



WASTE TIRES IN FLORIDA
STATE OF THE STATE
2008

I. GENERATION RATE

Annually, 16,000,000 automobile, light truck, and smaller tires plus 900,000 medium truck and larger tires were removed from vehicles in Florida in 2007. Adjusted for weight, this is 20,500,000 passenger tire equivalents (PTE) or an estimated 205,000 tons of waste tires.¹ Throughout this report, all tire quantities are stated as passenger tire equivalents.

II. MARKETS

Before Florida's waste tire management program was implemented in 1989, almost all waste tires in the state were landfilled or stockpiled. Starting in 1989, tires had to be cut or shredded into at least 8 pieces prior to landfill disposal, thereby encouraging development of alternative uses. An increasing percentage has been diverted to a broad range of constructive applications. Table I shows the 2007 estimated usage of waste tires generated in Florida based on a detailed market survey. In total, 18.5 million (90%) of the 20.5 million waste tires generated in Florida in 2007 were constructively utilized. The 2.0 million tires listed within the disposal classification include 1.3 million tires landfilled in Dade County and over 500,000 tires landfilled in Alabama due to its allowance of low-cost tire monofills. Some shredded tires were imported into Florida from neighboring states for colored mulch feedstock. Waste tires from Puerto Rico have also entered into Florida markets and processors.

Florida's crumb rubber markets include asphalt modification, playground/sports surfacing, soil modification/cover and molded products. The Florida Department of Transportation (FDOT) purchases about 5,000 tons of crumb rubber annually from Florida producers as part of the interlayer, friction course and crack sealants used in roadway construction and maintenance. Manufacturing crumb rubber for this market consumes about 720,000 tires. Florida was the only state that specified rubber modified asphalt (RMA) for friction course pavement on all state-maintained roads, but polymers have displaced crumb rubber in some road classes. DOT has initiated a detailed research program that could reverse this decline and increase crumb rubber usage through substitution of polymer/crumb rubber blends. If successful, the blends may increase total crumb usage by broadening applicability to structural courses as well as the friction course.

Playground surfacing, both loose-filled and poured-in-place, is a significant use of crumb rubber. This market increased significantly in 2001 as a result of new state grants supporting up to 50% of crumb rubber purchase costs associated with surfacing materials intended to enhance safety and accessibility of playgrounds. Although this market has declined after completion of the grant program, the market has continued on its own merits. In addition, innovative athletic fields utilizing crumb rubber within artificial turf surfaces increased in 2007. Crumb rubber is also used for soil modification to decrease compaction and enhance drainage on sports fields and other high-traffic grassed areas. Florida producers have significant sales

¹ A 20 pound passenger tire is 1 PTE; a 100 pound truck tire is 5 PTE.

of crumb rubber to regional manufacturers of molded rubber products, such as tiles and mats. Colored mulch is growing rapidly in Florida and is becoming a significant national market.

Florida utilized an estimated 4,730,000 waste tires in crumb rubber applications during 2007, representing 23% of total generation. National crumb rubber markets have not developed as rapidly. The crumb rubber industry has historically experienced excess capacity. There have been many business failures throughout the country, and some of the remaining companies are struggling to survive, but the industry seems to be stabilizing as synthetic athletic fields and colored mulch markets continue to expand.

TABLE 1: 2007 ESTIMATED WASTE TIRE USAGE (in PTEs)

MARKET	2007 USAGE OF WASTE TIRES GENERATED IN FLORIDA (PTE)	APPLICATIONS	STATUS
Export of Used Tires (not included in waste tire totals)	250,000	Primarily to Caribbean/Latin countries	Stable – now increasing in US markets also
Crumb Rubber Applications			
Highway Uses	720,000	Rubberized asphalt, crack sealants	Still declining, but new DOT research program
Playground/Sports Safety Surfaces	1,100,000	Cushioning material	Increasing synthetic sports fields
On-ground Uses	2,010,000	Soil amendments and mulch	Colored mulch is growing
Molded Products	900,000	Mats, tiles, outdoor tables	Int'l manufacturing competition increasing
Subtotal-Crumb Rubber	4,730,000		
Energy Use			
In-State Industrial TDF	5,730,000	Includes Ridge Generating, Rinker, CEMEX, and Florida Rock	Will increase with additional kilns and optimized usage
In-State WTE Use	2,240,000	Supplemental energy use by 8 facilities	Dependent on available capacity
Out-of -State TDF	4,500,000	Paper/cement in Georgia and Alabama	Stable, but vulnerable to local suppliers
Subtotal-TDF	12,470,000		
Civil Engineering			
Drainfield Aggregate	220,000	Replaces rock/aggregate	Declining after initial rapid growth
Landfill Daily Cover	720,000	Displaces soil	Low-value use
Other CE Uses	310,000	Drainage layer, gas collection	Project dependent
Subtotal-CE	1,250,000		
Disposal	2,050,000	Landfill disposal of shredded tires, including >1.3 million in Dade County	Will decrease as additional markets develop
TOTAL	20,500,000		

