

Reducing Dependence on Conventional Energy Sources

Nathan Ryan Maiwald
Santee State Park, Park Manager
251 State Park Road
Santee, SC 29142
(803) 854-2408
Email: nmaiwald@scprt.com

Problem Statement

Santee State Park is one of 47 state parks in South Carolina and just like all of our state parks we are challenged with the notion of providing high quality experiences while at the same time focusing on protecting the states natural and cultural resources. That statement in itself is conflicting because while our job is to lessen the impact on all of our resources, we have to maximize our profits to balance our bottom line. That in turn means more visitors causing higher impact on our resources. It's an interesting dilemma we're faced with as managers of our state parks.

So the question is asked, how can I operate my park as efficiently as possible with high visitation and the least amount of impact on our resources. There are several approaches that can be used to achieve this difficult goal. They include the following: 1) educating the public about their impact on the resources; 2) being good stewards by replenishing what we take away; and 3) protecting special resources by limiting access to them. While all of these approaches to protection are important, it would be most beneficial to narrow the focus to one specific goal or task.

With these things in mind, my goal as manager of Santee State Park will be to create an environment where we can provide a positive experience for the highest number of visitors and minimize the strain on our resources whether natural, cultural or fiscal. One area of research that we focus on is to assess the impact our visitors have on our facilities with utilities being the prime focus. Lessening the dependence on conventional

sources of energy while seeking alternative options will not only help the parks fiscal resources by reducing expenditures, but will also create a more positive impact on our natural resources by using greener methods.

Santee State Park has incurred roughly \$320,000 in utility costs over the last three fiscal years. While the revenue stream does balance out the cost differential, there is still hope to reduce expenditures by researching the potential for alternative energy sources. Keeping in mind our agency's mission statement and 5 goals, it's apparent we have a responsibility to examine our practices and always strive to be better stewards with our resources (see below).

Mission

To encourage people to discover South Carolina's State Parks by providing resource-based recreational and educational opportunities that emphasize the conservation, protection and interpretation of the state's natural and cultural resources¹.

Goals of the State Park Service

1. To serve as responsible stewards of the diverse natural and cultural resources entrusted to the SC State Park Service.
2. To provide quality customer service to our customers.
3. To provide an aesthetically pleasing physical environment in parks through methods that complement the State Park Service's mission of stewardship and service.

¹ Santee State Park General Management Plan, 2007

4. To manage the fiscal resources of the State Park Service in an efficient and responsible manner.
5. To maximize the effectiveness of the State Park Service's human resources.²

Data Collection

While collecting data for my project, I hoped to discover many alternative energy sources to compare against the conventional sources we now use. This will help determine overall savings in dollar amounts but will more importantly lessen the impact on our overall environment. The first piece of data collection will be the breakdown of what we have spent as a park (Chart 1). My data included the last three fiscal years which I determined is sufficient enough to gather adequate variations in usage and expenditures. I compared these specific numbers against research that has been gathered up to this point on alternative or conventional energy practices that we don't currently use. I have gathered this information from multiple sources such as the South Carolina Energy Office, the Electric Co-op of South Carolina, the United States Energy Department, Santee Cooper Electric and various articles or research findings through the S.C. State Library.

As a state park, we are viewed as leaders in "being green" and expected to use methods for operating as efficiently and effectively as possible by reducing our impact on all resources whether locally or globally. Through all of my data collection, I presumed to discover alternative resources for energy production that would be utilized in three key aspects of our parks operation. I have shown what effect these alternative resources

² Santee State Park General Management Plan, 2007

would have on our operation in relation to fiscal savings as well as the positive impact they would make on our natural resources. The three key aspects are as follows: 1) visitor and interpretive center; 2) cabin operation (to include all 30); and 3) residential employee housing. While the knowledge of alternative resources is vital, it is imperative that while we implement the use of cleaner and greener energy that we also educate and promote this importance to our visitors and general public. The United States Department of Energy has provided an outline which helps determine the breakdown for the annual energy bill for typical family homes. We will use this same outline to represent the percentages for our parks usage. This chart was significant in my research of data analysis which lead me to focus on the three key components (heating and cooling, lighting, and water heating) that comprised the highest usage levels of most utility costs (Chart 2).

