Results of the Kloiya River Resistivity Counter 2011

Skeena Fisheries Report SK 159

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Executive Summary

A Logie 2100C resistivity counter was installed at the Kloiya River on March 18, 2011. The counter electrodes are located within a plastic tube 150 cm in length with a inside diameter of 37.5 cm. The tube was placed near the top of a vertical slot fishway located approximately 2 kilometres upstream of the Kloiya River estuary. Steelhead migrating through the fishway passed through the culvert resulting in a change in conductivity that was analysed by an algorithm and recorded by the counter. A row of data for each event was comprised of the date, time, direction of travel and peak signal strength. Electrical power was provided by a stream engine that utilizes the head of water at the site to generate hydro electric power. Battery Power was found depleted on a site visit on April 13. It was found that one of the water supply hoses to the stream engine had lost its prime and was not supplying water to the stream engine. The prime was re-established on April 13 and the counter remained powered up for the remainder of the project. The last data recorded prior to the site visit, on April 13, was at 0432 on April 5. It is assumed that the counter was not functioning after that time. The charging system was repaired on April 13 and the counter was functional again on the same day. Water temperature was recorded on a hand held HB USA thermometers. Temperatures ranged from 3°C on March 18 to 15°C on June 2.

There was no migration recorded for the first 10 days of counter operation. The first steelhead was recorded on March 28, 2011. Daily upstream migration was relatively consistent after March 28 until upstream migration stopped on May 19. Upstream migrants were not recorded on only six days during the project (not including then period of time the counter was believed to be powered down). The counter was allowed to power down after May 25 since no upstream migrants had been recorded for six days. March represented 4% (n=6) of the total uncorrected up counts, April 66% (n=98) and May 29% (n=44). The highest daily uncorrected upstream count was 12 on April 28. Between March 18 and May 25, 2011 the counter recorded a total of 148 up counts, 53 down counts and 46 changes in conductivity that did not meet criteria to be classified as a migrating fish. Counter efficiency was calculated on trace data collected in 2007. In 2007, trace data was recorded for 74% of the data recorded by counter. Trace data indicates that the counter efficiency for upstream migrants is 94% and 76% for downstream migrants. After corrections for counter efficiency, the 2011 steelhead escapement upstream of the Kloiya River dam is estimated to be 99.

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1.0 Introduction

The Kloiya River watershed is located approximately 15 km southeast of Prince Rupert, B.C. (Figure 1). This coastal watershed provides spawning and rearing habitat for populations of chinoook salmon (*Oncorhynchus tshawytscha)*, chum salmon (*O. keta)*, coho salmon (*O. kisutch)*, sockeye salmon (*O. nerka)*, steelhead (*O. mykiss)*, coastal cutthroat trout (*O. clarkii)*, Dolly Varden (*Salvelinus malma*), pink salmon (*O. gorbuscha)*, general sculpins (*Cottidae*) and threespine stickleback (*Gasterosteus aculeatus*) (*Habitat Wizard. Aug 2007*). The Kloiya River is a fourth order stream with an approximate length of two km. A dam with a vertical height of approximately seven meters was constructed in 1949 two km upstream of the Kloiya River estuary. This structure was built to provide a source of water for the Skeena Cellulose pulp mill. A vertical slot fishway approximately 50 meters in length was incorporated into the dam's construction to facilitate fish passage upstream of the structure.

Kloiya River winter-run steelhead are known to spawn and rear in the mainstem Kloiya River as well as tributaries to Taylor Lake (Diana Creek) and Prudhomme Lake (Prudhomme Creek) (*Tredger, 1981*). The river provides the closest winter-run steelhead angling opportunity for anglers from Prince Rupert and Port Edward. The recreational steelhead fishery typically begins in late November and continues into April *(Mark Beere pers. Comm.)*. The short fishable section of the river below the dam is subject to significant and rapid fluctuations in flow and stage, and has a limited number of angling locations that are accessible by trail.

Information about the Kloiya Watershed steelhead population is limited to a study undertaken in 1981 by Ministry of Environment commissioned by the Salmonid Enhancement Program as well as the resistivity counter projects in 2006, 2007, 2009 and 2010. The 1981 study was limited to quantifying juvenile steelhead abundance, smolt production and estimating values for habitat capacity thresholds. In 2005, the Ministry of Environment (*MoE*) began investigating the potential of using the Kloiya as an index stream for monitoring the abundance trends of north coast winter run steelhead using resistivity technology. This report compiles information from project years 2006, 2007, 2009, 2010 and 2011.