As shown in Table 1, use of the hydrocarbon resources contained in waste tires as a supplemental energy resource was the largest application, consuming 60% of Florida's waste tire generation. Eight waste-to-energy facilities consume tires to enhance their combustion temperature control and/or optimize electricity generation. Other industrial facilities utilizing

tires as fuel within Florida and in neighboring states are economically supplied by Florida's well-developed tire collection and processing industry. Nationally, use of waste tires as an energy resource is by far the largest application, mirroring Florida's experience.

Florida has been one of the pioneers in large-scale use of shredded tires as a replacement for natural soil and aggregate in civil engineering applications such as landfill drainage layers, methane gas collection systems, and septic system drainage trenches. These uses consumed approximately 530,000, or about 3%, of Florida's waste tires in 2007. As tire chips have become a proven, technically acceptable material for these applications, further market growth for tire chips will be dependent on comparative economics and new cell construction.

Continued market development is the controlling factor in diverting the remainder of unutilized waste tires from landfills and stockpiles. Cemex has restored tire usage as a supplemental energy resource at its cement facilities in Brooksville, and could potentially use over 2,000,000 tires/year if both facilities ultimately optimize tire usage. Florida Rock Industries' new cement kiln in Alachua County has initiated use of waste tires at a low rate due to operational considerations. Additional cement facilities are in planning or construction stages and these potential users are evaluating TDF and initiating permitting procedures.

The Florida Department of Environmental Protection (DEP) is clearly interested in defining and initiating additional measures to enhance product markets in Florida. Possible examples intended to accelerate market development include identification and preliminary screening of manufacturing industries capable of utilizing crumb rubber, as well as other facilities capable of using tire-derived fuel (TDF) in a technically, economically and environmentally acceptable manner. DEP will explore obstacles to civil engineering applications such as drain field aggregate and highway construction applications. Constructive utilization of all waste tires generated in Florida remains a sound objective, and significant progress has been made toward this objective since the waste tire program was established.

III. RESEARCH, DEMONSTRATION, AND SPECIAL PROJECTS

A. STATE SPONSORED RESEARCH AND DEMONSTRATION

1. Crumb rubber made from a small part of the tires from the Polk City Waste Tire Site was used to produce RMA for paving the Withlacoochee and Van Fleet trails in 1995. This was the first use of RMA for a trail in the U.S.
2. Research into the safety and effectiveness of using crumb rubber as a parking lot surface at a Florida Community College at Jacksonville facility in Nassau County was completed. The final report, issued in October 1999, found that this application is environmentally sound and identifies some design considerations, maintenance needs, and practical limitations of crumb rubber parking lots.
3. RMA was used to pave sections of the Nature Coast Trail in Dixie, Gilchrist, and Levy counties. A test section combining RMA with fine recycled glass cullet was completed in October 2000, demonstrating the first combined use of RMA and glass in paving.

B. SPECIAL PROJECTS

1. SUPPLEMENTAL PROGRAM FOR ACCELERATED WASTE TIRE SITE REMOVAL

In 2002 and 2003, a total of 30 Florida counties were placed under a medical alert for potentially serious diseases, namely West Nile Virus (WNV), Eastern Equine Encephalitis (EEE) and St. Louis Encephalitis (SLE). These diseases can be communicated to humans by mosquito species known to breed in stagnant water in outdoor containers, such as waste tires. To remove small waste tire accumulations in counties affected by the medical alert, DEP developed and continued its supplemental program to enhance cooperative efforts by state and county governments. The program was available in 2006, and was requested by 2 Florida counties. No requests for assistance were received in 2007.