Data Analysis

While heating and cooling a facility consumes roughly 50% of monthly utility costs, there are several approaches that can be taken to reduce the remaining 50%. One easy and convenient method is the installation of compact fluorescent light bulbs or CFL's. The first CFL's were introduced in the early 1990s and were too large for most light fixtures and were also very costly³. CFL's consume roughly 75% less energy than regular incandescent bulbs while lasting up to 10 times longer⁴.

³ http://saving-energy.suite101.com/article.cfm/saving_energy_with_cfl_light_bulbs/1-25-2009

⁴ http://www.energystar.gov/index.cfm?c=cfls.cfls_choose_guide/1-25-2009

The most significant impact of changing out incandescent light bulbs for CFL's in our operation would be evident in our 30 rental cabins at Santee. Overall, the cabins have a total of 240 light bulbs utilized. By calculating data received from the Electric Co-Op of South Carolina, just by changing from incandescent light bulbs to CFL's would save the park \$34 per year per cabin. That's also roughly \$308 per cabin for the lifetime of the CFL bulbs⁵. Multiply those numbers by 30 cabins and we would then save \$1020 per year and a total of \$9240 over the life of the bulbs (numbers are based on replacing 60 watt, 750 hour incandescent bulbs with 14 watt, and 10,000 hour CFL bulbs at 3 hours per day at a rate of \$.085 KWH). The parks visitor center and ranger residences aren't as significant of a savings as our cabins, but when calculated will still save a total of \$470 per year and around \$4200 over the lifetime of the bulbs. These numbers are very significant, especially when you look at the overall savings. With the three operations combined: cabins, visitors center, and residences, it would be a total savings of over \$1400 per year and more then \$13,000 over the life of the bulbs.

While saving money is very important and vital to our operation, there is something much more important at stake, our environment. The United States Energy Department states that "if every American home replaced just one light bulb with an energy star qualified bulb, we would save enough energy to light more than 3 million homes for a year, more than \$600 million in annual energy costs, and prevent greenhouse gases equivalent to the emissions of more than 800,000 cars"⁶.

⁵ http://www.ecsc.org/index.php?option=com_content&task=view&id=75&Itemid=3100/1-25-2009

⁶ http://www.energystar.gov/index.cfm?c=cfls.pr_cfls/1-25-2009

Studies by the US Department of Energy (DOE) show that water heating comprises roughly one-fifth of energy consumption (Chart 2). Between our cabins, visitor center and residences, Santee State Park operates a total of 37 water heaters ranging from 40 to 80 gallons. Using our utility costs from Chart 1, I determined that one-fifth of the cost for our cabins, visitor center, and residences over the last three years was over \$32,000. The U.S. DOE states that the use of a tank less water heater can be 24 to 34 percent more efficient than conventional storage tank heaters. The average savings of a tank less water heater by most standards is 30%⁷. If we were to install tank less water heaters throughout these operations, we would save an estimated \$9000 to \$10,000 per year. Why pay for heating water when you're not using it? That's the benefit of on demand water heaters.

The benefits from CFL's, tank less water heaters and other alternative approaches to providing energy efficient methods to our operation pale in comparison to the potential savings and impact lessened on the environment by the use of solar energy. While solar panels or Photovoltaic (PV) systems are very costly, the return on investment is astounding. The actual return on fiscal resources may take many years to incur, yet the impact on the environment is immediate and significant. In Chart 3, you will see a PV calculator which was completed based on one of our rental cabins. Using Chart 1, it was determined that the annual utility costs per cabin were roughly \$1,300. While the cost of the installation of the PV system for one cabin is \$24,000, the tax incentives on the state and federal level reduce the net cost by roughly \$10,000. Of course with state budgets

⁷http://apps1.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12820/1-25-2009

being reduced everyday, recouping the cost for the installation of a PV system would take years. However, with the impending economic stimulus plan being set forth by our US Government, these are exactly the type of “shovel ready” (meaning that if money was approved today you have a project that’s needed and can be completed or started quickly) projects they are attributing money too. While the initial installation is a hefty price to pay, the return to the environment is priceless. According to Kyocera Solar Inc, the installation of one PV system is estimated to prevent 6,023 pounds of carbon dioxide pollution which is equivalent to reducing 7,228 miles of auto driving and planting 20,279 square feet of trees⁸. These numbers are based on an annual estimate. Imagine those numbers multiplied by 30 cabins and the return on investment to our environment is astonishing.