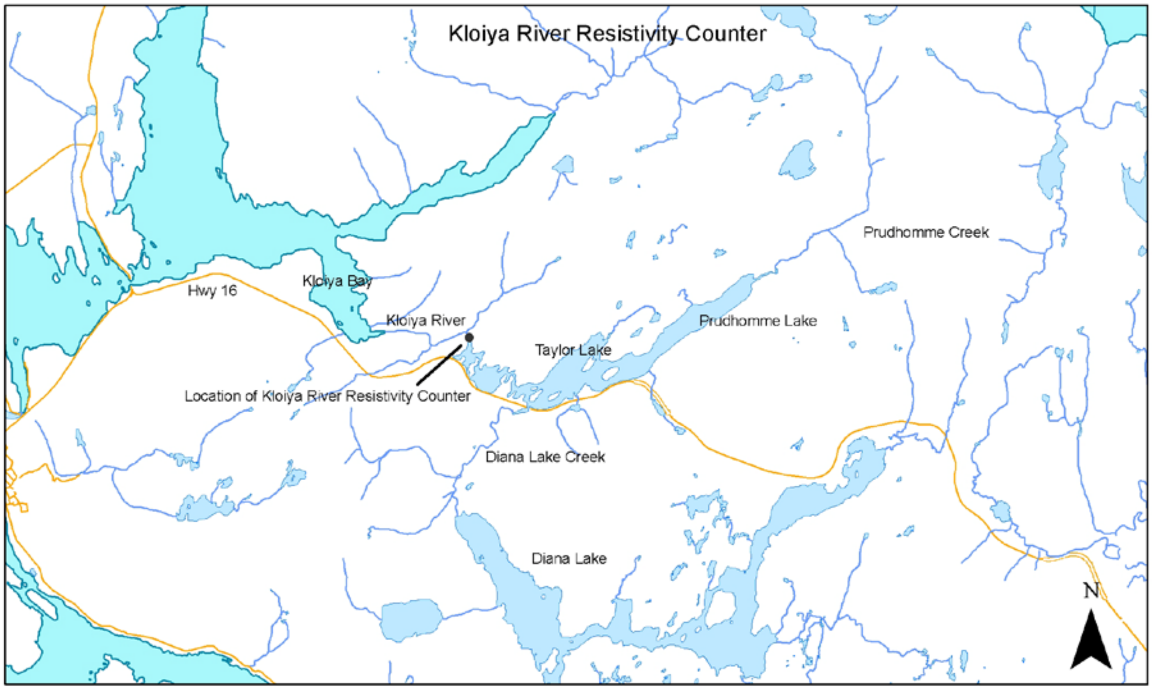

Figure 1. Location of Kloiya River resistivity counter.

2.0 Project Design/Methods

The Kloiya River was surveyed in November 2005 to determine a suitable location to install and operate a Logie 2100C resistivity counter (*Aquantic Ltd, Scotland*). All resistivity counters operate in conjunction with three electrodes placed on top of a fixed weir, transportable flat pad, or inside of a tube. The three electrodes create a field that monitors the conductivity of the water within the field. The counter recalibrates the measured conductivity every 30 minutes. When a fish passes through the field the change in conductivity is recorded by the counter. The signal is analyzed by an algorithm and a row of data is produced indicating the date, time, direction of travel and peak signal size. Changes in conductivity not determined to be caused by a fish are classified as events. The fishway was selected as the location for the counter based on several advantageous attributes. The location is adjacent to a secure storage shed to store the electronic equipment, the site is accessible by vehicle, the head of water at the dam can be used to generate power for the equipment and fish migrating through the fishway would be forced to swim through the resistivity counter tube. The tube type counter was developed and tested on the Bonaparte

River near Cache Creek, B.C. (*McCubbing 2003*). The counter tube on the Kloiya River has a inside diameter of 37.5 cm and an overall length of 150 cm. The tube is attached to aluminum grate and lowered into existing concrete slots in the fishway (Picture1).

Picture 1. Kloiya River resistivity counter tube

The location of the counter was selected due to the high probability of successfully enumerating adult steelhead at that location. Although steelhead are known to spawn below the dam, the decision was made to locate the counter at the fishway and enumerate a proportional representation of the annual Kloiya River steelhead escapement. Tredger 1981, estimated that at capacity, spawning tributaries upstream of the fishway represented 53% of annual watershed steelhead smolt production. A subsequent qualitative habitat survey of the mainstem Kloiya River, in April 2006, indicated that there is a limited amount of spawning and fry habitat available below the dam inferring that a majority of the steelhead recruitment occurs in tributaries above the fishway (Mark *Beere pers. Comm.).*

In 2011, data produced by the Logie 21000 C was downloaded on to a Lenovo T500 Thinkpad lap top computer (*IBM, Armonk, New York, USA*) using version 1.0.1 of the fish counter control program (*Aquantic Ltd, Scotland*). This software was used to change counter parameters and download data. Counter data was downloaded bi-monthly. One Hobo Pro v2 temperature data loggers (*Onset*

Computer Corporation, Pocasset, MA) recorded hourly water temperatures (°C) The data logger recorded water temperature in the fishway immediately downstream of the counter tube. On retrieval it was determined that the stainless steel cable had been chaffing on the concrete fishway resulting in a break in the cable. The logger was not recovered.

