.

As a continually growing problem, something has to be done about wildfire management in Wildland Urban Interface zones prior to the need for fire suppression. Too often are lives lost and homes destroyed because of thick forest fuels in close proximity. A predevelopment burn in an area will aid in many objectives for the landscape and the ecosystem, while minimizing fuel loads in future WUI. This alone will set a strong base for lower fuel loads in sensitive areas. In order to maintain safer fuel loads, there is almost no better method than to safely involve homeowners. They will take pride in tending their land, making it safer for themselves, their families, their belongings, and those around them. Teach the citizenry how they can properly and effectively maintain their land and its surroundings to protect what they hold dear. Even minimal involvement will require less need for agency employees to do the same job.

Encourage participation even further with incentives. Homeowner insurance is not cheap because of the threat of fire in a WUI, so offer discounts to those who display a certain level of involvement in maintaining a safer wilderness around their home. Devise a use for cut-up undergrowth. Show homeowners how they may be able to use it within the household for things such as gardening mulch. Provide a company that can pay homeowners for their woody undergrowth as a contribution to a wood product. With the fuel situation of today's society and the consideration of using woody biomass for fuel, use the debris from WUIs for experimentation. There are multiple ways to provide incentives, many times depending upon the location. However, the primary motivation should be to protect lives and property. Although this will not end destructive wildfire, it is an effective beginning with great potential for safer development and community involvement.

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**Diana Mato**  
**The Damming of Hetch Hetchy Valley**

Ninety-four years ago, President Woodrow Wilson signed a bill into law that is still being fought today. It authorized the damming of the Tuolumne River and the conversion of Hetch Hetchy Valley into a water reservoir for San Francisco. A brief history leading up to the signing of the Raker Bill is presented, followed by Clawson's Policy Analysis Framework and Bonnicksen's Iron Law of Consensus. Two policies will be analyzed- the effects of leaving Hetch Hetchy Valley with no dam and the historically accurate dam policy- and one of the two will be argued as the better policy.

## **Objective look at the issue**

San Francisco was running out of water. The city was at the end of a dry peninsula and was limited on unutilized local fresh water sources (Chowder, 1990). One hundred sixty miles away, in Yosemite National Park, was the Tuolumne River in Hetch Hetchy Valley. In 1882, San Francisco began to consider the Hetch Hetchy Valley as one of several reservoir sites and, in 1890, proposed damming the valley publicly (Sierra Club, 2007). The main attraction within Yosemite National Park was Yosemite Valley; Hetch Hetchy Valley was considered just as breathtaking, but was underappreciated by the public. In fact, very few visited Hetch Hetchy Valley (Sierra Club, 2007). In 1903, Mayor James Phelan applied to the Interior Department for a permit for the storage of water in the Hetch Hetchy Valley and was denied. In 1905, he applied again and again was denied (Sierra Club, 2007). In 1906, a major earthquake hit San Francisco and the surrounding

communities. As buildings crumbled, exposed electric lines started fires across the city; but, there was so little water, citizens had to watch their city burn (U.S. Geologic Survey, 2006).

After this major disaster exposed the need for more water, Mayor Phelan again applied for a permit to store water in Hetch Hetchy Valley. The petition was approved for congressional consideration (Sierra Club, 2007). The next year, congressional hearings were held, but only a recommendation to further explore the Hetch Hetchy issue was given. Noone wanted to officially declare sides on this issue. After consideration and congressional visits to Hetch Hetchy Valley, the city was asked to provide more data on other water sources and a more thorough evaluation of the possible damage of a dam (Sierra Club, 2007). This requirement was never fully completed, neither were other water sources enthusiastically sought. In 1913, a recommendation was made to dam Hetch Hetchy Valley, and Congress passed

the Raker Bill by a wide margin (Chowder, 1990). The Raker Bill was signed by President Woodrow on December 19, 1913. Construction of the O'Shaughnessy Dam was completed in 1923 at a cost of \$100 million and transported water 160 miles by gravity alone to San Francisco and 32 Bay Area communities (Sierra Club, 2007). The dam was raised in 1938 to accommodate more water storage, and is at this height (Sierra Club, 2007). The water flows into the homes of 2.4 million people and 75,000 businesses, and the power generated by the dam supports San Francisco's schools, municipal transit system, and international airport (Nash, 2005).

### ***Analysis of policy alternatives***

#### **Clawson's Policy Analysis Framework**

The first Clawson criterion for a successful policy is based upon physical and biological feasibility and their consequences; meaning, that this policy can be carried

out (Clawson, 1987). Building a dam in Hetch Hetchy Valley was feasible; the valley was selected from many choices as a good reservoir site. The high demand for water enabled the city to predict making up the money spent on building the dam through the water and electricity usage, making such a policy more acceptable to the voting public. The publicity generated over this issue increased public awareness of this natural resource, and thus possibly could have increased park visitation had the valley been left without a dam. Not building a dam would not have had an environmental impact on the landscape directly, but, with increased visitation, human impact through trash, trails, and camp sites would have increased.