Implementation Plan

Although we have many different methods and approaches we can take to lessen our demand on conventional energy sources, what’s next? Well, the answer is simple, “lets get started.” We have already implemented some methods such as installing low flow toilets and urinals, timers on light switches and the addition of over 300 CFL’s to our operations through the “Do the Light Switch” campaign carried out by the Electric Cooperatives of South Carolina (ECSC) during the summer of 2008. The program was promoted throughout all 47 State Parks in SC and in total the ECSC donated 4300 CFL’s valued at more then \$7,000.00. Using my previous figures on CFL savings, that translates to roughly \$260,000 over the lifetime of these bulbs. While there is so much

⁸ <http://kyocerasolar.cleanpowerestimator.com/kyocerasolar.htm/2-05-2009>

talk about the benefits of CFL's, there is one downside to these bulbs, disposal. CFLs contain a very small amount of mercury sealed within the glass tubing – an average of 4 milligrams. By comparison, older thermometers contain about 500 milligrams of mercury – an amount equal to the mercury in 125 CFLs. Mercury is an essential part of CFLs; it allows the bulb to be an efficient light source⁹. No mercury is released when the bulbs are intact (not broken) or in use. Most makers of light bulbs have reduced mercury in their fluorescent lighting products. Due to the fact that CFL's do contain mercury, there are particular recycling methods needed to dispose of burnt out or non-used bulbs. Most packaging of CFL's provides specific information on disposing, cleaning up broken bulbs and safe and proper use of the bulbs.

Implementing tank less water heaters and photovoltaic systems will be a more difficult task. The necessary resources to install either type of system are in place, yet the major stumbling block we face is the funding. Although these systems are very costly and a little more time consuming to install than, say, CFL's there is some great legislation on the horizon that may benefit our endeavors. Congress is working on a stimulus package that will contain funding specifically for public facility energy efficient projects. South Carolina alone may receive as much as \$25 to \$45 million dollars. We were asked by the S.C. Energy Office to provide information for the in-coming administration for some "shovel ready" energy efficient projects that could be implemented quickly. Santee State Park alone requested more than \$100,000 to install additional low flow toilets, low flow shower heads and sinks in all cabins, purchase energy efficient appliances, purchase and install tank less water heaters and install a photovoltaic system on at least one cabin.

⁹ Energy Star, Frequently asked questions, July 2008

While the implementation of all these efficient methods will help to reduce dependence on our energy output, we still have to make sure we are managing the progress. We continue to monitor our energy use on our parks expenditure and usage program (Chart 4). As manager, I must also play an active role in requiring my employees to carry out effective and efficient methods in reducing our energy output as well as providing information to our visitors on how to better assist us in our efforts. All of our literature throughout the park provides information on recycling and how to be better stewards of our resources. In our cabins, we provide booklets that talk about how to help visitors reduce energy costs through specific practices during their stay with us. Some of these practices include making sure all lights are turned off when not in use, setting thermostats to 68 degrees in the winter and 78 degrees in summer, reusing towels rather than changing them out daily, and not running water constantly when washing dishes just to name a few.

Evaluation Method

Several different methods will be used to monitor measure and calculate data collection and determine overall success of my initiative. They include: 1) expenditure tracking reports, 2) operational reviews, 3) usage reports, 4) visitor and employee buy in and 5) continued research to develop additional greener and efficient approaches to managing our operations.

By using my expenditure tracking reports as well as usage reports, I will be able to compare and contrast numbers over the last few fiscal years (FY's) with upcoming FY's. This will help us try and determine areas of gain as well as areas of loss which

would be beneficial for future planning of our management practices. The expenditure tracking report (Chart 4) I have developed accounts for the cost and usage amount of the utilities for each individual facility on my park. Integrated into this report is a usage report which determines the number of nights a facility is occupied and can be broken down by day, month, or year.

