

**AN INVESTIGATION INTO  
ENCLOSURE SPACE USE  
BY LUCY THE ELEPHANT  
AT THE EDMONTON VALLEY ZOO  
ALBERTA, CANADA  
WINTER 2009 – 2010**

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## Enclosure Space Use Study Introduction

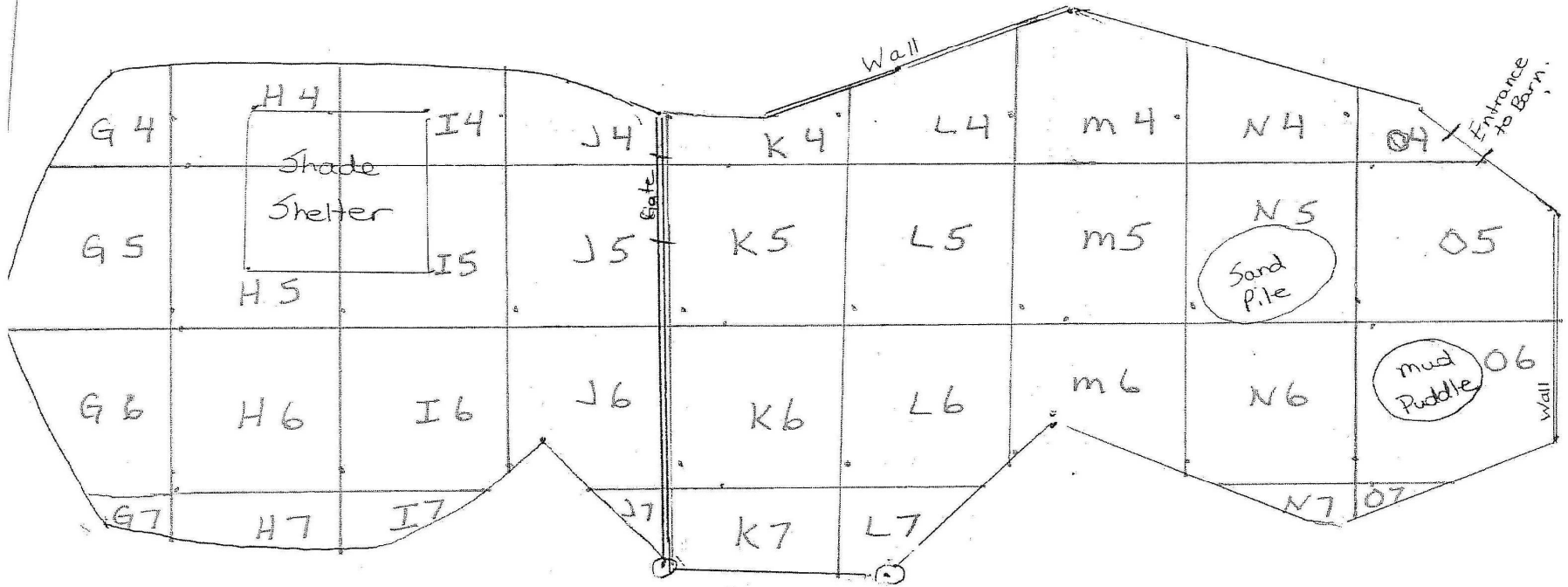
Lucy is a female Asian elephant and resident of the Edmonton Valley Zoo since 1977. This study was carried out to document Lucy's interaction with her exhibit, namely her use of space throughout the day.

Female elephants are intensely social creatures that remain in the same family group for their entire lives. Lucy lives alone at the Valley Zoo and interacts mainly with her keepers. In addition to her solitary lifestyle, Lucy lives in an exhibit exponentially smaller than the space she would inhabit if she had remained in the wild. Space aside, the composition of the exhibit does not allow Lucy to engage in natural behaviours like foraging, digging and exploring. Lucy's current home is climate inappropriate and contradictory to her biological adaptations. All of these conditions influence how Lucy uses her living space.