The second Clawson criterion for a successful policy is based upon economic efficiency, that benefits of the policy outweigh the costs (Clawson, 1987). The physical geography of California between Hetch Hetchy Valley and San Francisco enabled water to flow to the

city by gravity alone (Sierra Club, 2007). This provided for cheaper water than many other sources that would have required pumping. The dam was built not only for a water reservoir, but also as a hydropower plant, thus generating \$500 million to \$1.5 billion in water and electricity revenue (Nash, 2005). These figures are hard to compare to the non-market benefits of leaving Hetch Hetchy Valley in its natural state.

The third Clawson criterion for a successful policy is based upon economic equity. It examines who gains from the policy and who loses from the policy (Clawson, 1987). The costs of building and maintaining the dam would be funded by those who paid for the electricity and water from the dam. Nobody is physically losing from the building of the dam, just the emotional attachment and spiritual connection to Hetch Hetchy Valley, which again is hard to quantify in the market. Today, 2.4 million people at all economic and social levels directly benefit from the dam, (Nash, 2005). If

you drank water in the San Francisco and surrounding areas, you helped pay for the dam. By not building the dam, you would have placed all of San Francisco and surrounding communities in physical danger by losing their access to fresh drinking water. Ultimately, with no dam, the few that had visited Hetch Hetchy Valley were benefiting while millions were suffering.

The fourth Clawson criterion for a successful policy is based upon cultural acceptability. It follows the rule that “There are some uses which the dominant social culture refuses to permit and others which it will insist upon” (Clawson, 1987). The opposition against building the dam was considered the first grass-roots organization in America. This being the first major attempt at organizing an environmental opposition, it failed. The lingering outcry against the dam and recent attempts to have the dam removed to restore Hetch Hetchy Valley demonstrates the lack of acceptability of this policy. Although San Francisco and surrounding

residents would have had to find another water source, they were pretty much the only group negatively affected by not building the dam. City officials acknowledged the fact that other water sources were available, so this was not a do-or-die situation in that Hetch Hetchy was their only option. With the amount of public opposition, one would think that another source would have been sought by San Francisco.

The fifth and final Clawson criterion for a successful policy is based upon operational practicality, or can do what that policy mandates be done (Clawson, 1987). Once the dam is there, it is there. Maintenance is required, but will be handled by San Francisco since it is its water being lost from a damaged dam. Recently, organizations lobbying for removal of the dam have been calling for restoration of Hetch Hetchy Valley, but in reality, it will not be restored for hundreds of years. The valley has been underwater for 84 years, and the down-river bed of the Tuolumne River has adapted to

the decreased flow; so, tearing down the dam is not necessarily the best idea, either. Status as a national park will protect the area from development, and overruling the building of the reservoir for San Francisco will discourage attempts of the same thing at a later time for Hetch Hetchy. At the same time, the dam was approved despite circumstances. If it had not been approved at this time, it might have been approved at a later time.

### **Bonnicksen's Iron Law of Consensus**

The first criterion of Bonnicksen's Iron Law of Consensus is that a policy must protect life sustaining processes. The building of the dam and the consequent flooding of the Tuolumne River into Hetch Hetchy Valley destroyed any life processes in that valley. On the other hand, the dam did sustain life in San Francisco by providing more fresh water to an area in constant water shortage. Preservation of Yosemite National Park in its

condition and preventing a dam would have continued the life-sustaining ecosystem processes in the valley. The continued status as a park protected Hetch Hetchy Valley and the ecosystems somewhat, though at the time, many policy-makers believed the park resources were to be utilized by man.

The second criterion of Bonnicksen's Iron Law of Consensus is that a policy must enhance human well-being. The dam provides water to San Francisco and surrounding areas. The need for water had become increasingly apparent, especially after the 1906 earthquake, the consequent fires, and the lack of water to extinguish them (U.S. Geological Survey, 2006). At the time, not many people visited Hetch Hetchy Valley; more visitors stayed in the main Yosemite Valley. Increased publicity from the dam controversy raised awareness of the existence of Hetch Hetchy Valley. Preservation of the area would have benefited those who had already

visited Hetch Hetchy and those planning to visit after all the publicity.

The third criterion of Bonnicksen's Iron Law of Consensus is that a policy must respect humans and all other living things. The dam policy obviously favors human need over all others, but it does not discriminate against a particular species. The Hetch Hetchy Valley was only one of many habitats within the Yosemite National Park and surrounding system. Not damming Hetch Hetchy Valley upholds the highest respect for the living systems within the valley, but places them above human needs. Although other sources for water were available, Hetch Hetchy was the best option (Sierra Club, 2007).

The fourth criterion of Bonnicksen's Iron Law of Consensus is that a policy must be ecologically and economically sustainable. The dam was built to be a water storage facility forever; it met the needs of people at the time and continues to meet the needs of people.

