

## Environmental Impact Report

### FY2014 Snapshot

Total Number of Students	839
Total Number of Interns	13
Total Number of Staff	10
Total Meals Served	12,540
Total Nights of Accommodation	3,976
Total Electricity Used on Campus	53,599 kWh
Total Electricity Produced on Campus	34,123 kWh
Average Annual Water Used on Campus	267,570 Gallons



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# Overview of Yestermorrow's Environmental Impact

Overall energy and water use by the Yestermorrow campus is relatively low compared to other campuses. Since the last assessment was completed in 2011, both electricity production and consumption have decreased and in Fiscal Year 2014 Yestermorrow produced 64% of its annual electricity on-site. Propane usage also decreased by 8%.

## Weighted Users

The 'weighted user' is a calculated number used to create a count of the population of each campus. This calculation takes into account the number of full-time campus residents, the number of commuting students and staff, and the number of part-time students and staff. For the Yestermorrow calculation of 'weighted users,' the number of full-time residents for each week in a month was taken and averaged to get a monthly average full-time resident number. That number was then added to the number of staff to get an annual number of full-time resident-equivalents. This 'weighted user' calculation produced a full-time residence equivalent of 29 'weighted users' in FY14 (down from 41 'weighted users' in FY11). This calculation is a key tool in the STARS rating system, which is the first national certification program to recognize sustainable communities. The 'weighted user' number is used to create a count of the population of each campus that is comparable across different housing settings and campus sizes. In this assessment however, no comparisons have been made to any other campus, but allows us to compare the data from FY 2014 to the data from FY 2011.

## Carbon Equivalent Emissions

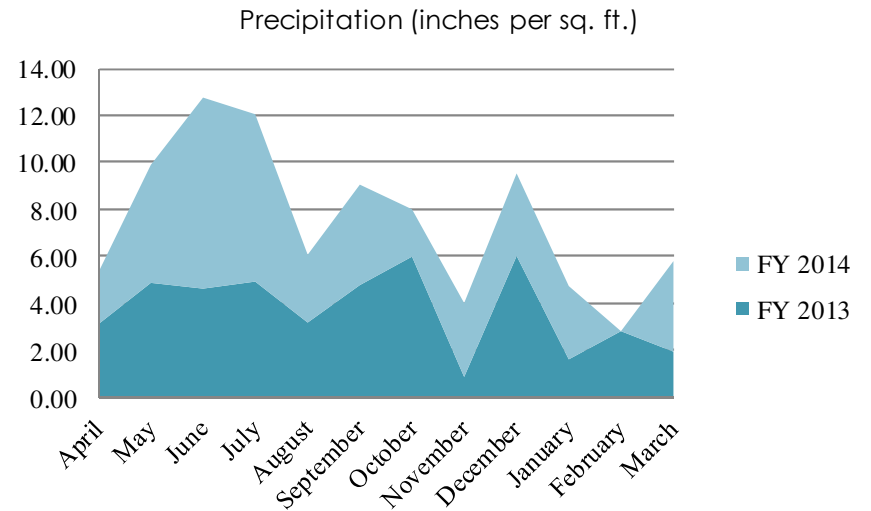
Campus carbon (or carbon equivalent) emissions are also low, but are dominated by travel-related emissions. Electricity and propane account for only 5% of the total carbon emissions of the school. Overall carbon emissions are very low, helped by the on-site renewable energy production, but the carbon emissions of electricity purchased from the grid increased due to changes in Green Mountain Power's fuel mix. We estimate that transportation of students, faculty, and staff to and from the campus accounts for 95% of the campus-related carbon emissions. This is an important strategic issue that may define some of Yestermorrow's growth plans.

# Site Use and Rainfall

Yestermorrow Campus, Waitsfield, Vermont

## Land Use Analysis

Total Campus Acres:	38
Developed:	15%
Forest/Wildlife:	67%
Wetland:	10%
Meadow/Agriculture:	8%



Precipitation on the Yestermorrow campus averages 40 to 45 inches per year. This totals around 3.5 million gallons of water per year falling on the campus.

### Site Water Absorption Characteristics

67% Forested land	EVT= 0.65 water/day
<i>*Vermont Forests average 175 trees per acre</i>	
18% Marsh/Meadow including Crops	0.9 inches of water/day
15% Impervious surfaces	0 inches of water/day
<i>*Impervious surface includes buildings and paved areas.</i>	

During non-freezing months, essentially all of the precipitation that falls on the Yestermorrow campus is used by the vegetation in evapo-transportation (EVT) or is absorbed by the soil, except during heavy rains. During frozen months, this relationship is different, and leads to greater soil absorption and much more runoff into surrounding land and the Mad River.