Electrical power for the counter system was generated by a Stream Engine (*Energy Systems and Design Ltd, Sussex NB*) which utilized the head of water at the site to keep the batteries charged and the equipment functioning.

3.0 Equipment Settings

3.1 Logie Counter Settings

Logie 2100C counter settings are dependent upon several parameters. Water conductivity is the primary metric for determining counter settings. Specific conductance and Total Dissolved Solids (TDS) values for the Kloiya River are very low, 15 µmhos/cm and 10 mg/l respectively. As a result, the counter gain was set at a value of 400 to compensate for the low conductivity. Threshold values required for fish identification was set at 20. Counter software used during the 2011 project was version 9.10.

4.0 Results

4.1 Counter Efficiency

The Kloiya River resistivity counter was installed and operational on March 18, 2011. The first steelhead migrating upstream was recorded on March 28, 2011 and the last steelhead migrating upstream was recorded on May 19, 2011. During this time period, the counter recorded 148 up counts, 45 down counts and 45 events. Events indicate a change in conductivity that was not recognized by the counter algorithm as a fish. A total of 246 rows of data were recorded as upstream counts, downstream counts and events (Table1).

Date	Time	Description	P.S.S
28-Mar	14:02:50	U	57
28-Mar	15:21:56	U	41
28-Mar	15:55:38	U	60
28-Mar	16:28:16	E	125
29-Mar	12:40:11	U	59
29-Mar	13:28:22	U	49
29-Mar	13:33:27	D	125
29-Mar	14:06:07	E	34
30-Mar	15:08:42	D	37
30-Mar	16:32:06	U	42
02-Apr	8:49:48	U	44
02-Apr	9:37:07	E	126
03-Apr	13:36:39	U	77
03-Apr	14:04:21	E	125
03-Apr	14:07:54	U	33
05-Apr	3:27:11	E	127
05-Apr	4:32:06	D	49
13-Apr	15:03:28	U	50
14-Apr	9:34:38	E	84
14-Apr	18:27:51	U	66
14-Apr	18:39:16	U	54

Table 1**.** Example of text data collected from counter in 2011**.**

To estimate counter efficiency, counter data is calibrated with trace data. The trace data provides a visual record of the counter data that can be compared to the counter algorithm’s classification. Trace data can only be collected on a dedicated lap top computer that must be left on site to record the trace data. It is expected that trace data collected in 2007 is a reasonable estimate of counter efficiencies on a annual basis. In 2007, 115 or (74%) of the counter records had corresponding trace data that can be used for analysis. These data were collected between March 8 and May 13, 2007. Two letter codes were used to compare text and trace data and determine event classification (Table 2).

UU	Upstream fish classified as a upstream fish
UE	Upstream fish classified as a event
DD	Downstream fish classified as a downstream fish
DE	Downstream fish classified as a event
EE	Non fish event correctly classified as a event

Table 2. Codes used to compare trace and text data.

Counter efficiency for upstream counts was determined by dividing the number correctly classified up counts UU (83) by the total number of up counts UU+UE (88). This results in a upstream efficiency estimate of 94%. This is a significant improvement compared to the 81% upstream efficiency calculated in 2006 (*Peard 2007*). Counter efficiency for downstream migrants was calculated by dividing the correctly classified number of down counts DD (19) by the total number of down counts DD+ DE (25). Therefore, the counter efficiency for downstream migrants was calculated to be 76%. Downstream efficiency also benefitted from a higher gain setting. The 2006 downstream counter efficiency was estimated to be 58% (*Peard 2007*). The remaining eleven events were changes in conductivity that were not related to fish passage. Classification errors, upstream or downstream, primarily involved fish traces not breaking the threshold required to be identified as fish. This may be due to very low conductivity in combination with changes in swim height as the fish migrates through the field. Figures 2 and 3 shows examples of downstream and upstream migrants, recorded in 2006, incorrectly classified as an event.