There has been some talk recently of destroying the dam and restoring the valley, but it has been in sustainable use as a reservoir for 84 years and is planned to continue (Sierra Club, 2007). Ecological sustainability was achieved at maximum by not having developed the valley. Preventing humans from drastically changing the landscape to accommodate peoples' needs would have set precedence to not allow any other development in the valley, thus preserving it in the long term. It may not have been economic though, visitation to Hetch Hetchy was limited and the building of the dam and consequent purchase of water and electricity raised more funds than park visitation alone.

The fifth and final criterion of Bonnicksen's Iron Law of Consensus is that a policy must be acceptable to affected interests and ownerships. Although the government owned the land of Hetch Hetchy Valley, all American citizens were affected parties in this issue. The flooding of Hetch Hetchy Valley was considered a slap in the face

to thousands of preservationists, and it is still being argued that the dam needs to be removed. San Francisco officials acknowledged that there were other sources for water available to develop, but not on public land as Hetch Hetchy was. (Sierra Club, 2007) Lake Eleanor, also in the Yosemite Park System, was promised to be developed before Hetch Hetchy (Sierra Club, 2007). Other sources of water could have been developed at a greater upfront cost to San Francisco, but still satisfactory in the acquisition of more water without flooding the Hetch Hetchy Valley.

### **The better policy**

Following Clawson's Policy Analysis Framework, the policy supporting the dam in Hetch Hetchy Valley is the better of the two policies. Although it received huge opposition when it was proposed and today still (criterion 4), the dam policy meets the other four criteria. The costs are accrued only by those who benefit from the water and electricity (criterion 3), the societal

benefits of the dam are greater than the non-market costs of loss of habitat (criterion 2), and operational costs are funded through use of the dam (criterion 5). The policy was definitely feasible as it was the adopted policy and the dam was built. Following Bonnicksen's Iron Law of Consensus, the policy supporting no dam in Hetch Hetchy Valley is the better choice. The dam fulfills only the criteria of promoting human well being (criterion 2) and of economic and ecological sustainability (criterion 4). Overall, combining Clawson and Bonnicksen, the policy of damming the Tuolumne River and using Hetch Hetchy Valley as the water reservoir is the best option. The dam policy fulfills more requirements of the two analysis frameworks than the no-dam policy, and thus was historically a good idea.

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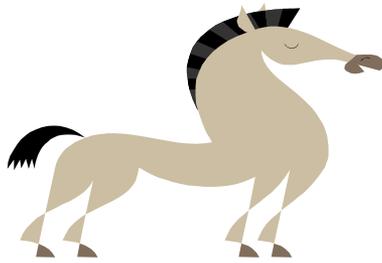
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**Mallory Wheaton**  
**The Overpopulation of Protected Wild Free-Roaming Horses and Burros**

**I. Introduction**

*“Congress finds and declares that wild free-roaming horses and burros are living symbols of the historic and pioneer spirit of the West” (The Wild Free-Roaming Horses and Burros Act of 1971).*



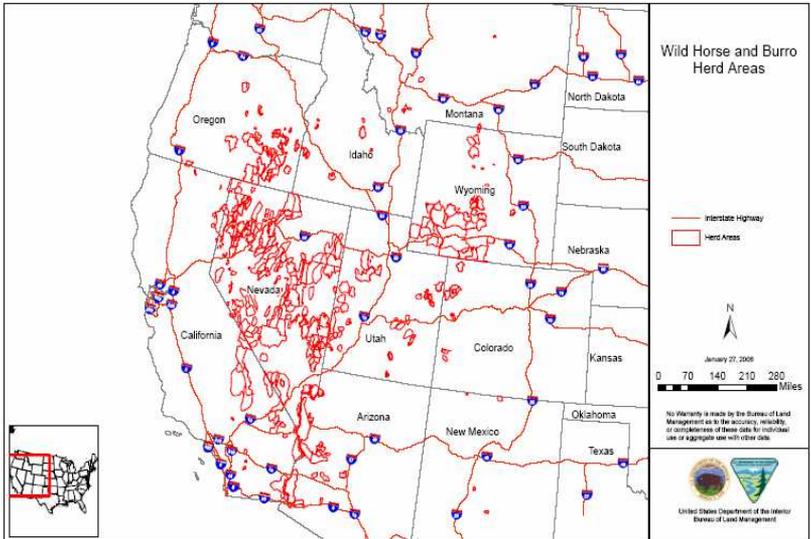
Photos courtesy of Bureau of Land Management

The wild horse, or mustang, has had a long and difficult history as the West was won. Prior to the passing of the Wild Free-Roaming Horses and Burros Act of 1971, to make room for livestock on the range, mustangs were periodically rounded up and sold to slaughter houses for pet food. In response to objections from horse enthusiasts throughout the nation, Congress passed this act protecting wild free-roaming horses and burros from harassment, capture, and death. The declining population of wild horses recovered, today to the point where the population is exceeding the carrying capacity of the environment. The Bureau of Land Management estimates 29,000 wild horses roam an area that can support a population of 27,500. In addition, lacking any natural predators, wild horse populations can double every four years (Bureau of Land Management, 2007).