# Potable Water Use

To calculate the estimated annual water usage for FY14, the gallons of total potable water consumed on campus between 7/3/2012 and 10/13/2014 were averaged.



## FY 2013/2014 Water Use Analysis

Total Potable Water Consumed on Campus between 7/3/12-10/13/14:	599,610 gallons
Average Potable Water Consumed Per Year:	266,493 gallons
Gallons per 'Weighted User':	
Per Year:	9,189 gallons
Per Day:	25 gallons
Annual Estimated Sewage Output:	199,869 gallons
Per User Per Year:	6,892 gallons

*Yestermorrow uses 50% less water per person per day than the U.S. average for an efficient household*

### Assumptions:

Average US household use is 45 gallons per person per day for an efficient household.

75% of water that is delivered to campus buildings leaves as sewage.

# Occupancy

## Population Averages FY12-FY14

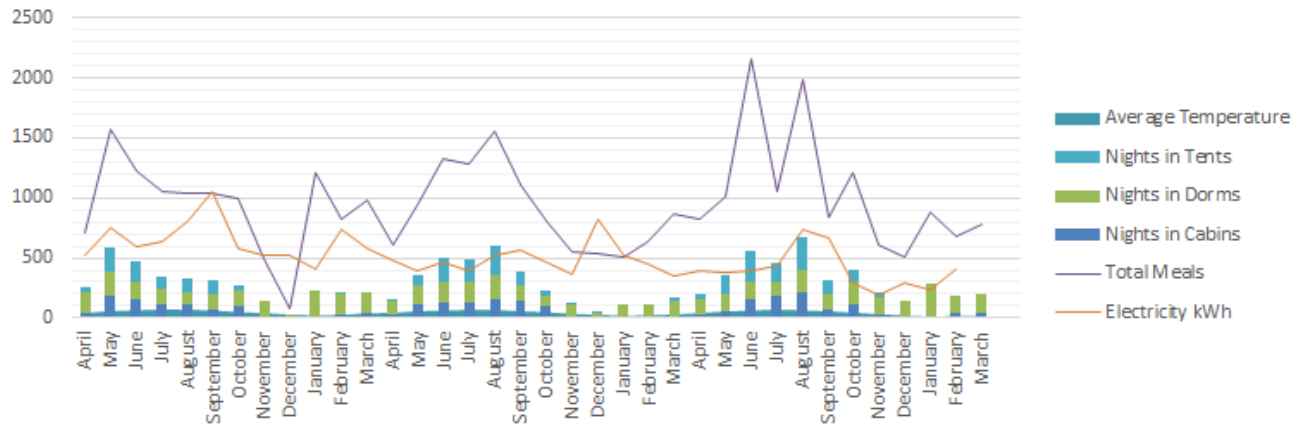
	2014 avg	2011 avg	Change	% Change
<b>Students</b>	897	943	-46	-5%
<b>Paying</b>	756	835	-79	-10%
<b>Comp</b>	140	156	-16	-11%
<b>Staff</b>	10	10	0	0%
<b>Interns</b>	13	17	-4	-31%
<b>Faculty</b>	188	118	70	37%

## Total Nights Spent in...

<b>Cabins</b>	874	615	259	30%
<b>Dorms:</b>	1714	1301	413	24%
<b>Tents:</b>	953	1050	-97	-10%

<b>Total meals</b>	13,588	14,592	-2100	-18%
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<b>Average number of nights per student (excluding interns)</b>	5	3	2	36%
<b>Average number of meals per student (excluding interns)</b>	15	9	6	41%