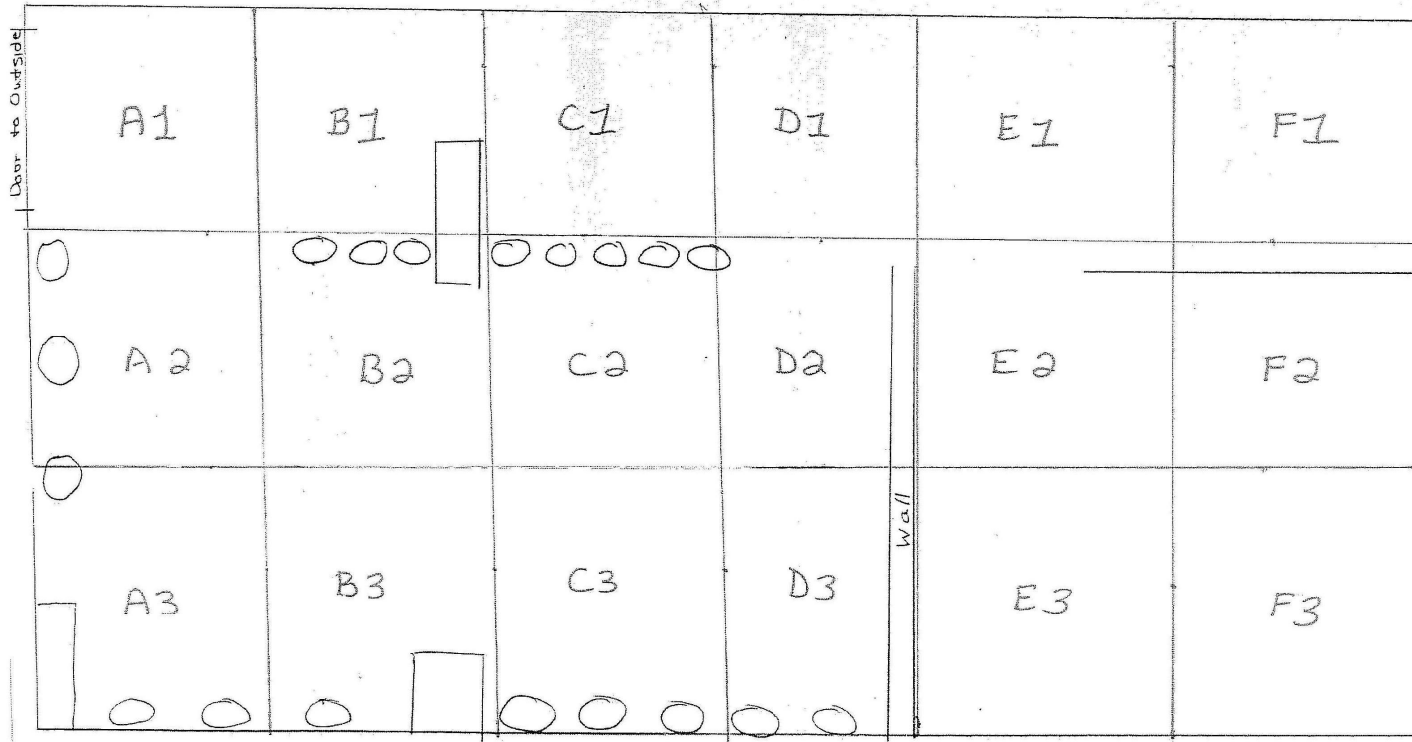
An investigator observed Lucy for 10 separate four hour sessions starting on December 4, 2009 and ending on February 13, 2010 . Based on a diagram of the exhibit, which was segmented into quadrants, the investigator noted which quadrant Lucy was in every 2 minutes during each 4 hour observation period and made notes about Lucy's behavior and actions. On each day, between 133 and 172 observations were made regarding Lucy's location in her exhibit. A total of approximately 41 hours of data was collected.

In order to visually represent the data, each quadrant was assigned a numerical value and these values are represented in the following graphs and charts.