The program uses the strengths of state and local governments to accelerate collection, transportation, and processing of waste tires. DEP used existing contracts with processors to provide trailers, transport and process collected waste tires for constructive applications. County governments used their capabilities to advertise the program, secure local collection sites and load trailers. Since 2001, almost 260,000 tires have been removed from 10 counties under this program.

Merging the capabilities of governments in this partnership accelerated waste tire removal from small accumulations and reduced this breeding ground for dangerous mosquitoes. West Nile Virus is expected to be present in Florida again in 2008. As counties are designated with medical alert status, the waste tire resources available to the Department will be used for this program again.

2. MATCHING GRANTS FOR PLAYGROUND SURFACING PRODUCTS

The 2000 Legislature provided \$ 1.5 million for matching grants to counties to purchase surfacing products made from Florida waste tires. The objective was to improve playground safety in Florida parks and schools while also promoting waste tire recycling. Surfacing products purchased under these grants had to meet applicable national safety and accessibility guidelines and be made from whole waste tires collected and processed in Florida.

The funds were distributed to participating counties on the basis of population, with a \$4,000 minimum grant. A 50/50 match of funds was required. Only the direct costs of playground surfacing materials derived from recycled waste tires were reimbursed from grant funds, and not other materials, installation, or equipment. The grants were passed through to other local governments, school boards, and non-profit organizations via a competitive process.

At the end of the program in December, 2001, 22 counties had spent \$343,265 in state matching grant funds. The program was responsible for the purchase of 3,620,154 pounds of loose fill rubber granules and 37,896 square feet of poured-in-place surfacing containing crumb rubber. This represents the use of about 310,000 passenger tire equivalents based on average manufacturing yields and surfacing composition.

3. PLAN FOR RECOVERY OF THE ARTIFICIAL TIRE REEF IN BROWARD COUNTY

During the 1970s, between one and two million tires were placed in the ocean off Broward County as an artificial reef. The tires did not successfully create an artificial reef. Over the years, many of the tires were mobilized by tropical storms and hurricanes. The movement of these tires has caused damage to nearby existing coral reefs. A small tire retrieval program was conducted in 2001 by Dr. Robin Sherman of Nova Southeastern University, under a \$30,000 grant from the National Oceanic and Atmospheric Administration (NOAA). Approximately 1,600 tires were retrieved at a cost of over \$17.00/tire. Due to the magnitude of the project and the projected cost, the tires have not yet been abated.

The Department of Environmental Protection (DEP) was contacted by a Coastal America representative in 2006 and asked to work with them on a major project to remove the tires. Coastal America is a partnership of federal agencies tasked with the protection and restoration of our oceans and coasts. Coastal America organized a cooperative project with the U.S. Navy, US Army, US Coast Guard, NOAA, Broward County Environmental Protection Department and DEP to abate this tire pile that is endangering the Broward County Osborne Reef.

The NOAA Marine Debris Program funded a reconnaissance project that was conducted in August, 2006. The scope of work for this project included the development of a strategy for removing and properly disposing of the tires. Retrieval techniques were explored; 30 sample tires were retrieved and examined for processing suitability. Handling, staging and transportation methods were considered; and end uses were explored. As there has not previously been a recovery of waste tires from the ocean of this scale, it was decided that a pilot program was needed in 2007 to test diver retrieval productivity, loading and transport methods, and tire processing and use.

The next steps included planning the complete removal of the waste tires and seeking funding for this effort. Complete removal required Federal funding for military diver salvage operations and watercraft, as well as State funding for processing and disposal of the recovered tires. Project management for the 2007 pilot was provided by Broward County and tire processing services were funded by DEP out of current year abatement funds. The Navy took lead and organized the multiple military dive teams interested in recovering tires as a part of their annual training in 2007 and beyond.