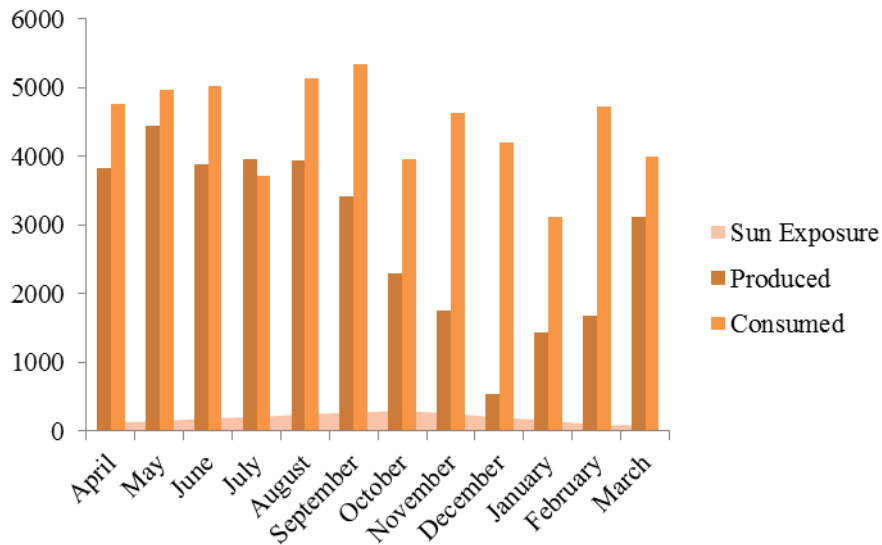


# Electricity Consumption and Production

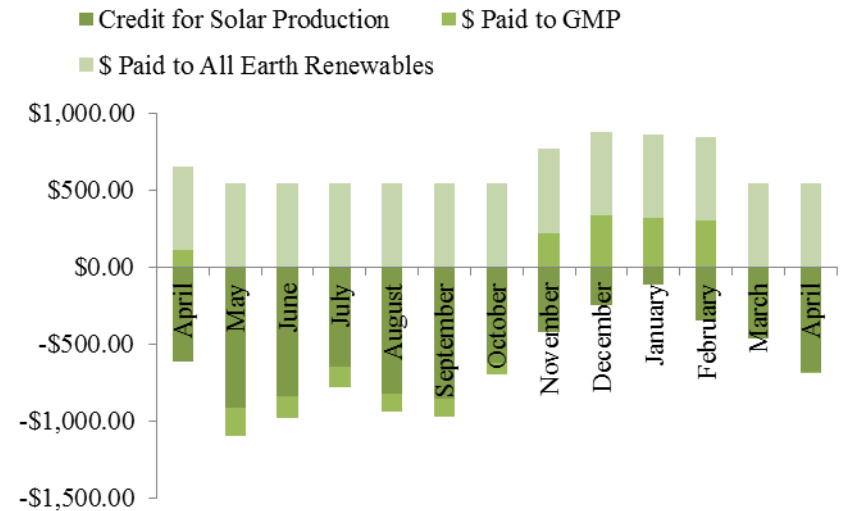
	FY2014	FY2011	Change	Change %
Total Electricity Consumed (kWh)	53,599	60,946	-7,347	-14%
Electricity Produced On-Site (kWh)	34,123	34,544	-421	-1%
Electricity Purchased from the Grid (kWh)	19,476	26,402	-6,926	-36%
Total Electricity Purchased (\$)	\$7,521.86	\$8,095.13	-\$573.27	-8%
Total Electricity Credit (\$)	\$6,919.58	\$5,888.31	\$1,031.27	15%
kWh Per 'Weighted User'	1,848	1,486	362	20%
Electricity Energy Use Intensity (EUI) (kBtu/SF)	13.8	15.7	-1.89	-14%

*In Fiscal Year 2014, Yestermorrow produced 64% of the electricity used on campus through the use of the AllSun Trackers photovoltaics.*

Sun Exposure, Electricity Production and Consumption for FY 2014



Fees and Credits for Electricity Consumption and Production for FY 2014



# Propane Consumption and Weather Trends

Propane consumption decreased by 8% in Fiscal Year 2014 compared to FY11.