Lucy's Outdoor Enclosure



Lucy's Barn



### Summary of data collected: Lucy

First, a numerical value was assigned to each quadrant:

<b>Not in view</b>	0
A2	2
A3	3
B1	4
B2	5
B3	6
C1	7
C2	8
C3	9
D1	10
D2	11
D3	12
E1	13
E2	14
E3	15
F1	16
F2	17
F3	18

There were 10 days of data collected on Dec. 4 2009, Dec. 11 2009, Dec. 24 2009, Jan. 6 2010, Jan. 27, 2010, Jan. 29, 2010, Feb. 1 2010, Feb. 4 2010, Feb. 6, 2010 and Feb. 13, 2010. On each day, between 133 and 172 observations were made in regards to Lucy's location in her exhibit.

Observations were made 2 minutes apart. There were situations where multiple observations were made in a single 2 minute increment. For these observations, the time equivalent is assumed to be an equal proportion of the 2 minute time interval and the number of observations made.

Roughly 41 hours of data was collected.

Exhibit 1:

		Number of times counted										
		Dec. 4 2009	Dec. 11 2009	Dec. 24 2009	Jan. 6 2010	Jan. 27 2010	Jan. 29 2010	Feb. 4 2010	Feb. 1 2010	Feb. 6 2010	Feb. 13 2010	TOT AL
<b>Not in view</b>	<b>0</b>	34	0	28	0	0	30	30	48	29	22	221
A1	1	5	24	8	4	4	13	11	3	4	34	110
A2	2	27	18	11	20	6	22	16	17	17	17	171
A3	3	2	1	16	0	1	19	1	5	10	4	59
B1	4		30	13	47	58	0	13	8	13	4	186
B2	5	8	37	8	8	18	12	12	16	8	10	137
B3	6	0	4	7	11	10	3	3	0	4	1	43
C1	7	15	0	1	6	1	0	7	6	0	2	38
C2	8	0	7	10	0	4	1	3	27	6	6	64
C3	9	0	1	0	0	0	0	0	1	5	0	7
D1	10	0	2	9	3	3	3	2	13	10	4	49
D2	11	12	4	5	0	6	13	18	7	3	10	78
D3	12	0	0	0	1	0	0	1	5	6	3	16
E1	13	3	6	9	27	4	5	3	5	11	5	78
E2	14	0	8	0	0	2	0	3	1	0	5	19
E3	15	0	0	7	0	11	1	1	3	3	0	26
F1	16	0	1	4	0	0	1	3	2	0	0	11
F2	17	18	5	4	0	1	0	0	0	0	0	28
F3	18	0	0	3	0	4	10	10	5	4	1	37
M4	19	12	0	0	0	0	0	1	0	0	0	13
	TOT AL	136	148	143	127	133	133	138	172	133	128	

In total, Lucy spent the most time in quadrants B1 and A2. Lucy spent roughly 6.23 hours in quadrant B1, or 15.28% of the total time observed. She also spent roughly 5.46 hours in quadrant A2, or 13.31% of the total time observed.

Note: to estimate the amount of time spent in each quadrant, every observation counted for 2 minutes. For multiple observations for each time segment, each observation counted for an equal portion of those two minutes (i.e. if three observations were made between 10:42 and 10:44, each observation is assigned a time value of 2 minutes ÷ 3, or 0.67 minutes)

