

The narcotics distribution network through the southwestern U.S. border is extremely robust. Attempting to interdict drugs at the border is a labor-intensive and expensive process and produces limited effects. Based upon our analysis, the most productive approach to combating the flow of narcotics is to attack the production network inside Mexico. Additionally, the U.S. Border Patrol can employ training and additional staffing in a cost-effective targeted approach in order to achieve America’s desired end state.

**Background**

Trafficking of illicit drugs from Mexico through the U.S. border is an estimated \$45 billion per year industry. Between 2005 and 2009, more than 1.5 million kilograms of narcotics were seized along the border. Even with a federal budget for narcotics interdiction for fiscal year 2012 of \$3.9 billion, experts estimate that only 30% of cocaine is interdicted and that at least 75% of illicit drug shipments must be seized before the traffickers' profits are impacted.

The narcotics distribution network is secretive, sophisticated, and largely controlled by powerful cartels across Mexico. Experts do know that more than 99% of the total drug flow is overland (figure 1) and employs commercial trucking, rental cars, and private vehicles. While interdiction is possible, it is time consuming, expensive, and manpower intensive.

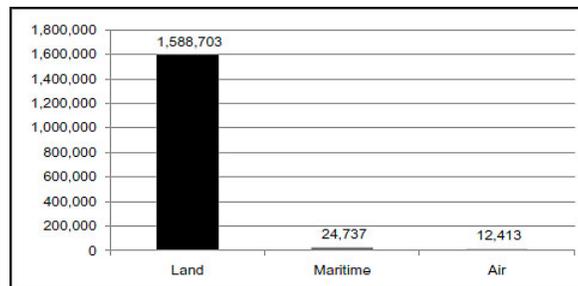


Figure 1. Seizures of Drugs in Transit, Within the United States, in Kilograms, 2009

**Model**

The objective is to maximize the effectiveness of U.S. border enforcement in the War on Drugs. Using a Red Team approach, the Customs and Border Patrol (CBP) targets Don Diego de la Vega, a Zeta Cartel drug lord, in his efforts to move cocaine through the U.S. border. We model the transportation and distribution network across the border as a graph.

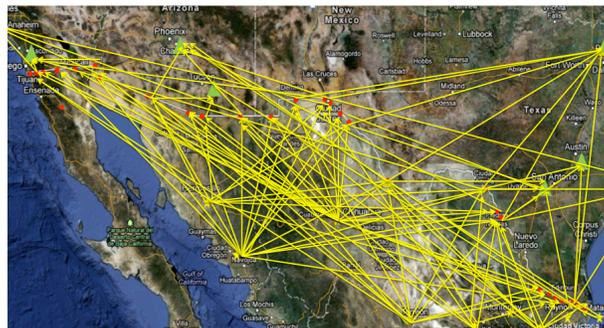
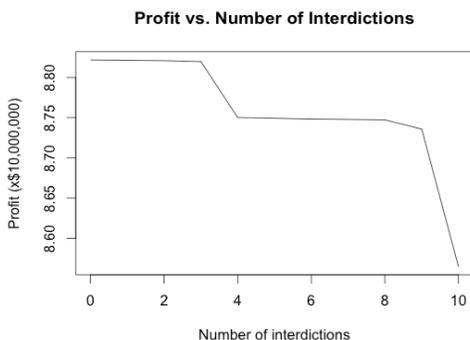


Figure 2. The nodes of the graph are the Mexican origination cities, the highway border crossings, and the U.S. destination cities. Edges represent the highways connecting the nodes. The length of a connecting edge is the cost of using a highway. Production costs are incurred at origination cities based upon price per kilo. Profits are assigned to U.S. cities based upon sale price per kilo.

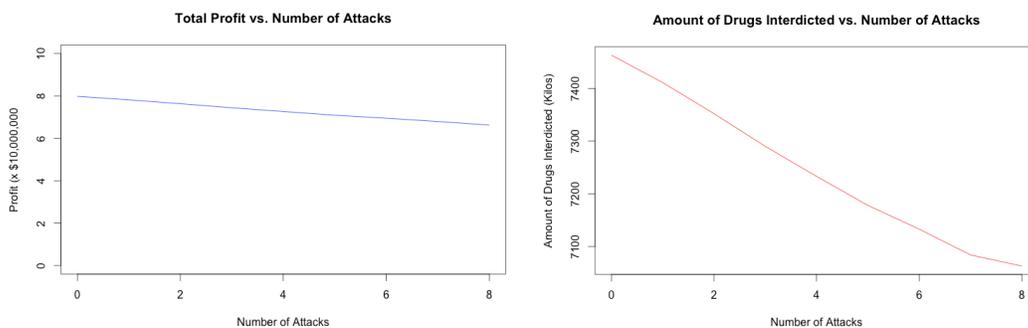
The first phase is to model narcotics distribution in a minimum cost flow producer-consumer scenario. Demand is assigned as 9500 kilos distributed among the top nine highest population centers in California, Arizona, New Mexico, and Texas by population density. Production is also 9500 kilos assigned to the top eight population centers in northern Mexico. Production and distribution costs are incurred at the production facility. Profits are achieved upon delivery to a U.S. city based upon the street value of cocaine in that area. Cost of using a border crossing is the amount of bribe money per kilogram to smuggle 100% of his drugs through that border crossing. Interdictions represent the application of additional resources and staffing to raise the cost high enough to prevent de la Vega from using a border crossing. Decrease in producer profit is the measure of effectiveness of the U.S. strategy.