## **II. Problem Statement and Statement of Objectives**

The wild horse population is exceeding its carrying capacity and current programs, techniques and methods of management are unsuccessful in maintaining a healthy population size. The objectives of this paper are as follows:

1. to show that overpopulation exists and the effects of this excess,
2. the current methods of population control authorized by Congress,
3. the success of these current methods and
4. to propose implementation of new methods to better manage the population of the wild horses.



### III. Literature Review

In past years, studies have been conducted to determine if immunocontraceptives are effective at controlling horse populations. An immunocontraceptive is unlike most contraceptives, in that it acts as a vaccine to prevent fertilization. A study by scientists under the supervision of the Bureau of Land Management in 2000 yielded successful results in reducing the occurrence of pregnancy in mares (Turner, 2007). Mares rounded up

by officials were injected with pellets containing porcine zona pellucida (PZP) designed to deliver a dose at one, three- and twelve-month intervals (Turner, 2007). Percent fertility was greatly reduced using this method. “Birth control” for free-roaming horses was first suggested in 1972 when the Bureau of Land Management asked John

			<u>Untreated Females</u>	<u>Treated Females</u>	<u>Fertility Rate (%)</u>			
Year	Adults Observed	Foals Observed	With Foal	No Foal	With Foal	No Foal	Untreated	Treated
2000	107	27	11	9	16	17	52.4	48.5
2001	127	40	37	32	3	55	53.6	5.2
2002	236	41	31	22	10	57	58.5	14.9
2003	128	28	22	21	6	13	51.1	31.6

Table 1: Results of PZP treatment on fertility of females from 2000 to 2004 (Turner, 2007)

2004	187	46	28	26	18	21	51.8	46.2
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W. Turner and Jay F. Kirkpatrick to develop a method of contraception for wild horses (Gillis, 1994). An encouraging method for population control of federally protected free-roaming horses, immunocontraception is nevertheless not a common practice by the Bureau of Land Management. The future of PZP however seems bright as PZP is used in other species to prevent overpopulation.

Before the passage of The Wild Free-Roaming Horses and Burros Act of 1971, horses were commonly rounded up and sent to slaughter houses to fill the demand for the pet food industry (Gillis, 1994). The horrific conditions en route to slaughter houses and the general idea of killing horses for food were two major factors in the passage of the act (Pitt, 1985). Although horses are no longer rounded up and sent to slaughter houses, many fear that some wild horses will end up on

the black market as dog food because of loopholes in the adoption program. Today the Bureau of Land Management makes every effort to ensure that all adopted horses are cared for in the most humane way possible, but previously that was not the case. An investigation by the Associated Press found that several Bureau of Land Management employees adopted horses and sold them to slaughter houses (Glover, 2001). Death in a slaughterhouse is objected to by the majority of Americans, and the main goal of any new population control method would be to prevent this harassment.

The Wild Free-Roaming Horses and Burros Act of 1971 authorizes the Secretary of the Interior to remove excess animals, including “order[ing] old, sick, or lame animals to be destroyed in the most humane manner possible” (The Wild Free-Roaming Horses and Burros Act of 1971). This method of culling is another solution to the overpopulation of wild horses used by the Bureau of Land Management. Aside from the mountain lions of

the Montgomery Pass population, wild horses have no natural predators (Tennensen, 1992). Thus, the elimination of the old, sick, and lame fills the ecological gap of the missing predator. Human predators however differ from natural predators, especially in the eyes of the public. Considering how the public's reaction to slaughter house round ups in 1970 led to the passage of the act, it is doubtful that public opinion will be in favor of culling horse herds as a major method of population control.

A policy adopted in 2004 allows the sale of those animals over the age of ten years that have been unsuccessfully offered for adoption three times (Section 142 of Public Law 108-447). These animals will be freeze-branded to distinguish them from the adoptable animals and can be purchased for ten dollars by public land ranchers (Bureau of Land Management). Conditions on the purchase of these animals ensure humane treatment and care. Buyers agree not to sell the

horses to slaughter houses or to people who sell them. Under the sale-authority law, proceeds from the purchased horses go to the Bureau of Land Management's Wild Horse and Burro Adoption Program.

The final, and most utilized, method of population-control for free-roaming horses is the Bureau of Land Management Adoption Program. This program has placed over 200,000 animals into private care (Bureau of Land Management). For an average of \$185, any person over the age of eighteen without a history of inhumane treatment of animals who is able to provide care may adopt a living symbol of the West (Iraola, 2005).

A major concern with this program, however, is that by adopting only the healthy animals would reduce the fitness of the remaining herds. Also, the removal of too many horses might alter the gene pool, leading to less genetic diversity of the horse populations (Glover, 2001).