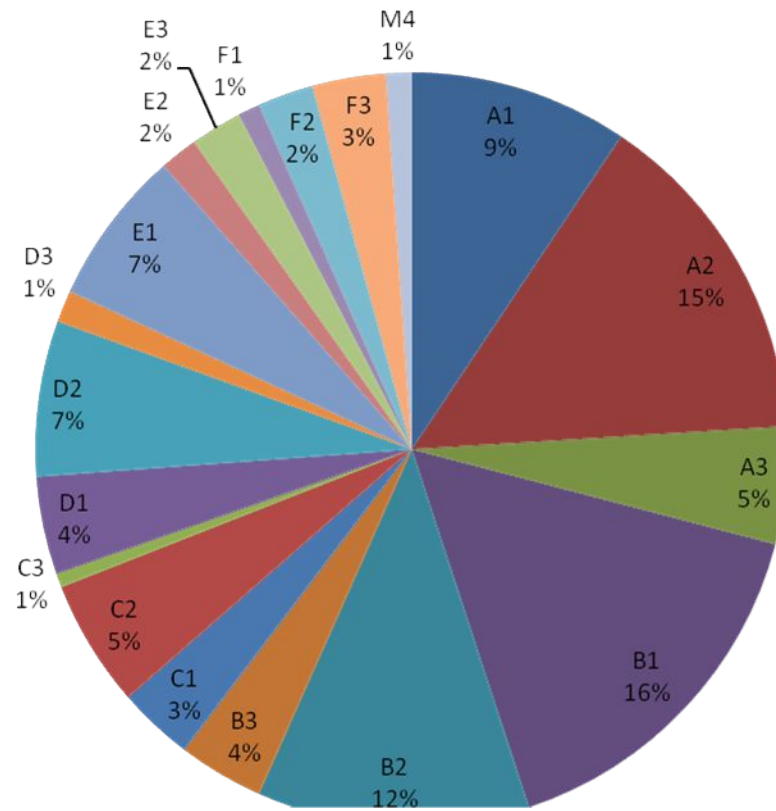
Exhibit 2:

		Average Number of times counted relative to total observations per day									
		Dec. 4 2009	Dec. 11 2009	Dec. 24 2009	Jan. 6 2010	Jan. 27 2010	Jan. 29 2010	Feb. 4 2010	Feb. 1 2010	Feb. 6 2010	Feb. 13 2010
<b>Not in view</b>	0	0.2500	0.0000	0.1958	0.0000	0.0000	0.2256	0.2174	0.2791	0.2180	0.1719
A1	1	0.0368	0.1622	0.0559	0.0315	0.0301	0.0977	0.0797	0.0174	0.0301	0.2656
A2	2	0.1985	0.1216	0.0769	0.1575	0.0451	0.1654	0.1159	0.0988	0.1278	0.1328
A3	3	0.0147	0.0068	0.1119	0.0000	0.0075	0.1429	0.0072	0.0291	0.0752	0.0313
B1	4	0.0000	0.2027	0.0909	0.3701	0.4361	0.0000	0.0942	0.0465	0.0977	0.0313
B2	5	0.0588	0.2500	0.0559	0.0630	0.1353	0.0902	0.0870	0.0930	0.0602	0.0781
B3	6	0.0000	0.0270	0.0490	0.0866	0.0752	0.0226	0.0217	0.0000	0.0301	0.0078
C1	7	0.1103	0.0000	0.0070	0.0472	0.0075	0.0000	0.0507	0.0349	0.0000	0.0156
C2	8	0.0000	0.0473	0.0699	0.0000	0.0301	0.0075	0.0217	0.1570	0.0451	0.0469
C3	9	0.0000	0.0068	0.0000	0.0000	0.0000	0.0000	0.0000	0.0058	0.0376	0.0000
D1	10	0.0000	0.0135	0.0629	0.0236	0.0226	0.0226	0.0145	0.0756	0.0752	0.0313
D2	11	0.0882	0.0270	0.0350	0.0000	0.0451	0.0977	0.1304	0.0407	0.0226	0.0781
D3	12	0.0000	0.0000	0.0000	0.0079	0.0000	0.0000	0.0072	0.0291	0.0451	0.0234
E1	13	0.0221	0.0405	0.0629	0.2126	0.0301	0.0376	0.0217	0.0291	0.0827	0.0391
E2	14	0.0000	0.0541	0.0000	0.0000	0.0150	0.0000	0.0217	0.0058	0.0000	0.0391
E3	15	0.0000	0.0000	0.0490	0.0000	0.0827	0.0075	0.0072	0.0174	0.0226	0.0000
F1	16	0.0000	0.0068	0.0280	0.0000	0.0000	0.0075	0.0217	0.0116	0.0000	0.0000
F2	17	0.1324	0.0338	0.0280	0.0000	0.0075	0.0000	0.0000	0.0000	0.0000	0.0000
F3	18	0.0000	0.0000	0.0210	0.0000	0.0301	0.0752	0.0725	0.0291	0.0301	0.0078
M4	19	0.0882	0.0000	0.0000	0.0000	0.0000	0.0000	0.0072	0.0000	0.0000	0.0000