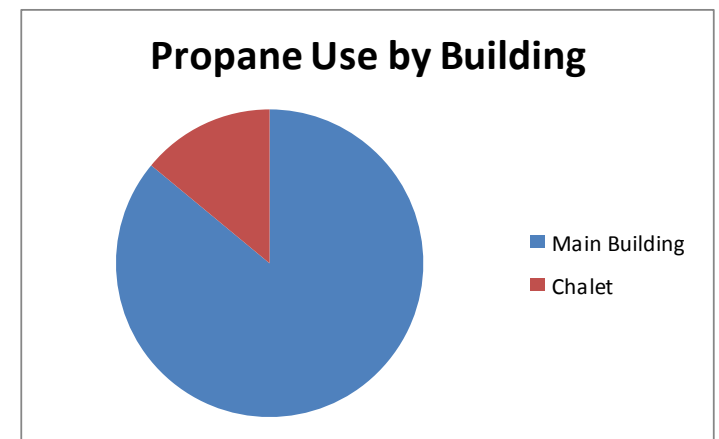
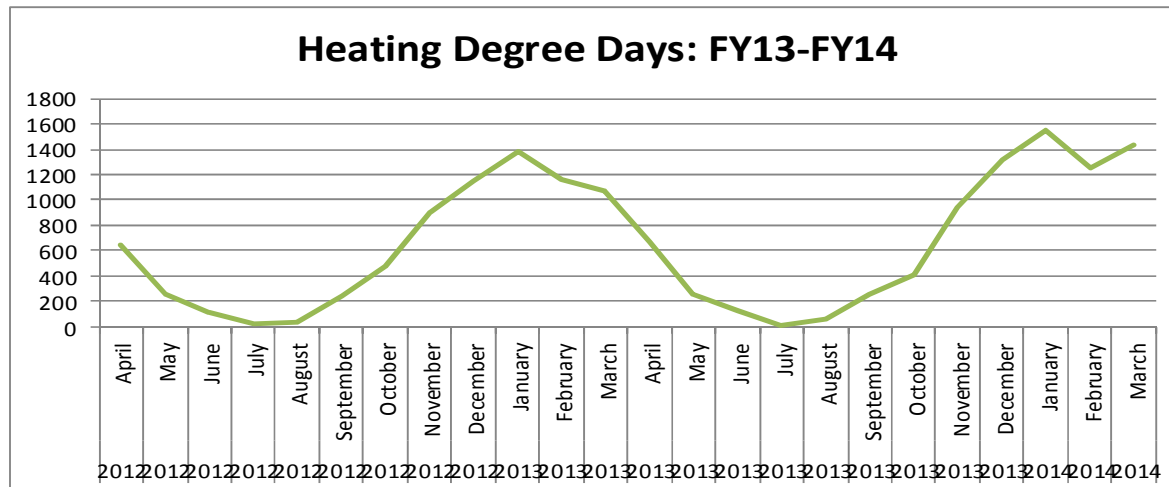
	FY2014	FY2011	change	% change
Propane- Main Building	3571.3	3834.7	-263	-7%
Propane- Chalet	602.4	693.3	-91	-15%
Total Propane Consumed (gallons)	4,174	4,528	-354	-8%
Total kBtu	382,311	414,792	-32,481	-8%
Annual Propane per 'Weighted User' (kBtu)	11,947	10,117	1,830	15%
Propane Energy Use Intensity (PEUI) (kBtu/SF)	29	31.3	-2.4	-8%

Yestermorrow's propane use is offset by the solar hot water system installed in 2010. While the solar hot water is not metered separately, it is estimated to offset Yestermorrow's propane use by over 400 gallons per year.

Currently Yestermorrow does not have any way to monitor propane use by month. Propane deliveries come only occasionally throughout the year.

FY14	% of total use	gallons	kbtu	PEUI*
Main Building	86%	3571.3	327131.08	33
Chalet	14%	602.4	55179.84	31

\*Propane Energy Use Intensity





# Energy Analysis

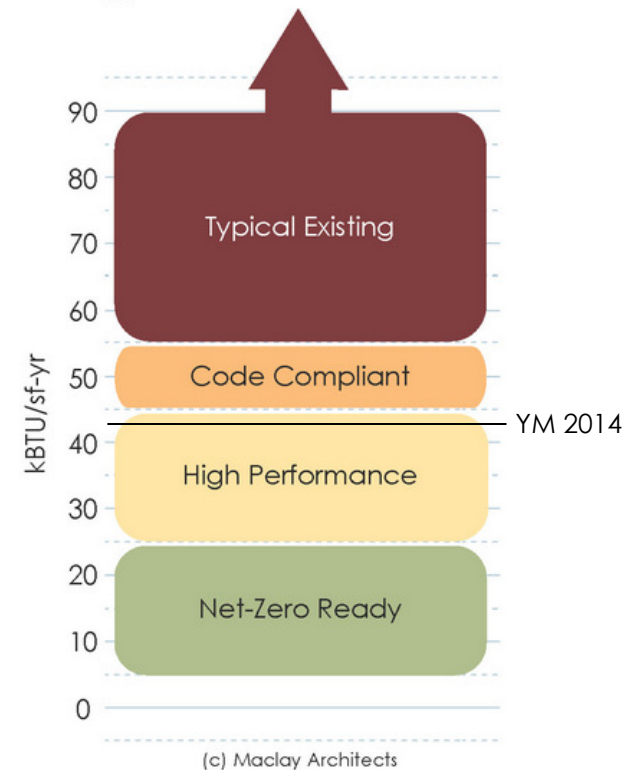
## FY 2014 Total Energy Use for the Yestermorrow Campus

The chart below shows energy used on campus, broken down to show the contribution of electricity use and propane use to total energy use.

2014 Energy Analysis (kBtu)	2014	2011	Change	% Change
Energy from Propane:	382,311	414,792	(32,481)	-8%
Energy from Electricity:	182,933	208,009	(25,076)	-14%
<b>Total Energy Consumed:</b>	565,244	622,801	(57,557)	-10%
kBtu per 'Weighted user':	19,491	15,190	4,301	22%
Total Energy Use Intensity*:	43	47	(4)	-10%

\*kBtu per square foot of buildings, including unconditioned but occupied space (13,250 s.f.)