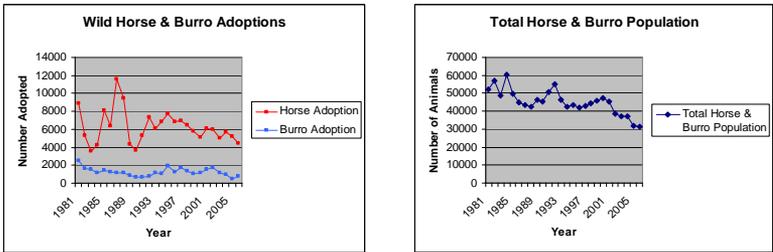


Figure 2: Wild horse and burro adoptions and populations from 1981 to 2007 (Bureau of Land Management)

#### IV. Analysis and Discussion

The Wild Free-Roaming Horses and Burros Act of 1971 was implemented to protect and manage wild horses. This act, however, neglected to provide the methods necessary to carry out this duty. The Bureau of Land Management was given control of the horse population without an adequate budget. In 2006, the Bureau of Land Management spent \$36.8 million on wild horse and burro populations, \$19.6 million of which

was spent caring for wild horses and burros at short- and long-term care facilities (Bureau of Land Management, 2007). Methods have either been tried or are in experimental stages, but the only legal solutions are the sale or adoption of mustangs.

Immunocontraceptives should be in the forefront of the minds of the Bureau of Land Management officials. Through little effort and with little money, the horse population could be reduced drastically. Horses have no natural predators, and as a result, most foals that survive their first year of life go on to live twenty years, producing more foals. With a simple dart of PZP, mares could be prevented from becoming pregnant, thus reducing the number of individuals added to the population each year. Reversible sterilization should be under serious consideration because it does not involve the death of any animals or the need for homes. In addition, if the least fit mares were rendered chemically sterile, the

overall fitness of the horse population would increase because only the most fit would reproduce. Since only the strongest stallions reproduce, a scientifically produced increase in genetic fitness would have to deal with the mares. Through this method, the population would be healthier and more genetically diverse, ensuring the legacy of these living symbols of the West.

In previous times, rounding up wild mustangs and shipping them to slaughter houses to be processed into dog food was an effective, if unpopular, method of controlling the horse population because this practice enraged the public, Congress was forced to pass The Wild Free-Roaming Horses and Burros Act of 1971, it is highly doubtful that this practice could be used today as a method of population control. Turning a wild, free-roaming horse into a can of pet food is not the American ideal. As a society, Americans enjoy the idea of a range, a wilderness similar to those found in old folk stories and history books. The mustangs embody this notion, and

killing these majestic animals to nourish domesticated pets at a lower price is seen as something akin to killing the history of this great nation and eliminating the legacy of the hardy pioneers whose courage made America what it is today. Thus, even though this method would solve the problem of overpopulation, this practice is unlikely to be revived in the near future.

Another unpopular solution is the culling of the least fit individuals by the Bureau of Land Management officials. The Secretary of the Interior has the authority and obligation to remove excess animals, one method of which is culling. Along with the pet food industry, culling old, lame, and sick individuals isn't seen as "American." These human predators would serve the same purpose as natural predators. Ecologically speaking, this method would best control the overpopulation. Culturally speaking, however, this method would cause the most controversy. Although both forms of predators prey on the old, lame, and sick,

public opinion would find a big difference between a mountain lion trying to feed her cubs and a governmental official shooting a horse with a cold. Hunting is a popular form of recreation for many Americans, but many people object to hunting in general. It is likely that an even greater number of people would object to “hunting” a horse, an animal that has served as both companion and partner to humans.

Under the 2004 Sales Authority law, the Bureau of Land Management is allowed to sell mustangs over the age of ten years if the horses were unsuccessfully offered for adoption on three separate occasions. Perhaps, since the cost of these horses is much less, people would be willing to buy these horses that they would not adopt. A problem arises with this policy, however, with the resale of these animals. One might purchase several horses with the supposed intent of providing a good home and then sell the animals to the pet food industry or the foreign meat market. The

Bureau of Land Management attempts to prevent this by putting conditions on the sale of the animal, but people do not always keep their promises and there is no way the government can keep track of every horse. An additional idea regarding the sale of wild horses is to identify each horse and require all slaughter houses to check for identifying marks, similar to the microchip system used in dogs and cats.



The final, most common, least controversial and legal method is the Adopt-a-Horse Program. Many people dream of owning a horse, and the thought of owning a mustang is even more enthralling. A mustang, however, is not the best choice for every horse lover. These animals were born and raised in the wild and thus act

differently from their domestic counterparts. Whereas one can usually know what to expect from a domestic horse, a mustang is full of surprises, possibly the reason so many people love them. Thus, owning a wild horse may pose a risk to oneself and to others. This program can be so successful only because the market for mustangs is finite. Not everyone wants a wild horse, and since horses generally live long lives, a wild horse is not something that is replaced every few years. Selecting the youngest and healthiest horses for adoption may hurt the natural population. If only the fittest animals are adopted, the less fit will be left as breeders and the future offspring may not be as healthy. Certain colors might also be selected for and since coloration is a hereditary trait, certain lineages may be adopted more frequently, which would decrease the genetic diversity of wild populations, thus increasing the possibility of extinction.