While tracking expenditures and usage is important and vital to the overall success of this program, the one aspect that's harder to manage and control is visitor and employee accountability. There has to be adequate training, follow-up and supervision to successfully manage this aspect of the evaluation. You can give employees and visitor's guidelines and rules necessary to be efficient and effective in managing Santee with a greener mentality, but the fact is if they don't believe and understand the significance of what it is they are accomplishing by carrying out greener philosophies, the program will ultimately fail.

To stay on track, I have developed a simple evaluation process that will be carried out on a monthly basis by Santee State Park Management.

- Enter monthly, utility costs and kilowatt per hour use for each specific facility then compare the numbers with last two fiscal years (Chart 4).
- Enter the number of nights a facility was occupied or vacant whether a rental unit or residence, and compare with last two fiscal years (Chart 4).
- Meet with staff on a regular basis with new and innovative methods to help reduce energy consumption

- Keep literature around park and in rental facilities current and up to date on efficient cost saving energy methods.

Using these approaches will not guarantee a reduction in all energy consumption, but the idea is to create a level of accountability for monitoring and managing our park as efficiently and effectively as possible.

Summary

For too long, our society has sat by and watched our resources be depleted with the assumption that they will never run out. There is research and data available that can support the theories that our resources are on the way out or that they are stable and will be around for many years to come. Either way, why should anyone assume that the air we breathe, the water we drink and any other resource we use on a daily basis will be around forever? With today's technologies and forward thinking, we have the opportunity to not only reduce our use on resources, but actually replenish much of what we take away.

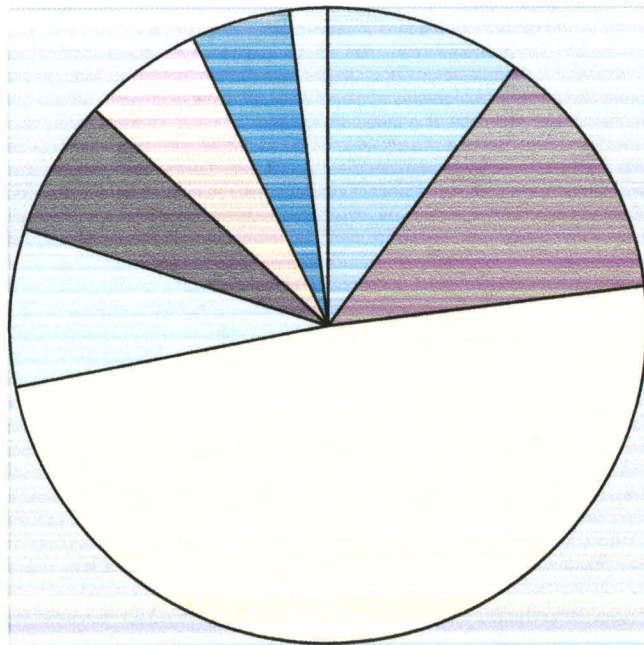
With the ever changing dynamics of our society and the strain put on land and resources, there has got to be some change or at least an attempt to slow the process down. As stewards of our State Parks and land in general, we are challenged with the notion of protecting not only our cultural resources but also our natural resources. Therefore as a caretaker or manager of this park, I must take all necessary measures to ensure that Santee State Park will not only be here tomorrow, but for years to come. While the steps being taken at Santee State Park won't fix the problems we have on a

state, national or global scale, we see ourselves as one piece of the puzzle. It is up to us to change habits in energy fields if we want a better future not only for us but mostly for future generations. So as we look towards the future, we will focus on leaving things better than the way we found them, and rest easy knowing we did our part.