## Energy Conservation Standards



## Main Building Only

Main Building kBtu/square foot	
Propane	327131
Electricity	167783
	494914 total kBtu
	49 kBtu per sf

\*current conditioned square footage = 10,000 sq.ft.

The overall Energy Use Intensity of the Main Building at Yestermorrow is 49 kBtu/sf which according to metrics used by Maclay Architects, is code-compliant but shows room for improvement. Comparing Yestermorrow's building to similar structures is somewhat challenging given that it includes so many different functions: woodshop, dormitory and kitchen in addition to more typical offices and classroom spaces. A full energy audit was conducted in October 2014 and will inform improvements to the building envelope to reduce heating and electrical loads going forward.



# Emissions Analysis

## Total Emissions for Yestermorrow are Low

Carbon equivalent emissions produced by Yestermorrow's electricity consumption are low, but increased in FY2014 since Green Mountain Power changed the source of its electricity purchases (market purchases vs. Vermont Yankee nuclear). We also count the energy generated on-site as a reduction in the use of grid-produced electricity. Specific emissions for Vermont's electricity mix are calculated using eGRID.

Carbon Dioxide Equivalent emissions (eCo2) include the following greenhouse gasses:

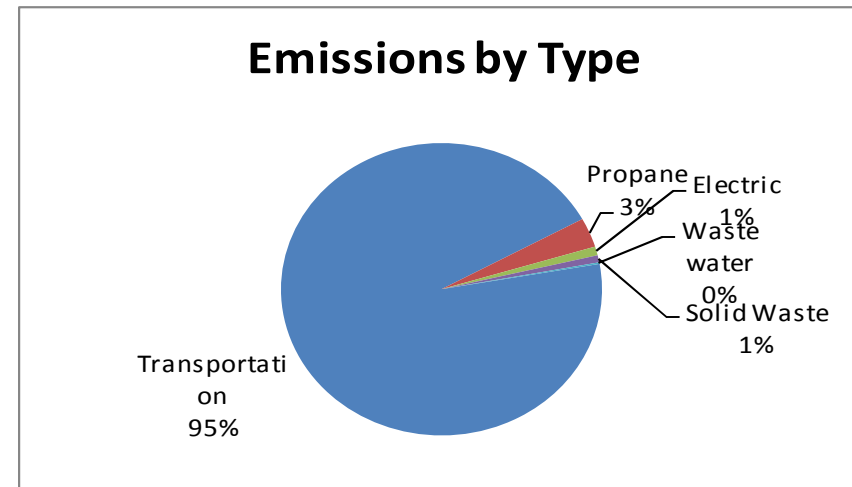
- CO2: Carbon Dioxide
- CH4 Methane
- N2O: Nitrous Oxide

We used the Clean Air Cool Planet online tool Campus Carbon Map to calculate emissions for purchased electricity, propane, solid waste and waste water. The transportation emissions were calculated separately (see appendix) based on actual miles traveled by each student.

Emissions: MT eCO2	FY2014
Transportation*	639.53
Propane	21.98
Electric**	6.49
Solid Waste	5.45
Waste Water	1.14
<b>Total</b>	<b>675</b>

\* average of FY13 and FY14

\*\* Note: In preparing our FY14 calculations, we discovered that the electricity emissions number in the 2011 report had been calculated incorrectly as 2 MTeCO2 when the correct number should have been 15 MTeCO2. This number is based on the amount of electricity purchased from the grid, and does not include electricity produced on-site.



## Total eCO2 Emissions Dominated by Travel

Emissions for Yestermorrow are dominated by travel, because of the overall low energy use on campus and long distances students and staff travel.

# Purchasing

Yestermorrow's purchasing falls into two primary categories: food, for feeding students and staff, and construction materials for community projects and campus renovations.

## Construction Purchasing Totals (FY13-14):

Locally Sourced:	\$26,941	24%
Local Vendors	\$72,804	64%
Non-Local Vendors	\$14,340	13%

## Food Purchasing Totals (FY13-14):

Locally Sourced:	\$8,609	11%
Local Vendors	\$57,703	71%
Non-Local Vendors	\$15,254	19%



### Definitions:

Locally Sourced: Raw materials purchased from farms, sawmills, quarries within the state of Vermont and services provided by sub-contractors based in Vermont

Local Vendors: Locally owned businesses (within the state of VT) that sell products likely sourced from out-of-state