## V. Conclusion

Thus, although wild horses are an American symbol of freedom, they, too, can suffer from

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overpopulation. In order to preserve these beautiful animals, the Bureau of Land Management is obligated by the Wild Free-Roaming Horses and Burros Act of 1971 to manage the populations. Current and past management techniques include: immunocontraceptives, supplying slaughterhouses with horsemeat, culling excess animals, selling of unadoptable animals, and the Bureau of Land Management Adoption Program. These methods, however, are ineffective in controlling the population size. Currently 29,000 animals live in an environment that can support only 27,500, according to studies by the Bureau of Land Management. This means that 1,500 horses and burros must be removed somehow. Also, the

number of future animals that will contribute to the overpopulation is unknown and eventually these also must be removed. The market for mustang adoptions is not infinite. Not every potential horse owner has the desire, or skill, to tame a wild animal. In spite of this, however, adoption or sale would be the best solution to this problem, since the other methods would end in the death of the animals. Immunocontraceptives hold the key to the future of wild horse and burro management. For now, adoption remains the most favorable method, but by increasing the use of immunocontraceptives, the wild horse population would hopefully be under control within ten to twenty years without causing the death of any individual animals.

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**CHARLET HUBERTUS  
BACK OFF MY FOOD:  
OSTRICH FEEDING BEHAVIOR**

**INTRODUCTION**

Pecking order and feeding behavior is an issue that must be addressed in all areas of animal health and behavior. In order for zoos and wildlife refuges to best simulate a natural environment, the habits of the species must be taken into account. For example, research has shown that younger ostriches require much more water with their food than adults for survival (Williams et al., 1993). Nutritional studies have been conducted on groups of ostriches to best simulate the natural feeding behavior (Baltmanis, 1996). It is important that the animals are kept comfortable, and ostriches seem to be most at ease

in groups. Ostriches in the wild feed in groups of 4-5, and they take turns looking up every 2-4 minutes to keep watch for danger (Africa Safari, 2007). Studies have shown that ostriches in a stressful situation express feeding disorders such as feather pecking and pecking at the wires of their enclosure (Aganda et al., 2003). Additional studies on feeding behavior are needed to determine how many ostriches can be housed together while keeping stress to a minimum.

The objective of this research was to determine if ostriches in captivity express different behavior when eating than wild birds. Understanding these differences is important in minimizing stress in captive environments.

### **PROCEDURE**

This experiment was conducted at the Wildlife Research Center on Texas A&M University campus in College Station. Three pens containing two ostriches each were monitored in this experiment. Pen 1

contained Sammy, 14, male; and Winnie, 11, female. Pen 2 contained Window, yearling, male; and Betty, 14 female. Pen 3 contained Hunter, 14, male; and Woody, 14, female. Sammy and Winnie had been housed together for 2 months. Window and Betty had been housed together for 6 months, and Hunter and Woody had been housed together for 11 years.

For the first two feedings of the experiment, the meal was placed in the same standard location where the birds were fed every day, with the bowls one foot apart. On the third feeding, the feed was placed in two bowls touching each other, and behavior changes were recorded. By the fourth meal, the feed was placed in separate bowls two feet apart, and once again, behavior changes were recorded. Over the next four mornings, the bowls were placed four, six, eight, and ten feet apart, respectively.

The behaviors quantified were dominance, pecking order, and keeping look-outs. Dominance was

measured by who ate first, and if that bird ate more food than the other. Dominance was expressed by one ostrich threatening and chasing another away from the food bowl. Lookouts were distinguished by recording which ostrich looked up, as if watching for danger. Submissive behaviors were recorded.

## **RESULTS**

Only the males showed obvious dominant behaviors, but often neither the male nor the female displayed dominance. Dominance was expressed when a bird lifted his wings, held them out, and fluffed out his feathers to appear bigger. He held his tail feathers and head very high, and if this did not provoke a submissive response, he charged at the object he was threatening. Submissive birds dropped their heads slightly, kept their wings close to their bodies, and avoided fluffing out their feathers in an apparent attempt to appear small. As they took the submissive stance, they often backed away from the dominant bird. If they did not back far enough away,

this often provoked the dominant bird to attack. Birds that dropped their wings below their stomach were not recorded as submissive, as this was a sign of relaxation and a way to keep cool (Thompson, 2007).