	Highest
	Lowest
	Not in View

Exhibit 3:

### Summary of total observations in each quadrant



Note: these values do not reflect time, they reflect purely the number of observations made. This graph also omits the times when Lucy was not in view.



Exhibit 5: A sample of tracking Lucy's movements between 11:30 and 12:30 across all 10 days

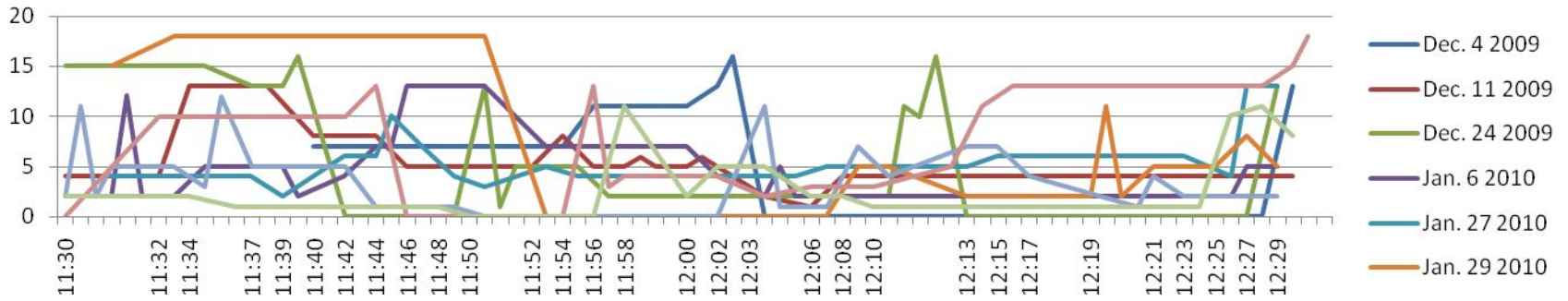
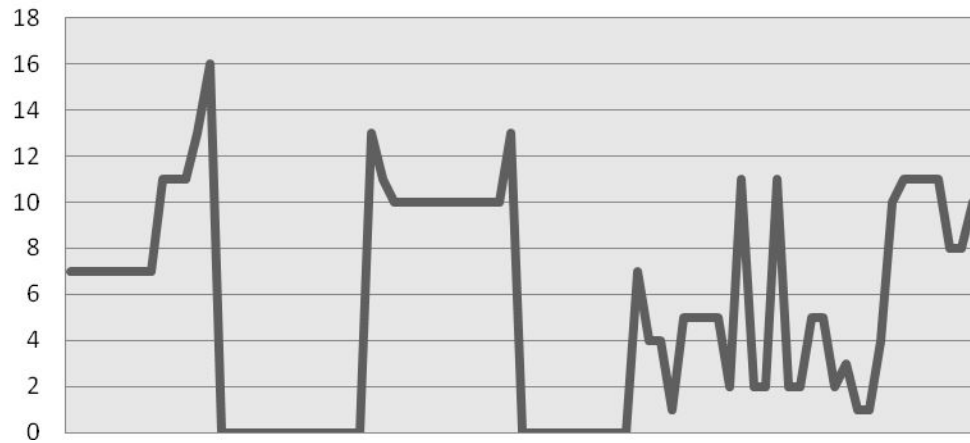
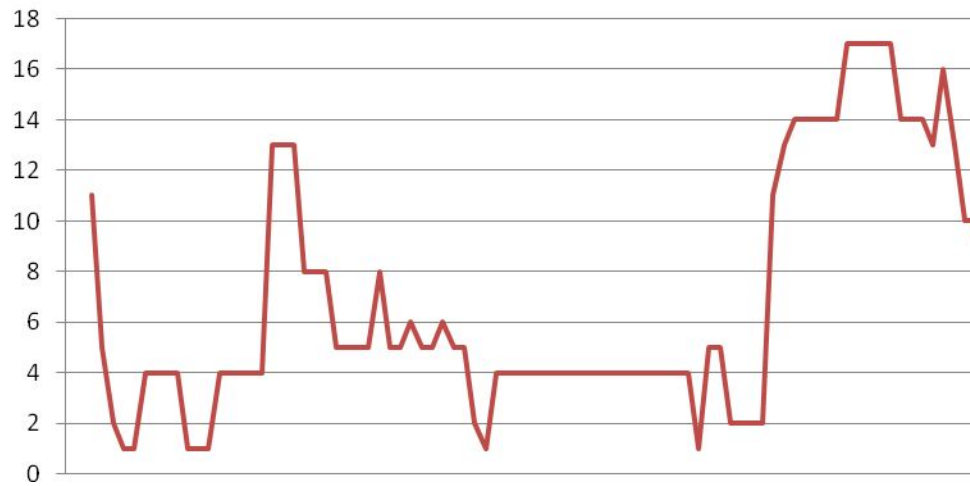