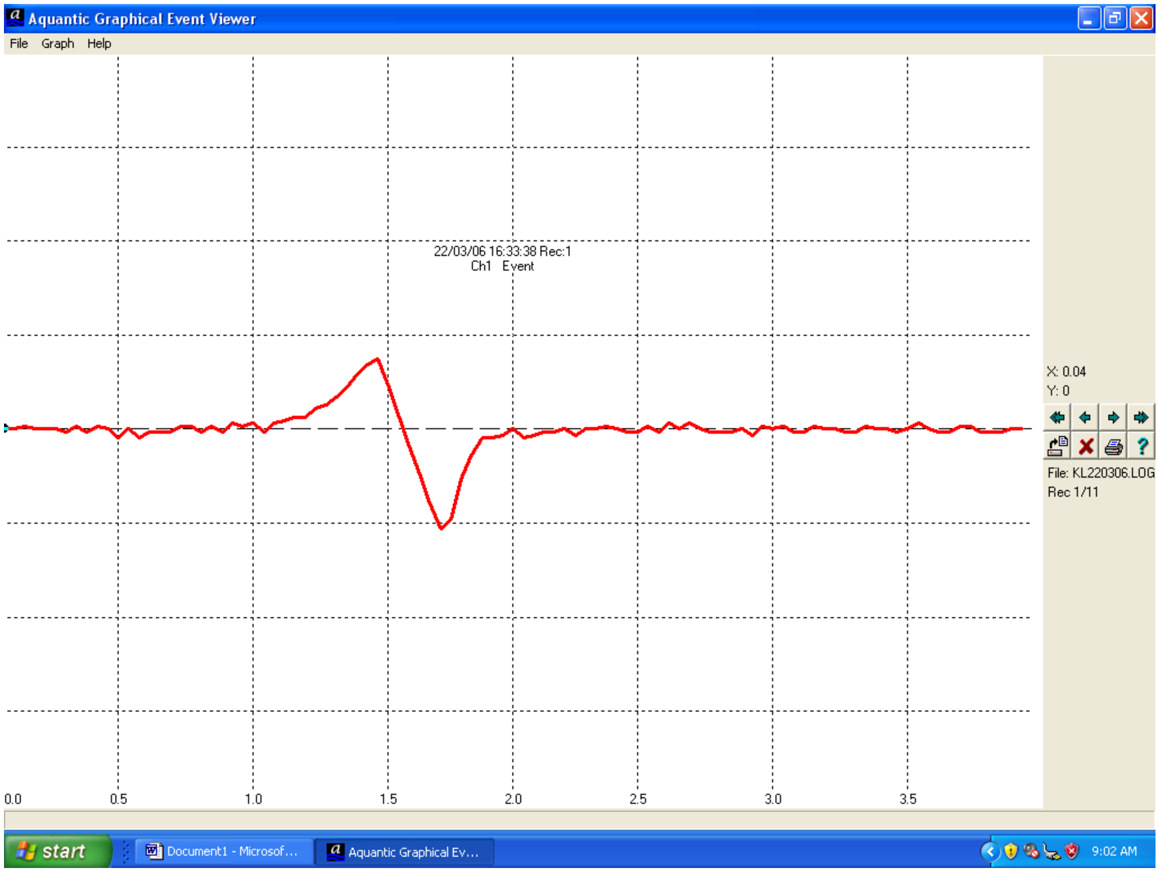

Figure 2. Downstream migrant incorrectly classified as a non fish event.