Table 1 summarizes how often and on what day dominance and lookout behavior were expressed. In this study 62 % of the feedings found at least one of the members of a pair of birds keeping a lookout. In 36 % of those feedings the look-out was occurring in Sammy and Winnie's pen. During 42 % of the feedings, one or more of the males expressed aggression or dominance over their partner. In 60 % of those occurrences Sammy expressed dominance over Winnie.

**dominance and look-out behavior expressed over eight feedings**

<b>Vinnie</b>	<b>Pen #2 Window and Betty</b>		<b>Pen #3 Hunter and Woody</b>	
<b>Look out</b>	<b>Domin-ance</b>	<b>Look out</b>	<b>Domin-ance</b>	
my	Betty	Neither	Woody	Neither
my	Neither	Neither	Both	Neither
my	Neither	Window	Woody	Neither
er	Both	Neither	Neither	Hunter
er*	Window	Window*	Both, but not much	Neither
my	Neither	Window	Hunter	Neither
my	Betty	Neither	Both	Neither
my	Neither	Neither	Hunter	Neither
were moved to the pen adjacent to Window and Betty				

## **DISCUSSION AND CONCLUSIONS**

Studies have found that ostriches feed in family groups, and that they work together to keep a lookout in the wild (Africa Safari, 2007). Family groups work together to watch out for danger by alternating which ostriches lift their head and rotate it to check surrounding areas for movement. They alternate every few bites, and, because they stand facing separate directions, they cover 360 degrees. This behavior is sometimes hard to monitor because ostriches cannot swallow. They lift their heads when their mouths get full and allow gravity to take the food to the stomach. However, when they swallow they do not turn their head at all so this motion can be distinguished from lookout behavior (Roberts-Helton, 2007). Feeding behavior of ostriches in captivity has not been studied much, so the effects of captivity on dominance and lookout behavior are not well understood. The captive ostriches in this study lifted their heads quite often for swallowing, but

only two ostriches kept a fairly consistent watch by turning their heads and inspecting the surroundings. The data collected in this study imply that captivity affects the habits of the lookouts. The lookout regime was less rigid in the ostriches at the Wildlife Center. They appeared to be less concerned with keeping a strict lookout at all times, in contrast to what has been observed in the wild.

Sammy and Winnie were different from the other groups in this study. Sammy continuously expressed dominance over Winnie, and they were the only pen that consistently kept a lookout as they ate. Sammy was attached to the female Wildlife Center manager, and possibly his expression of dominance over Winnie was to impress the female manager. Winnie may have been keeping a consistent lookout because she was the submissive ostrich in the relationship. On the fifth day of the experiment, Sammy and Winnie were moved to a new pen. Sammy did not express dominance over

Winnie that day, which may have been because of the novel environment. Research at the San Diego Zoo found that larger groups with well-established pecking orders allowed the more dominant birds to feed first (San Diego Zoo, 2008), but with only two birds in a pen in this study, such behavior was not observed.

Only one of the dominance displays involved a male expressing dominance toward another male outside his enclosure. On the day that Sammy and Winnie were moved to the pen next to Window and Betty, Window expressed aggression toward Sammy through the fence. Window paced the fence and fanned out his wings in a threatening gesture, ignoring the food and allowing Betty to eat. After Window had paced the fence for five minutes and had not been challenged by Sammy, he returned to the food bowls and ate. Sammy showed no response to Window's aggression. Because the ostriches were raised at the Wildlife Exotic Center by people, they

may not have learned the importance of keeping lookouts as there was never a threat to their safety.

Future studies could determine if keeping a lookout is an environmentally influenced behavior, taught by the older ostriches to the younger ones, or if it is an instinctive behavior that develops as the animal matures. Sammy was hand-raised, and was quite accustomed to human contact. The other five ostriches were hand-raised but had limited human contact. Sammy appeared to prefer human contact to other ostriches, which could explain why he expressed such strict dominance over Winnie. Sammy was always in season and displaying courtship, unlike the other ostriches at the facility (Roberts-Helton, 2007). Sammy would display courtship behavior toward the workers by making a booming call, lying on the ground, and fanning his wings while swinging his head back and forth. Sammy was protective of the people who raised him, following them along the fence while threatening any

animals that approached them. He often appeared less interested in Winnie and more interested in entertaining the student worker. His displays of aggression toward Winnie could signify that he sees her as ranking below the worker who feeds him.