Chart 1. Santee State Park utility costs over last 3 F/Y's

Utility Costs									
	FY05/06		FY06/07			FY07/08			
JUL	\$ 12,269.20		\$ 13,355.53			\$ 12,511.18			
AUG	\$ 11,373.20		\$ 12,277.51			\$ 12,232.78			
SEPT	\$ 10,646.17		\$ 10,710.26			\$ 11,269.42			
OCT	\$ 8,348.20		\$ 6,887.90			\$ 6,127.69			
NOV	\$ 7,080.89		\$ 6,283.67			\$ 6,844.31			
DEC	\$ 8,699.56		\$ 7,828.68			\$ 7,714.10			
JAN	\$ 8,845.66		\$ 6,325.89			\$ 7,261.97			
FEB	\$ 6,263.77		\$ 7,081.85			\$ 9,507.31			
MAR	\$ 8,065.87		\$ 7,315.07			\$ 7,450.92			
APR	\$ 7,856.18		\$ 6,478.20			\$ 8,025.33			
MAY	\$ 9,207.73		\$ 8,618.62			\$ 8,511.47			
JUN	\$ 10,170.63		\$ 9,396.35			\$ 10,849.13			
TOTALS	\$ 108,827.06		\$ 102,559.53			\$ 108,305.61			
	CABINS	RES	OFFC	CABINS	RES	OFFC	CABIN	RES	OFFC
JUL	\$ 3,868.35	\$ 818.08	\$ 644.24	\$ 4,371.72	\$ 671.11	\$ 698.06	\$ 4,200.00	\$ 932.00	\$ 728.00
AUG	\$ 4,433.35	\$ 745.84	\$ 641.71	\$ 4,705.81	\$ 801.01	\$ 722.87	\$ 4,421.00	\$ 1,017.00	\$ 770.00
SEPT	\$ 3,926.99	\$ 1,097.88	\$ 762.92	\$ 4,563.57	\$ 675.30	\$ 683.41	\$ 4,700.00	\$ 993.00	\$ 767.00
OCT	\$ 3,091.39	\$ 651.17	\$ 646.61	\$ 2,599.88	\$ 400.68	\$ 527.00	\$ 2,782.00	\$ 604.00	\$ 614.00
NOV	\$ 2,437.89	\$ 436.35	\$ 476.40	\$ 2,347.39	\$ 337.00	\$ 434.00	\$ 2,409.00	\$ 553.00	\$ 589.00
DEC	\$ 3,078.86	\$ 488.23	\$ 433.03	\$ 2,675.00	\$ 433.00	\$ 528.00	\$ 2,411.00	\$ 686.00	\$ 523.00
JAN	\$ 3,933.53	\$ 1,002.79	\$ 552.45	\$ 2,521.00	\$ 526.00	\$ 532.00	\$ 3,101.00	\$ 799.00	\$ 531.00
FEB	\$ 2,695.55	\$ 600.01	\$ 476.75	\$ 2,679.00	\$ 859.00	\$ 616.00	\$ 3,688.00	\$ 1,091.00	\$ 609.00
MAR	\$ 3,487.41	\$ 820.19	\$ 559.71	\$ 2,778.00	\$ 620.00	\$ 570.00	\$ 2,330.00	\$ 633.00	\$ 496.00
APR	\$ 2,682.98	\$ 633.18	\$ 471.14	\$ 1,842.00	\$ 431.00	\$ 536.00	\$ 2,595.00	\$ 730.00	\$ 573.00
MAY	\$ 2,594.16	\$ 647.62	\$ 603.68	\$ 2,371.00	\$ 620.00	\$ 576.00	\$ 3,461.00	\$ 681.00	\$ 628.00
JUN	\$ 3,209.45	\$ 442.79	\$ 635.98	\$ 3,192.00	\$ 633.00	\$ 541.00	\$ 3,627.00	\$ 668.00	\$ 736.00
TOTALS	\$ 39,439.91	\$ 8,384.13	\$ 6,904.62	\$ 36,646.37	\$ 7,007.10	\$ 6,964.34	\$ 39,725.00	\$ 9,387.00	\$ 7,564.00