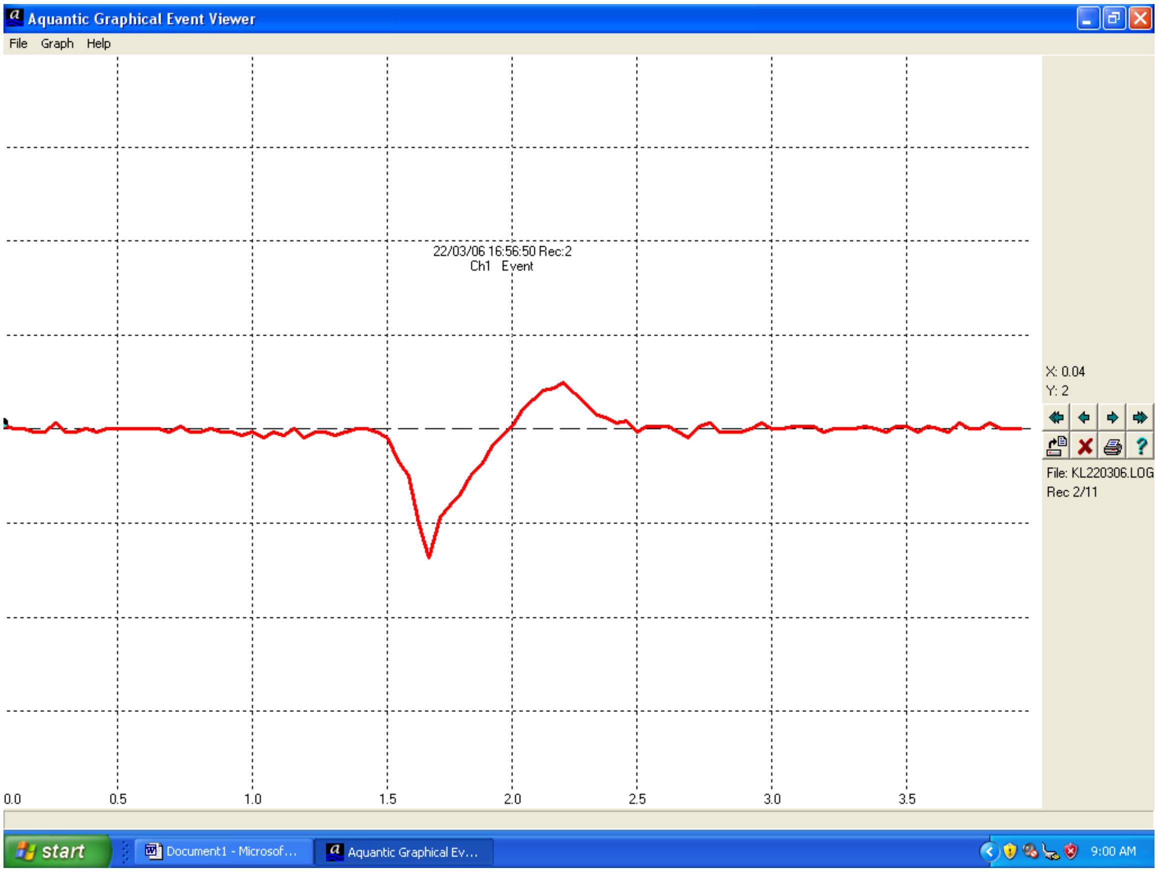

Figure 3. Upstream migrant incorrectly classified as a non fish event.

Sudden changes in water conductivity not related to fish migration are also recorded by the counter. Some examples of non fish events recorded by the counter include river otters, beavers, air entrainment and sudden changes in water flow (*Don McCubbing pers. Comm.*). These trace patterns are significantly different from fish traces and visual analysis can distinguish between changes in conductivity related to fish and non fish events. Figure 4 is an example of a change in conductivity not related to fish migration.

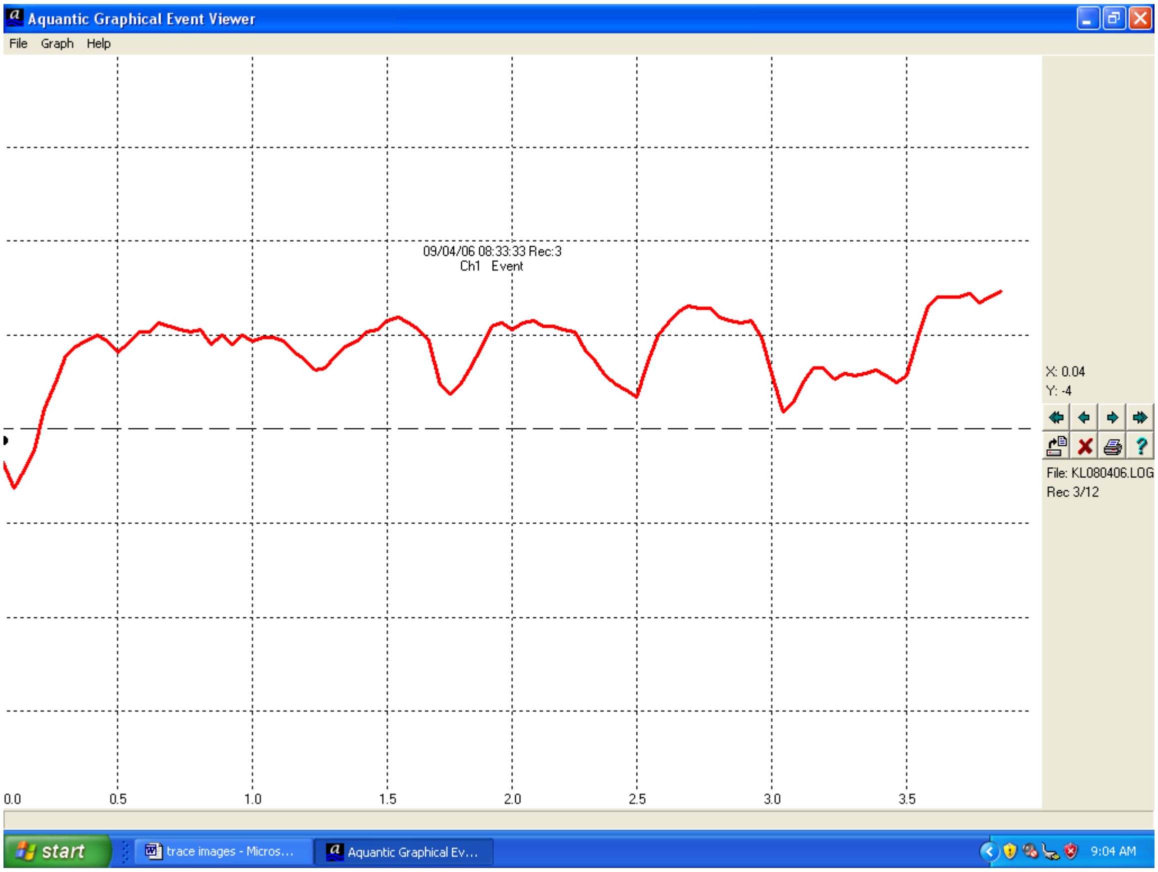

Figure 4. Change in conductivity correctly classified as a non fish event.