There would be great value in the continuation of this study in conjunction with a parallel study on wild ostriches. The results should be compared to determine if captive birds would survive better in larger family groups, or if pairs are more conducive to the captive environment. Such a study would provide zoos and other exotic facilities with data to determine the type of enclosure and how many birds per enclosure would be most comfortable for the ostriches and most efficient for the facility. Research should include groups of 4-5 birds, as this would be closer to the natural family unit that exists in the wild (Thompson, 2007). The effects of the human contact on the behavior of captive ostriches should be researched. The enclosed environment seems

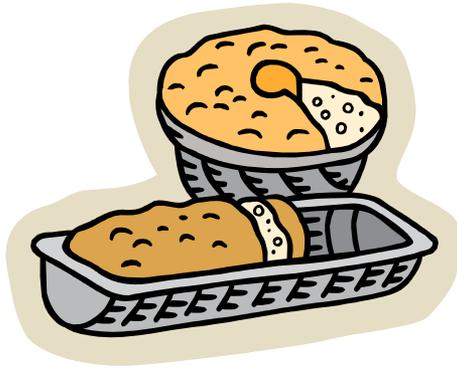
to lessen the practice of keeping lookouts, but early human contact appears to increase aggression in some cases. In the enclosed environment the birds do not need lookout behavior, but the issue of aggression is a concern to handlers in captive facilities. Human contact at feeding times may need to be reduced to prevent aggression in the birds and prevent injuries to handlers or other birds.

In conclusion, this study determined that little dominance was expressed in groups of only two birds, but when dominance was expressed, it was the male that was the aggressor. The dominant ostrich ate first, and the submissive bird ate from the remaining bowl. Two ostriches in one pen fed next to each other and alternately performed lookout behavior just as they would as a family group in the wild. The need for keeping a lookout is apparently lessened in the safe habitat of their enclosure. However the lookout data in this study is inconclusive as a wider range of ages is

needed to determine if age affects the lookout status, or if the safe environment affects the habit.

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**Mark Mitchell**

**Grupo Bimbo**

For a firm to survive in today's interconnected global market, the question is not whether or not to expand internationally, but when to do so. Grupo Bimbo has expanded into China and the Czech Republic, as well as having operations in a total of seventeen countries across the Americas. However, Grupo Bimbo has had difficulty along the way. Their United States operations

alone lost \$40 million in 2003 and \$30 million in 2004 before breaking even in 2005, and no country has proven to be as profitable as Mexico. Perhaps the best alternative for Grupo Bimbo is to focus efforts on continuing to maintain a strong presence in the home country of Mexico. It is in Mexico where Grupo Bimbo has built a 90% market share in the packaged bread segment, and 70% of all their sales also come from Mexico. To hold a 90% market share is a phenomenal feat, and if Grupo Bimbo can achieve this with their bread products, there is reason to believe that the same can be done and should be sought for their candies and snack products as well. I propose that a two year marketing campaign in Mexico promoting their snack and candy products has the potential to increase sales by 6.5% over the next two years. Let it be known that all of the following financial data is presented in pesos.

To fund this ad campaign, which will consist of television commercials, sponsorships, and magazine

advertisements, \$13.6 million will have to be financed by debt. Grupo Bimbo's debt ratio decreased 18.7% from 2004 to 2005 to 11.5% debt financing, down from 14.1%. My proposed marketing campaign will increase the debt ratio by 55% to 17.7% in 2006. While this is a substantial increase, 17.7% is still a very healthy level for the debt ratio. There is no cause for concern in debt liabilities brought on by this proposal.

Through the increase in sales brought on by the marketing campaign, Grupo Bimbo's liquidity will improve. This is an area in which they were previously in a downward trend. In 2005, Grupo Bimbo's current ratio was 1.44, which is down from 1.51 in 2004. If my proposal were to take place, it would increase by 1% in 2006 to 1.46. While this may seem like an insignificant change, breaking the downward trend is certainly an improvement worth noting.

Proper management of a firm's assets is vital to its success. Throughout the course of the past few years,

though, and on into the future, signs are that Grupo Bimbo's return on their assets (ROA) have, and will remain relatively unchanged. In 2005, their ROA dropped by a mere 1.3% to 7.6%, down from 7.7% in 2004. I project that in 2006, the marketing campaign will raise it 1.9%, back up to 7.7%, slightly over it's level in 2004. Again, this is not a significant increase, but breaking the downward trend is a positive sign that management and stockholders like to see.

Along with their ROA, Grupo Bimbo's profit margin also stays pretty stable. There was a slight dip of .4% from 5.1% in 2004 to 5.0 in 2005. Projections indicate that in 2006, it will rise by 1.4% to slightly back over the level of 5.1% realized in 2004. As with the previous two projections, these numbers are not eye popping, but the downward trends recognized recently are something to jump on and act on before they become so significant that they are difficult to reverse.

Projections of earnings per share are difficult to develop since they rely on stock market value of the firm's shares. However, the recent trend of a 6.2% increase in 2005 to 2.41 from 2.27 in 2004 is a positive sign, and with the improvement of Grupo Bimbo in every financial category short of debt management, there is reason to believe that the company will continue to improve in stock market value as well through the implementation of my proposed marketing campaign.

Through the aforementioned financial analysis, one can clearly see that Grupo Bimbo is capable of, and in need of executing this marketing campaign. It increases sales, financial analytical tools indicate it improves the firm's management of its assets, liquidity, profitability, and possibly stock market value, and reaffirms Grupo Bimbo as the industry standard in its home country of Mexico.

Example 1

$$f(x+h) - f(x)$$