Chart 2. Annual breakdown of energy use for a typical family home or rental unit

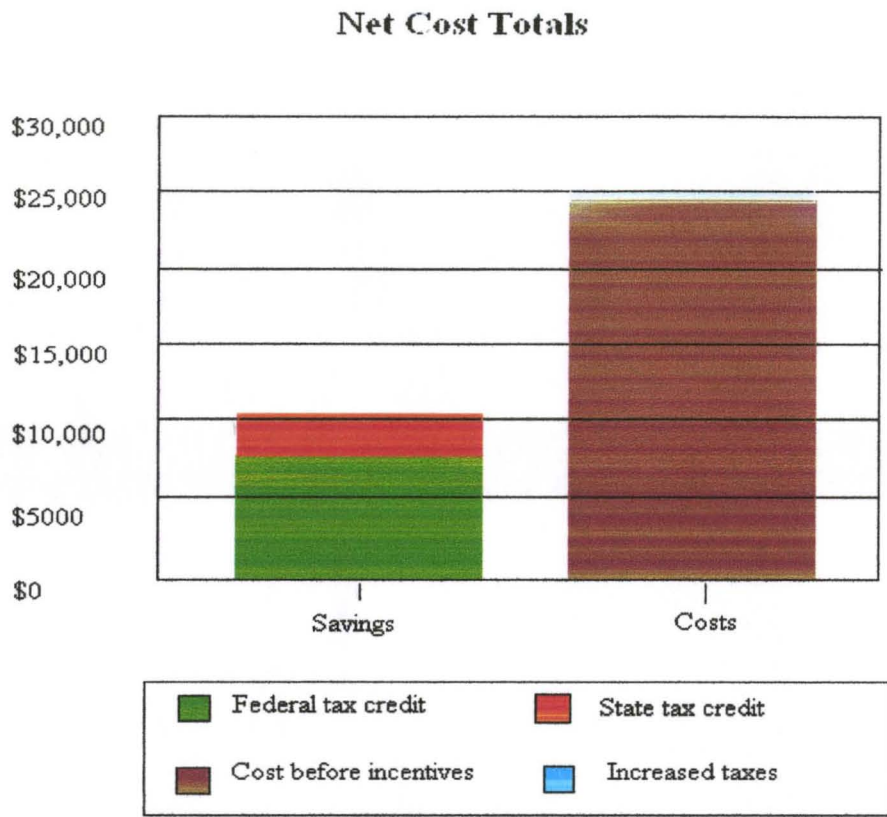


- Lighting-10%**
- Water heater-13 %**
- Heating and cooling- 49%**
- Other *-8%**
- Electronics-7%**
- Clothes Washer and Dryer-6%**
- Refrigerator-5%**
- Dishwasher-2%**

Source: U.S. Department of Energy

*other represents many household products including stoves, ovens, microwaves, and smaller appliances such as coffee makers and dehumidifiers.

Chart 3. Calculations for implementing one PV system in a cabin



Cost of system	\$24,000.00
SC tax credit	-\$3,500.00
Federal tax credit	-\$7,200.00
Net Cost	\$14,280

Source: Kyocera International

Chart 4. Snapshot of park expenditure and use tracking report

Row	Category	Item	Value	Item	Value	Item	Value	Item	Value
91	POWER	Residence	Nathan	344622	Meter #		Cabins		
92		Residence	Kurtie	3446366			Camping		
93		Residence	Rowdy	3446372			Shelters/Picnic Area		
94		Residence	Adin	3446747			Tackle shop		
95		Residence	Ben	3446379			Park Office/Ad		
96		Residence	Barracks	3446371					
97		Cabins	SA-C1	3447754		\$ 204.00			
98		Cabins	SA-C2	3447761		\$ 237.00			
99		Cabins	SA-C3	3447759		\$ 107.00			
100		Cabins	SA-C4	3447760		\$ 165.00			
101		Cabins	SA-C5	3447758		\$ 222.00			
102		Cabins	SA-C6	3447756		\$ 220.00			
103		Cabins	SA-C7	3446743		\$ 196.00			
104		Cabins	SA-C8	3446742		\$ 53.00			
105		Cabins	SA-C9	3446745		\$ 192.00			
106		Cabins	SA-C10	3446744		\$ 220.00			
107		Cabins	SA-C11	3447759		\$ 208.00			
108		Cabins	SA-C12	3447767		\$ 119.00			
109		Cabins	SA-C13	3446776		\$ 136.00			
110		Cabins	SA-C14	3446774		\$ 213.00			
111		Cabins	SA-C15	3446775		\$ 81.00			
112		Cabins	SA-C16	3446777		\$ 209.00			
113		Cabins	SA-C17	3446436		\$ 97.00			
114		Cabins	SA-C18	3446434		\$ 136.00			
115		Cabins	SA-C19	3446435		\$ 137.00			
116		Cabins	SA-C20	3446437		\$ 130.00			
117		Cabins	SA-C21	3446762		\$ 166.00			
118		Cabins	SA-C22	3446763		\$ 138.00			
119		Cabins	SA-C23	3446764		\$ 135.00			
120		Cabins	SA-C24	3446765		\$ 186.00			
121		Cabins	SA-C25	3446366		\$ 208.00			
122		Cabins	SA-C26	3446367		\$ 203.00			
123		Cabins	SA-C27	3446369		\$ 137.00			
124		Cabins	SA-C28	3446368		\$ 222.00			
125		Cabins	SA-C29	4779635		\$ 164.00			
126		Cabins	SA-C30	3446796		\$ 190.00			
127		Tackle Shop	SA-30	3446422					
128		Comfort Stations-CV#	SA-32	6610572					
129		Comfort Stations-CV#	SA-33	3446426					
130		Comfort Stations-CV#	SA-33	3446759					
131		Comfort Stations-CV#	SA-33	3446751					
132		Comfort Stations-LS#	SA-37(Camp area A,B&C)	6610590					
133		Comfort Stations-LS#	SA-34 (Camp area G & F)	6610591					
134		Comfort Stations-LS#	SA-34	3446761					
135		Comfort Stations-LS#	SA-35 (Camp area D & E)	6610569					
136		Comfort Stations-LS#	SA-36	29736473					
137		Comfort Stations-LS#	SA-37	29736483					
138		Waste #	SA-SS-2	3446750					
139		Waste #	SA-SS-2						