4.3 Escapement Estimate

After May 19, upstream migration activity ceased. A three day period of no activity was followed by downstream migrants only. Since this indicates kelt emigration there is a potential to bias the results when daily down counts are consistently greater than daily up counts. Therefore, the eight downstream migrants that are identified as kelts have been removed from the 2011 escapement estimate. A correction factor is applied to the rows of data logged as events (not indicated as up or down migrants) where trace data is unavailable. Trace data, collected in 2007, indicated that 22% of the events logged by the counter were upstream migrants. In comparison, 30% of the events were downstream migrants. These values are applied to the 2011 events where trace data does not exist. In 2011 this value is equal to 45. To estimate up counts, 45 is multiplied by 0.22. Therefore, it is estimated that 10 upstream migrants were not correctly classified. The estimate for downstream migrants is 45 multiplied by 0.30. It is estimated that 14 downstream migrants were not correctly classified. The escapement estimate for Kloiya River winter run steelhead is estimated by subtracting down counts from the up counts recorded during the project which is equal to 99. Figure 5 shows the escapement estimates for 2006,2007,2009,2010 and 2011.

U+UE-D+DE=escapement (148+10) - (45+14) =99

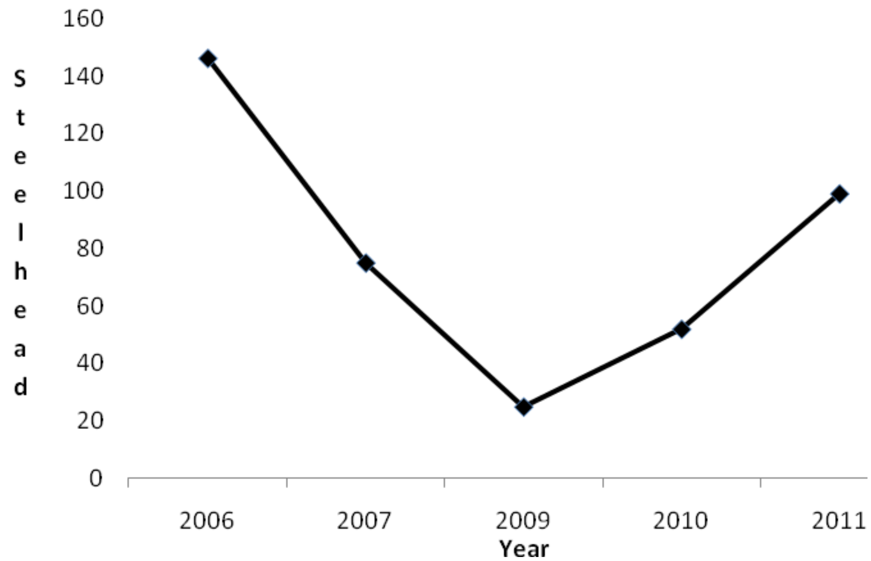

Figure 5. Kloiya River steelhead escapement estimates 2006, 2007, 2009, 2010 and 2011.

4.4 Run Timing

Anglers begin to capture Kloiya River steelhead in the month of November with peak catch reportedly occurring in March and April *(Mark Beere pers. Comm.).* In 2006, the resistivity counter was installed in November 30 to coincide with the time period when steelhead are known to be in the river. No migrations were recorded through the fish way until March 1 (*Peard 2007*). In 2007, the resistivity counter was installed on January 19. The first fish recorded migrating through the fishway on March 8 *(Peard 2008)* Data collected in 2006 and 2007 indicated that steelhead are not typically migrating through the fishway until March and as a result the counter has not been installed earlier than March since 2009. In 2011, the counter was installed and operational on March 18. No fish were recorded migrating through the fishway until March 28. This indicates that Kloiya River steelhead run timing into the lower river is significantly different from the migration through the fishway. For the purposes of this report run timing refers to the migration through the fishway and into Taylor Lake.

To gain a better understanding in run timing trends, uncorrected daily net up counts are used to demonstrate run timing. In 2011, the peak daily upstream count occurred on April 28 (Figure 6). In comparison, the peak daily count in previous years occurred on April 24 (2006), April 24 (2007) May 13 (2009) and April 18 (2010) (Figure 7). The mean date for the peak upstream daily count in 2011 is April 27 (SD=9.4).