Non-Local Vendors: Out of state, online and mail order purchases

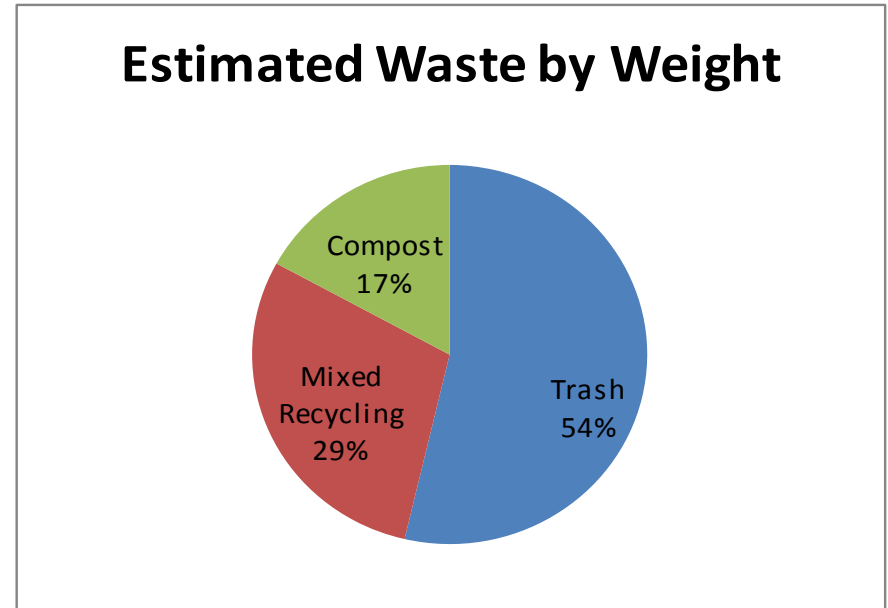
# Waste

Yestermorrow produces a low amount of solid waste, including a high percentage of waste that is composted on-site which includes kitchen scraps and paper towels. These numbers are estimated based on dumpsters being filled each week. In reality, the total amount hauled from campus may be slightly lower and the weight of both trash and recycling is dependent on the mix of materials included. These figures show overall averages by weight.

Compost= Assumes 5 gallons per day

Trash= 3 yd dumpster emptied once per week

Recycling = 4 yd dumpster emptied once per week



Waste		per week	lbs	tons	total tons per year
Trash	225 lbs/yard	3 yd	675	0.3375	17.6
Mixed Recycling	92.22 lbs/yard	4 yd	368.88	0.18444	9.6
Compost	1070 lbs/yard	35 gal=0.2 yd	214	0.107	5.6

Conversion Source: [www.nmenv.state.nm.us/swb/doc/Conversiontable.doc](http://www.nmenv.state.nm.us/swb/doc/Conversiontable.doc)

One cubic foot = 7.5 gallons or 1728 cubic inches

One cubic yard = 36" x 36" x 36" or 46,656 cubic inches

One cubic yard = 202 gallons or 27 cubic feet

SOURCES: National Recycling Coalition Measurement Standards and Reporting Guidelines; EPA; FEECO and CIWMB 2006

<http://recycle-bowl.org/wp-content/uploads/Estimating-Data-Fact-Sheet-2012.pdf>

## Appendix: Detailed Data and Calculations

Electricity Consumption FY2014						
Month	Main Bldg		Chalet		Total kWh	TOTAL PAID GMP
	kWh	\$ Amount	kWh	\$ Amount		
April	4360	\$ 639.32	397	\$ 81.20	4757	\$ 720.52
May	4600	\$ 656.16	380	\$ 78.63	4980	\$ 734.79
June	4640	\$ 641.76	395	\$ 54.63	5035	\$ 696.39
July	3280	\$ 453.66	441	\$ 60.99	3721	\$ 514.65
August	4400	\$ 608.56	740	\$ 102.35	5140	\$ 710.91
September	4680	\$ 647.29	664	\$ 91.84	5344	\$ 739.13
October	3680	\$ 508.98	290	\$ 40.11	3970	\$ 549.09
November	4440	\$ 614.10	192	\$ 26.56	4632	\$ 640.65
December	3880	\$ 536.64	299	\$ 41.35	4179	\$ 578.00
January	2880	\$ 398.33	234	\$ 32.36	3114	\$ 430.70
February	4320	\$ 597.50	407	\$ 56.29	4727	\$ 653.79
March	4000	\$ 553.24	0	\$ -	4000	\$ 553.24
<b>TOTAL</b>	<b>49160</b>	<b>\$ 6,855.54</b>	<b>4,439</b>	<b>\$ 666.32</b>	<b>53,599</b>	<b>\$ 7,521.86</b>