Exhibit 6: Tracking Lucy across all 10 days

**Dec. 4 2009**



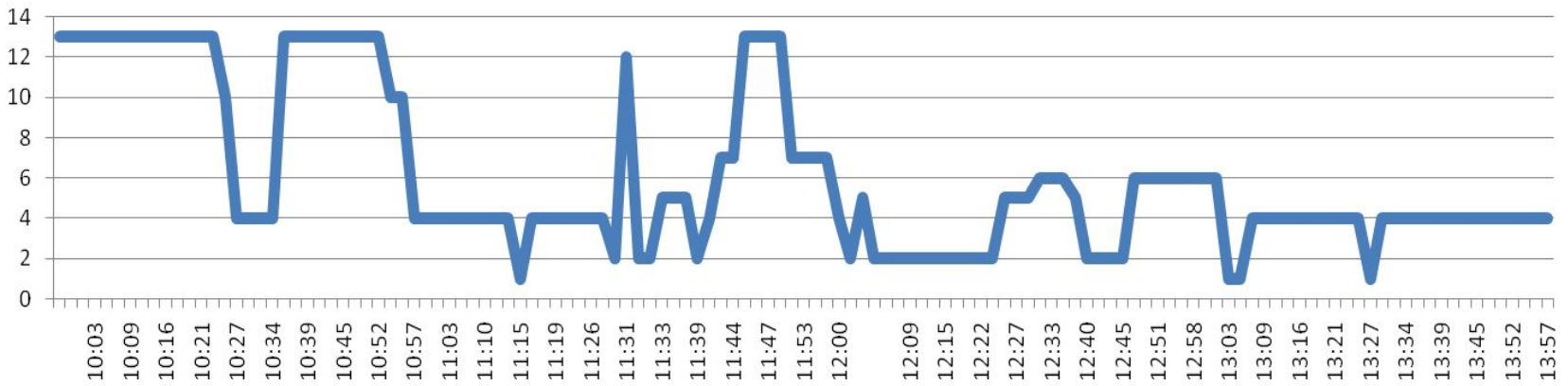
**Dec. 11 2009**



**Dec. 24 2009**



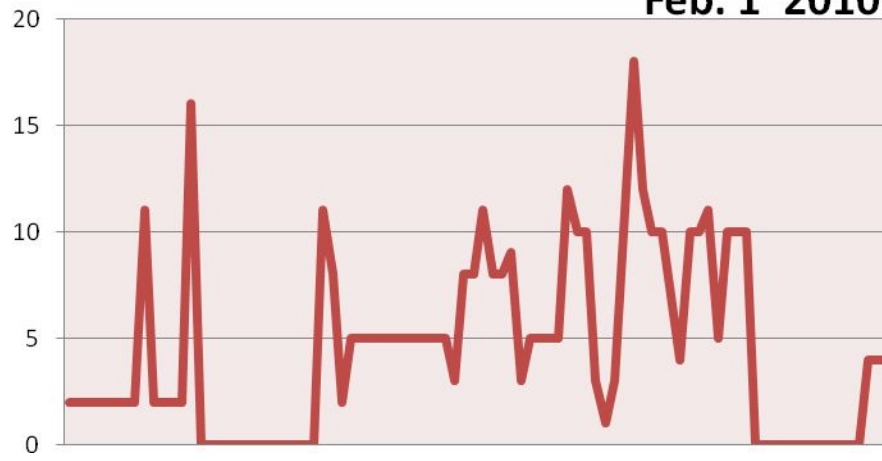