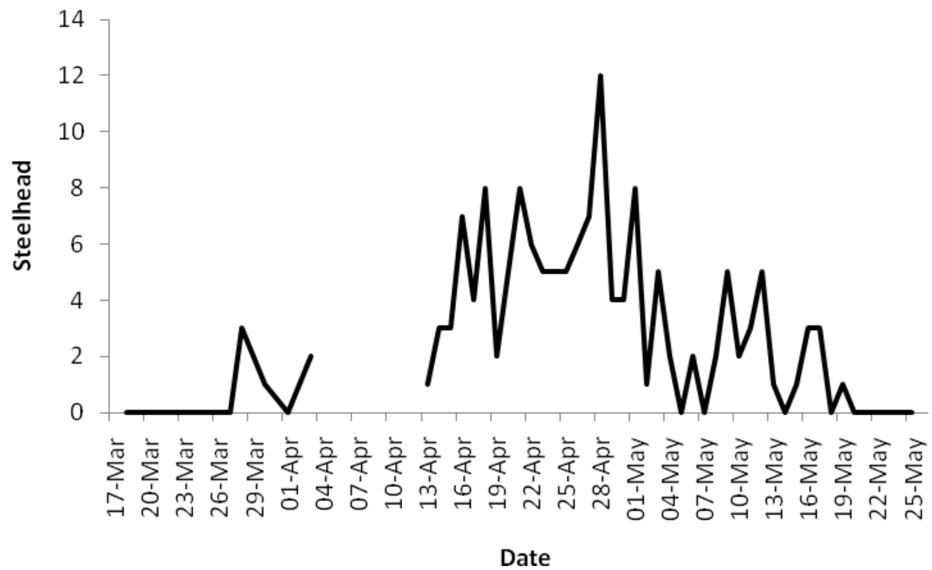

Figure 6 Uncorrected daily up counts March 18 to May 25, 2011.The gap in the time series is from when the counter was believed to have not been operational.

Run timing in 2011 is consistent with what has been observed in all project years excluding 2009. Limited upstream migration was observed until early April when upstream counts increased peaking in late April and then declining in late May (Fig 7). In 2011, there were no up counts recorded after May 19. In 2009, there were no steelhead recorded migrating through the counter until May 1 and the peak count was recorded on May 13.

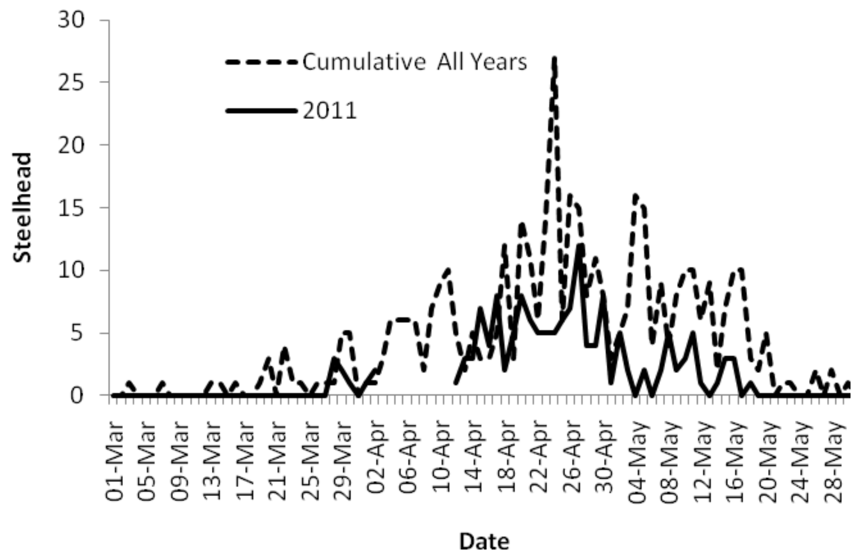

Figure 7. Kloiya River steelhead run timing.

4.5 Environmental Parameters

Water temperatures have a significant impact on fish behaviour. Rainbow trout / steelhead typically begin spawning migrations at temperatures greater that 5˚C, and spawning occurs at water temperatures ranging from 8˚C to 15˚C (McPhail 2007).

Water temperatures were recorded by HB USA (*Collegeville PA.*) hand held thermometers. Water temperatures were recorded between March 18, 2011 and June 2, 2011. Water temperature ranged between 3˚C (March 18 at 1200) and 15˚C (May 25 at 1100) (Figure 8). Water temperatures, after April 1, were warmer relative to the mean temperature to the same date in previous years. For example, on April 24 water temperature in 2011 was approximates 3˚C warmer than the mean temperature for that day. Figure 9 shows how upstream steelhead migration through the fishway when water temperatures began to increase and peaked when temperatures were greater than 5˚C.