Initially, the full abatement project was expected to last for portions of three years, depending on retrieval rates and the diving and watercraft units available each year. The extent of the funding required for full abatement was estimated to be about \$3.4 million in state and county funds. Funding estimates for military participation were not calculated as their participation falls within the Integrated Readiness Training (IRT) funded through Department of Defense (DOD). The total cost per tire is estimated to be less than the \$17.00/tire associated with the 2001 study conducted by NOVA Southeastern University, however, the cost to abate the pile still exceeded amounts in DEP's current waste tire abatement contracts. As a result, Governor Crist recommended and the Legislature passed a \$2 million special appropriation in 2007 for DEP to complete its share of the project.

The pilot program began in June 2007 and ran for 20 days. The IRT program provided forty military divers and one Landing Craft Unit (LCU) for the pilot. Broward County provided significant in-kind services that included all dockage and associated fees and all on-site management. The DEP provided funding for a tire processing contractor and for consumable supplies and equipment that the military could not provide.

Based on a conservative assumption, after pilot project completion, that military divers can remove 1000 PTE/day (40 divers and 1 LCU), monthly tire removal is estimated at 20,000 PTE (1000 PTE/day x 5 days/wk x 4 wks/mo); a 3 month project would produce 60,000 PTE; and a 4-mo project would produce 80,000 PTE. At this rate, complete cleanup of the estimated tires would take about eight years, since weather conditions and military asset availability limit work to about three to four months per year. Actual productivity could increase in future years and these projections will be revised accordingly.

It was decided that the priority areas needed to be redrawn to emphasize the importance of removing tires from the east face of the affected portion of the middle reef and adjacent areas of sand from which tires are likely to be transported to the middle reef face during storm events. In the revision, Priority area 1 will be cleared in a south to north direction first. Priority area 2, divided into five subareas, will be cleared beginning with area 2a (south to north), 2b, etc. Priority area 3 is relatively stable and shall only be cleared after areas 1 and 2. The total area of priority area 1 and the revised priority area 2 is approximately 30 acres. Estimated combined tire quantity is 651,565 PTE as presented in Table 1.

Table 1. Summary of estimated tire quantities to be removed in priority areas.

Priority Areas	Area (yd ²)	Thickness (yards)	Volume (yd ³)	Density (PTE/yd ³)	Tire Quantity (PTE= <i>passenger tire equivalent</i>)	
					PTE	Tons
1	26,494	1.00	26,287	14.0	368,018	3680
2 a	27,854	0.17	4653	15.0	69,797	698
2b	15,213	0.17	2586	15.0	38,790	388
2c	27,363	0.17	4652	15.0	69,780	698
2d	26,973	0.17	4585	15.0	68,775	688
2e	23,271	0.17	3956	15.0	59,340	593
TOTAL					651,565	6745

This number still exceeds the capabilities to remove all the tires in a 3-year project, as was originally intended. It is therefore necessary that, in order to remove the tires from priority area 1 and revised priority area 2, an increase in military salvage resources be made available with a 120-day project in each of 3 years, beginning in 2009. These additional resources would be additional divers and watercraft for tire transport to shore. Given these additional assets, Priority area 1 could be cleared in three years.

Major recommendations from the pilot program include:

- A. Broward County should continue to provide dockage for the LCU, at no cost to the project;
- B. Additional dive teams and watercraft should be provided in 2009, 2010 and 2011; and
- C. Salvage operations should be conducted over a 120-day period each year.

IV. LAW AND RULE CHANGES

The laws and rules governing Florida's waste tire management program have evolved since the program inception. The 1995 Legislature expanded the allowable uses for waste tire grants-in-aid to counties to include operation of waste tire recycling and education programs, enforcement, and purchase of materials and products made from waste tires collected and recycled within the state. Small counties (under 100,000 population) were allowed to use their consolidated small county grant funds for any solid waste related purpose, including abatement of waste tires. The Waste Tire Rule, Chapter 62-711, Florida Administrative Code (F.A.C.), was changed in 1996 to reduce the number of rules. In 1999, the definition of a waste tire site was changed from 1,000 to 1,500 waste tires in one location. Facilities that consume processed tires as a fuel or as a material for making a product were no longer required to obtain a permit if the tire material, inventory management practices, and storage configuration meet the standards in the rule.