Monthly Solar Production FY 2014						
Month	Total Credit		Paid to AER		Total kWh produced	kBtu
	\$		\$			
April	\$ (610.63)		\$ 543.35		3839.0	13102.5
May	\$ (915.03)		\$ 543.35		4485.0	15307.3
June	\$ (839.75)		\$ 543.35		3896.0	13297.0
July	\$ (649.95)		\$ 543.35		3950.0	13481.4
August	\$ (827.02)		\$ 543.35		3934.3	13427.8
September	\$ (857.28)		\$ 543.35		3145.8	10736.6
October	\$ (623.86)		\$ 543.35		2304.7	7865.9
November	\$ (419.67)		\$ 543.35		1751.6	5978.2
December	\$ (244.81)		\$ 543.35		535.3	1827.0
January	\$ (115.90)		\$ 543.35		1443.2	4925.6
February	\$ (350.84)		\$ 543.35		1682.9	5743.7
March	\$ (464.83)		\$ 543.35		3155.3	10769.0
<b>TOTAL</b>	<b>\$ (6,919.58)</b>		<b>\$ 6,520.20</b>		<b>34123.1</b>	<b>116462.1</b>

## Propane Consumption

Date		Gallons		Combined Gallons
Main Bldg.	Chalet	Main Bldg.	Chalet	
05/14/2013	05/07/2013	448.4	81.6	530
07/30/2013	12/19/2013	503	151.6	654.6
11/13/2013	02/04/2014	673.8	154	827.8
12/19/2013	02/19/2014	575.7	70.8	646.5
02/04/2014	03/25/2014	553.2	144.4	697.6
02/19/2014		320.9		320.9
03/25/2014		496.3		496.3
			<b>TOTAL</b>	<b>4173.7</b>

## Yestermorrow's Campus

	Square Feet
Main Building	10,000
Chalet	1,800
Cabins (3 Occupied)	1,200
Storage Shed	150
Garden Shed	100
<b>TOTAL</b>	<b>13,250</b>

38 Acres Owned by Yestermorrow

Built Footprint 1%

*No utilities in cabins or sheds*

Roughly 15% of campus developed

Square Feet in 38 Acres 1,655,280

## Weather Data

Year	Month	Precipitation (in per sq ft)	Average Temperature	Heating Degree Days
2012	April	3.12	42.6	647
2012	May	4.87	57.4	251
2012	June	4.62	63.0	111
2012	July	4.92	68.9	18
2012	August	3.18	67.9	32
2012	September	4.78	57.5	237
2012	October	5.99	48.9	478
2012	November	0.87	34.4	909
2012	December	6.01	27.9	1142
2013	January	1.62	18.8	1379
2013	February	2.82	21.8	1156
2013	March	1.94	30.4	1069
2013	April	2.20	41.5	671
2013	May	5.02	56.3	261
2013	June	8.14	63.6	122
2013	July	7.13	71.3	15
2013	August	2.89	65.3	59
2013	September	4.27	57.3	260
2013	October	2.01	45.4	408
2013	November	3.15	32.1	947
2013	December	3.52	22.4	1312
2014	January	3.12	14.3	1545
2014	February	1.83	18.1	1249
2014	March	3.86	18.4	1439

# Meals & Accommodations

**FY 2012-FY 2014**

*\*Not including Interns*

Month	Year	Paying Students	Comp Students	Nights in Cabins	Nights in Dorms	Nights in Tents	Full Meal	Meal Plan X 3	Lunch	TOTAL MEALS (I + J)
April	2011	27	8	39	176	46	201	603	105	708
May	2011	101	14	189	192	203	454	1362	205	1567
June	2011	91	20	149	150	177	366	1098	133	1231
July	2011	100	23	113	136	100	332	996	54	1050
August	2011	80	12	106	108	113	293	879	156	1035
September	2011	62	7	74	131	103	317	951	91	1042
October	2011	109	30	96	135	36	299	897	93	990
November	2011	68	12	9	126	0	140	420	70	490
December	2011	15	6	0	22	0	21	63	13	76
January	2012	44	1	10	212	0	342	1026	178	1204
February	2012	52	8	29	170	6	230	690	139	829
March	2012	60	15	47	169	0	265	795	191	986
April	2012	84	25	26	113	17	162	486	125	611
May	2012	55	13	118	152	85	282	846	88	934
June	2012	101	18	129	168	208	384	1152	180	1332
July	2012	48	13	132	167	192	390	1170	117	1287
August	2012	98	23	155	197	246	455	1365	187	1552
September	2012	81	10	140	131	112	312	936	169	1105
October	2012	72	18	99	90	33	243	729	74	803
November	2012	33	16	2	115	10	139	417	128	545
December	2012	35	2	0	44	10	132	396	145	541
January	2013	32	5	0	107	0	128	384	120	504
February	2013	44	5	0	107	0	152	456	182	638
March	2013	45	10	8	139	22	250	750	113	863
April	2013	60	17	26	124	44	245	735	95	830
May	2013	92	15	61	140	156	299	897	116	1013
June	2013	62	8	161	134	264	674	2022	134	2156
July	2013	85	3	178	126	157	317	951	107	1058
August	2013	81	8	217	187	267	608	1824	159	1983
September	2013	52	6	65	136	120	260	780	56	836
October	2013	83	8	119	185	94	362	1086	120	1206
November	2013	53	9	22	151	38	173	519	92	611
December	2013	43	5	10	126	0	149	447	64	511
January	2014	36	2	8	284	0	275	825	51	876
February	2014	45	10	43	140	0	192	576	103	679
March	2014	40	16	41	152	0	211	633	148	781
<b>TOTALS (3 years)</b>		<b>2269</b>	<b>421</b>	<b>2621</b>	<b>5142</b>	<b>2859</b>	<b>10054</b>	<b>30162</b>	<b>4301</b>	<b>34463</b>