**Figure 3. Operator resilience curve for the producer-consumer model. With unconstrained interdictions, there is a drop in profit from three to four interdictions resulting from the complete denial of the New Mexico border and from nine to ten interdictions resulting from the complete denial of California. The maximum profit reduction from a single attack which did not close down a state was \$180,000, representing less than a 1% reduction in overall profits.**

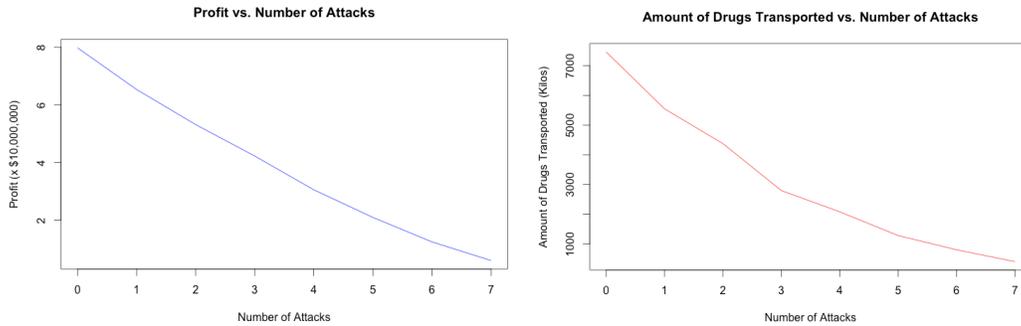
The second phase of analysis uses a profit-driven minimum cost flow scenario. Each crossing is randomly assigned an efficiency value with an expected value of 0.7 based upon national statistics. This value indicates how much of the narcotics flow passes through as it moves through a border crossing. The quantities produced in Mexico are the same as in the producer-consumer model.

With unregulated supply and demand, profit margin drives de la Vega to move all of his supply through the border crossing with the highest efficiency to the city with the highest per unit cost. To increase the realism of the model, we apply upper bounds to border crossings, namely that de la Vega restricts the flow though any one crossing to 1000 kilos. This spreads the flow across the region and improves the probability of any one shipment making it through to the U.S. The performance of the U.S. strategy is measured by decrease in profit and reduction of drugs delivered.



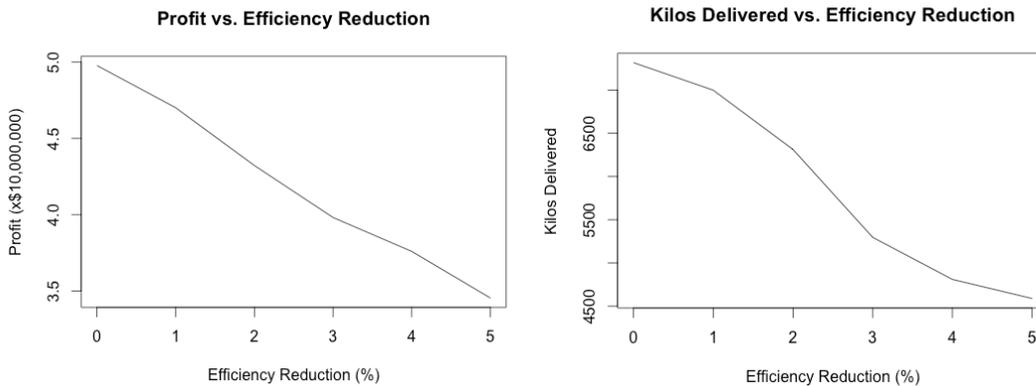
**Figure 4. Results of interdicting the distribution network of a profit-driven minimum cost flow model. As the number of interdictions is increased, De la Vega’s profits decrease, but he still maintains a profit margin of more that \$65 million. As border crossings are closed, he is forced to use increasingly less efficient crossings which reduced profit and amount of drugs delivered.**

The model also analyzes attacking the production facilities in Mexico. Mexican law enforcement locates and eliminates them from the network. We see authorities initially concentrating on the plants with the largest capacity and progressively closing them down until they reach the smallest capacity plants. In this scenario, profits decrease by more than \$60 million and the amount of drugs moved across the border is reduced by more than 9000 kilos. This plan requires the cooperation of the Mexican authorities and cannot be enacted unilaterally by the CBP.



**FIGURE 5. Results of interdicting production facilities in Mexico. This curve is much steeper indicating that attacking the supply network produces much better effects. This strategy also presents a lower cost alternative to interdicting one crossing at a time.**

Lastly, we examine a non-kinetic approach to decreasing narcotics flow across the border. By decreasing the efficiency of drug movements through the border, the U.S. has a low-cost and easily implemented alternative to applying significant manpower and money. Using the profit-driven model, we reduce the efficiency by five percent in increments of one percent and examine the results.



**FIGURE 6. With a five percent reduction in efficiency, de la Vega is influenced to reduce production by 2800 kilos which results in a \$15 Million profit reduction and 2700 kilo reduction in drugs delivered.**

## CONCLUSION

The most effective tactic in achieving America’s desired end state is attacking the production network through partnership with Mexican law enforcement. Interdicting narcotics at the border is expensive, time consuming, and manpower intensive. Independently, it produces little results when measured by reduction in producer profit and the amount of drugs that are delivered to U.S. cities. To complement an aggressive attack strategy by our partners, the CBP can employ a targeted training and staffing plan in order to reduce the efficiency of the narcotics flow. In order to gain advantage over this ruthless enemy, the U.S. must use all available kinetic and non-kinetic methods in a comprehensive strategy in order to effectively apply pressure on the cartel’s center of gravity.