In 2001, the Legislature significantly reduced funding levels for waste tire grants from \$7.9 million in 2000 to \$1.2 million in 2001. In addition, the number of counties eligible to receive these grants was reduced from all 67 counties to those 34 "small" counties with under 100,000 in population. The Legislature also provided \$1.5 million for matching grants to counties to purchase surfacing products made from Florida waste tires, as discussed in the preceding section. The funding level for waste tire grants was increased to \$3.4 million in 2002 and these grants were made available to all 67 counties again. The program was modified again in 2003, dividing \$4 million dollars equally among 34 small counties to be used for general recycling purposes, including waste tire management. In 2004, 2005, 2006, and 2007 \$6.5 million was allocated each year for these consolidated small county grants.

V. PERMITS AND REGISTRATION

There are 31 permitted waste tire processors operating at landfills and other waste tire sites. Of the 31 processors, 21 are fixed site facilities and 10 are mobile. There were 842 companies registered as waste tire collectors, using 1,998 trucks to haul waste tires in 2007.

VI. ABATEMENT

Currently, there are 9 known waste tire sites in Florida with a total of 718,500 tires, as summarized in Table 3. Only 3 of these sites contain over 5,000 waste tires. Abatement of the last known land based site containing over 30,000 tires was completed in 2003, including one auto salvage yard with 140,000 waste tires. The largest of the remaining waste tire sites, the Osborne Reef site contains an estimated 664,500 tires. Please see section *III. Research, Demonstration and Special Projects* for more information on the Osborne Reef waste tire removal project.

Owners and operators of illegal waste tire sites are required to abate their own sites, and many have done so. A partial list of sites containing over 40,000 tires that have been abated by landowners or operators without expenditure of public waste tire account funds is provided in Table 4. Sites abated by owners are not necessarily reported to DEP if the action is taken in response to local government encouragement without DEP assistance.

In addition, counties have used waste tire grant funds to remove waste tires from public property and from the property of illegal dumping victims. Some counties have even abated major stockpiles, as illustrated by Table 5.

TABLE 3: EXISTING ILLEGAL SITE STATUS

SITE NAME	COUNTY	ESTIMATED TIRES	ABATED TIRES	REMAINING TIRES	STATUS
A & A Auto	Manatee	15,000	12,500	2,500	Enforcement pending
Bessemer Street	Pasco	11,000	0	11,000	Enforcement pending
Casey	Okaloosa	16,000	11,000	5,000	Ongoing enforcement
Go Cart Track	Manatee	2,500	0	2,500	Ongoing enforcement
Hernandez	Hardee	3,000	0	3,000	Ongoing enforcement
Osborne Reef Broward County	Broward	675,000	10,500	664,500	Ongoing clean-up
Roberts Auto	Collier	22,000	0	22,000	Ongoing enforcement
Royal Auto	Hardee	3,000	0	3,000	Ongoing enforcement
Suggs Salvage	Desoto	5,000	0	5,000	Ongoing enforcement
TOTALS		752,500	34,000	718,500	

**TABLE 4: SITE ABATEMENT BY OWNERS OR OPERATORS
WITHOUT WASTE TIRE FUNDS
(Sites over 40,000 tires known to DEP)**

SITE	ESTIMATED TIRE QUANTITY	MARKET
Florida Tire Recycling	4,650,000	Landfill/fuel
Environmental Research	1,200,000	Landfilled
Anello - Celery Avenue	500,000	Unknown
OK Tire	350,000	Boiler Fuel
Conner Land	323,000	Waste to Energy
Shooting Range	250,000	Unknown
Caesar Street Warehouse	250,000	Unknown
Overland Road	200,000	Unknown
Calabrese	160,000	Landfilled
Pt. Everglades Warehouse	150,000	Landfill Cover
Burlington Street	150,000	Waste to Energy
Universal Tire	135,000	Waste to Energy
B & D Recycling	110,000	Waste to Energy
Ashley Tires Disposal	100,000	Waste to Energy
AB&B Auto Parts	90,000	Fuel
Florida Coastal Tire	90,000	Boiler Fuel
Tire Eagle	80,000	Landfilled
Clark Street	75,000	Unknown
Snake Road Auto Parts	61,000	Landfilled
Rainbow Industries	60,000	Unknown
Anello	50,000	Unknown
Boehm's Warehouse	43,000	Waste to Energy
Ashley Tires Disposal	100,000	Waste to Energy
Clark Street	75,000	Unknown
TOTAL	9,077,000	