**Jan. 6 2010**



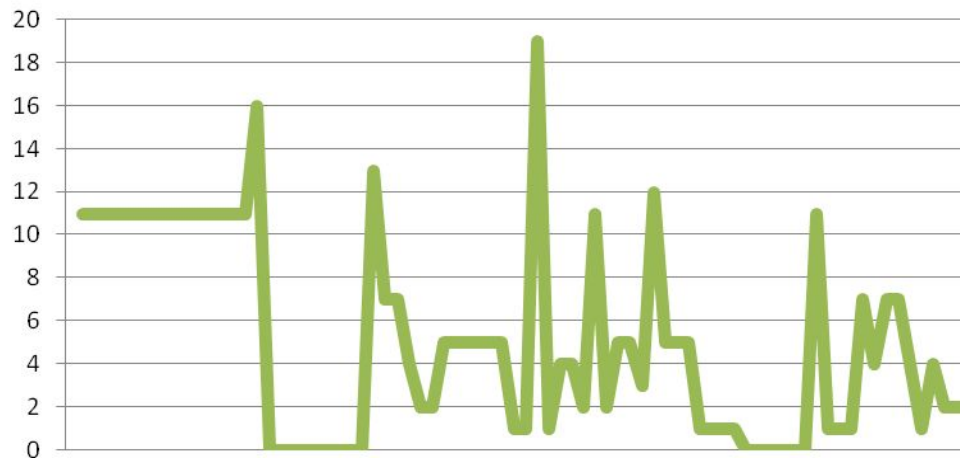
Jan. 27 2010



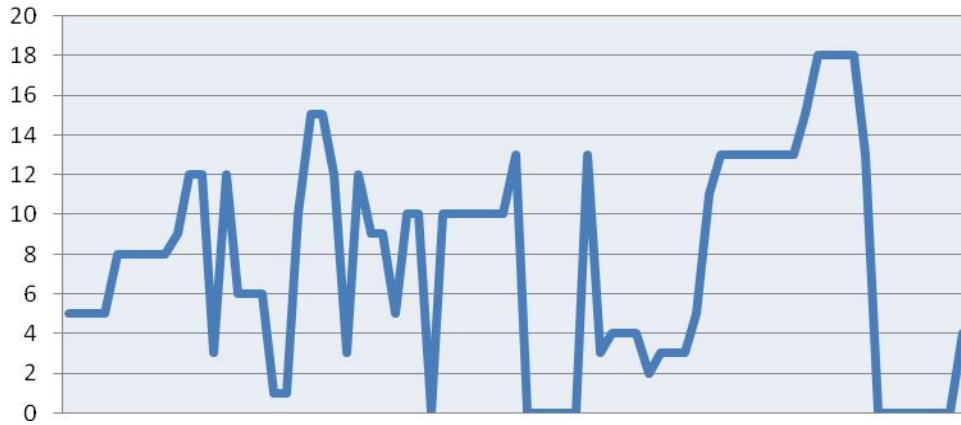
**Feb. 1 2010**



**Feb. 4 2010**



**Feb. 6 2010**



**Feb. 13 2010**