<b>Average/Year</b>	<b>756</b>	<b>140</b>	<b>874</b>	<b>1714</b>	<b>953</b>	<b>3351</b>	<b>10054</b>	<b>1434</b>	<b>11488</b>
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**Total Nights in Lodging**

3541

**Average Nights/Student**      **5**

**Average Meals/Student**      **15**

<b>Staff</b>		<b>10</b>
<b>Interns</b>		<b>13</b>
<b>Faculty</b>	<b>SS13</b>	120
	<b>FW13-14</b>	68
	<b>TOTAL</b>	<b>188</b>

NOTE: The student numbers were obtained through historical class data, but the meals and lodging information was taken directly from the meals/lodging sheets. The numbers therefore include instructors' meals and accommodations, so the numbers are higher than they would be if it were students alone. There is no good way to separate this out, and to be accurate, all meals and lodging should be included. The only way to come to fix this would be to add the number of instructors for each class into the student number, so the accurate population of the full class was represented.

## Commuting and Emissions

	one way	round trip
<b>TOTAL STUDENT MILES TRAVELED- FY13 and FY14</b>	<b>875850</b>	<b>1751700</b>
Total miles/student	600	1201
<b>DRIVE</b>		<b>348329</b>
<b>FLY</b>		<b>1403371</b>
<b>STAFF MILES TRAVELED - FY14</b>		
<b>DRIVE</b>		<b>60400</b>

### Conversion Factor

0.000404 MT eCO2 per mile  
 0.000776369 MT eCO2 per mile  
 0.000404 MT eCO2 per mile

### FY13-FY14

### ANNUAL AVG

141  
 1090

70.4  
 544.8

24.4

### TOTAL ANNUAL

**639.5 MT eCO2**

## Purchasing

	Local Product	Local Business	Non-Local	Total	
	\$16,495.67	\$51,821.18	\$5,844.77	\$74,161.62	Project expenses
	\$10,167.86	\$13,222.51	\$7,720.72	\$31,111.09	Campus expenses
	\$277.70	\$7,760.73	\$774.41	\$8,812.84	Campus Reno
Construction Purchasing	\$26,941.23	\$72,804.42	\$14,339.90	\$114,085.55	Construction Purchasing
Food Purchasing	\$8,609.03	\$57,703.37	\$15,254.40	\$81,566.80	Food Purchasing
	<b>Local Product</b>	<b>Local Business</b>	<b>Non-Local</b>		
Construction Purchasing	\$26,941.23	\$72,804.42	\$14,339.90		
Food Purchasing	\$8,609.03	\$57,703.37	\$15,254.40		
	<b>Local Product</b>	<b>Local Business</b>	<b>Non-Local</b>		
Construction Purchasing	24%	64%	13%		
Food Purchasing	11%	71%	19%		



## Weighted Users

	<b>FY14</b>	<b>avg per day</b>	with conversion factor	
Student days-paying	5246	14		from Luke's Enrollment Tracker Spreadsheet
Student days- comps	597	2		from Luke's Enrollment Tracker Spreadsheet
Total Student Days	5843	16		
Resident student days	3976	11 resident	11	from spreadsheet above
Commuter student days	1867	5 commuter	4	total students minus residents
Interns		6 resident	6	
Staff		10 commuter	7.5	
Instructors commuting		1 commuter	0.75	
		<b>33</b>	<b>29</b>	note: this double counts interns when they are in class