**TABLE 5: SITE ABATEMENT BY COUNTIES
USING WASTE TIRE GRANT FUNDS
(Sites over 100,000 tires)**

SITE	TIRE QUANTITY	MARKET
Benton Yards	250,000	Landfill Cover
36th Street Acquisition	250,000	Landfill Cover
Port Everglades	250,000	Landfill Cover
Ricker Road	187,000	Landfill Cover
RC's Tri-county	130,000	Landfill Cover
TOTAL	1,067,000	

When the Department is forced to abate a site, it gains legal access and then assigns an experienced contractor the task of stabilizing and abating the site. When the contractor has completed the task, the Department must seek cost recovery from the owner and operator. In some cases, counties assist DEP by performing local contract/site management services. Table 6 lists sites abated under Department contracts.

TABLE 6: SITE ABATEMENT UNDER DEPARTMENT CONTRACTS

SITE	TIRE QUANTITY	COST	MARKET
Polk City	1,948,557	\$2,593,000	Boiler Fuel
National Tire Recycling	1,021,695	\$945,000	Boiler Fuel
Danco AQ	838,445	\$872,000	Boiler Fuel
Import Auto Parts	390,275	\$344,000	Landfill Construction
Narcoossee Road	176,939	\$187,000	Landfill Construction
Coast Auto Parts	172,874	\$218,000	Kiln Fuel
Gilliard Bros.	155,117	\$154,000	Boiler Fuel
A Auto Parts	145,000	\$202,000	Boiler Fuel
Bob's Garage	58,263	\$118,000	Kiln Fuel
Burke Site	45,038	\$47,000	Waste to Energy
Register	44,624	\$51,162	Kiln Fuel
Draper	42,457	\$59,824	Boiler Fuel
Florida State Tire	41,121	\$78,000	Road Base
Old Bradenton Road	24,887	\$33,590	Boiler Fuel
Thaggard	23,933	\$83,053	Boiler Fuel
Oxborough Property	18,497	\$51,000	Kiln Fuel
Curry	17,270	\$27,000	Landfill Construction
Pioneer Mat	14,051	\$19,521	Boiler Fuel
Griffin	13,847	\$16,111	Landfill Construction
Reynolds Road	4,734	\$7,158	Boiler Fuel
Swindle	2,035	\$963	Drainfield Chips
Teaspoon	18,500	\$24,000	Boiler Fuel
TOTAL	5,218,159	\$6,131,382	

Total waste tire site abatement activity from the preceding tables is summarized in Table 7. Over 15,362,159 waste tires have been removed from waste tire sites in Florida since program inception. Approximately 59% have been removed by landowners or operators, often with encouragement from impending state and/or local enforcement action. Counties have removed 7% of the abated waste tires utilizing waste tire grant funds from the program. When other alternatives had been fully exhausted, over 5 million tires (representing 34%) have been abated under DEP contracts at a total cost of \$6,131,382.

TABLE 7: SITE ABATEMENT SUMMARY
(From Tables 4-6)

ABATED BY	QUANTITY	% OF TOTAL TIRES
DEP	5,218,159	34%
County	1,067,000	7%
Owner or Operator	9,077,000	59%
TOTAL	15,362,159	100%

VII. SUMMARY

The Florida waste tire management program has made exceptional progress. More than 90% of the 20.5 million waste tires generated annually in Florida are constructively utilized in diverse applications, compared to virtually no usage in 1990. Use of tire shreds in septic tank drain fields is declining, but high fuel prices are attracting additional use of tires as a supplemental energy resource in new and retrofitted cement kilns, waste-to-energy facilities, and power boilers, with additional growth probable. The Department continues to explore methods of encouraging and accelerating additional market development to achieve full utilization of this resource.

Waste tire stockpiles have been reduced by more than 15 million tires through persuasion of site owners, financing of county abatement actions, or abatement under department contracts. With continuing permitting and enforcement activity on both state and local levels, few new stockpiles have been created and existing stockpiles are continuing to be abated. Stockpiles have declined dramatically over the years, with the current list of known stockpiles containing approximately 54,000 waste tires, with the exception of the Osborne Reef site. The Department is continuing its efforts to identify and abate all remaining stockpiles.