Row	Category	Item	Value	Item	Value	Item	Value
91	Resource Management	Equipment Rental	Training	Off-Park Work Programs			
92			\$ 248.00	Residence	SA-1		
93			\$ 262.00	Residence	SA-2		
94			\$ 199.00	Residence	SA-3		
95			\$ 134.00	Residence	SA-4		
96			\$ 273.00	Residence	SA-6		
97			\$ 11.00	Residence	SA-6		
98			\$ 204.00	Cabins	SA-C1		
99			\$ 237.00	Cabins	SA-C2		
100			\$ 107.00	Cabins	SA-C3		
101			\$ 165.00	Cabins	SA-C4		
102			\$ 222.00	Cabins	SA-C5		
103			\$ 220.00	Cabins	SA-C6		
104			\$ 196.00	Cabins	SA-C7		
105			\$ 53.00	Cabins	SA-C8		
106			\$ 192.00	Cabins	SA-C9		
107			\$ 220.00	Cabins	SA-C10		
108			\$ 208.00	Cabins	SA-C11		
109			\$ 119.00	Cabins	SA-C12		
110			\$ 136.00	Cabins	SA-C13		
111			\$ 213.00	Cabins	SA-C14		
112			\$ 81.00	Cabins	SA-C15		
113			\$ 209.00	Cabins	SA-C16		
114			\$ 97.00	Cabins	SA-C17		
115			\$ 136.00	Cabins	SA-C18		
116			\$ 137.00	Cabins	SA-C19		
117			\$ 130.00	Cabins	SA-C20		
118			\$ 166.00	Cabins	SA-C21		
119			\$ 138.00	Cabins	SA-C22		
120			\$ 135.00	Cabins	SA-C23		
121			\$ 186.00	Cabins	SA-C24		
122			\$ 208.00	Cabins	SA-C25		
123			\$ 203.00	Cabins	SA-C26		
124			\$ 137.00	Cabins	SA-C27		
125			\$ 222.00	Cabins	SA-C28		
126			\$ 164.00	Cabins	SA-C29		
127			\$ 190.00	Cabins	SA-C30		
128				Tackle Shop	SA-30		
129				Tackle Shop			
130			\$ 167.00	Comfort Stations-CV#	SA-32		
131			\$ 106.00	Comfort Stations-CV#	SA-33		
132			\$ 26.00	Comfort Stations-CV#	SA-33		
133			\$ 1,262.00	Comfort Stations-PA#	SA		
134			\$ 1,231.00	Comfort Stations-PA#			
135				Comfort Stations-LS#	SA-34		
136			\$ 711.00	Comfort Stations-LS#	SA-36		
137				Comfort Stations-LS#	SA-36		
138				Comfort Stations-LS#	SA-37		
139			\$ 11.00	Waste #	SA-SS-2		

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