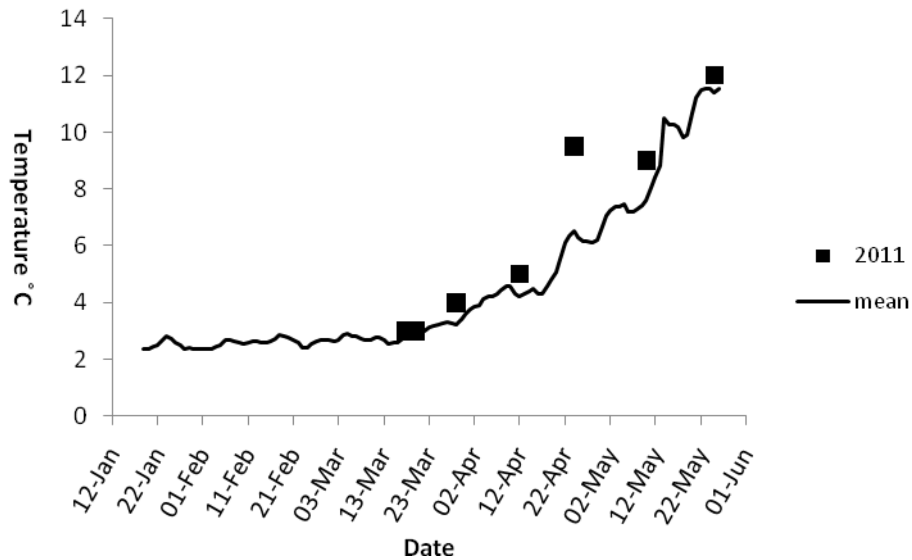

Figure 8 Mean daily water temperatures all years compared to 2011.

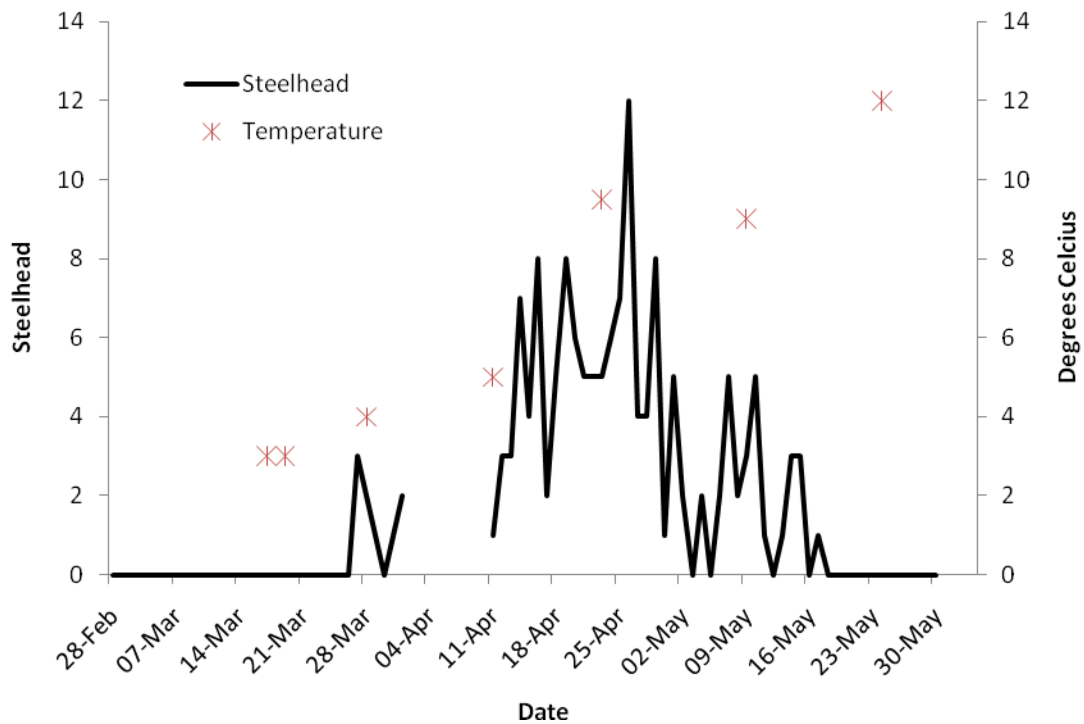

Figure 9. Uncorrected steelhead up counts related to water temperature 2011.

Kloiya River level and flow is controlled by the Kloiya River Dam. A water survey station maintained by Environment Canada is located approximately 300 meters downstream of the structure. The station collects and records data that is accessible from the Environment Canada website. The hydrograph in Figure 10 is produced using data from that website. Water flow down the fishway can be manipulated independently of the dam's gate, however, visual observation during site visits indicated that flow in the fishway remains relatively consistent independent of reservoir level, or stage level in the Kloiya River. In previous years, flow (m^3/sec) was the unit used for the analysis in this annual report. Data from the Environment Canada website in 2011 is only available as a value of level (meters) and is reported in the report 2011 as such. River level during the project ranged between 0.76 m (April 17) and 1.00 m (May 3). The mean water level was 0.82 m

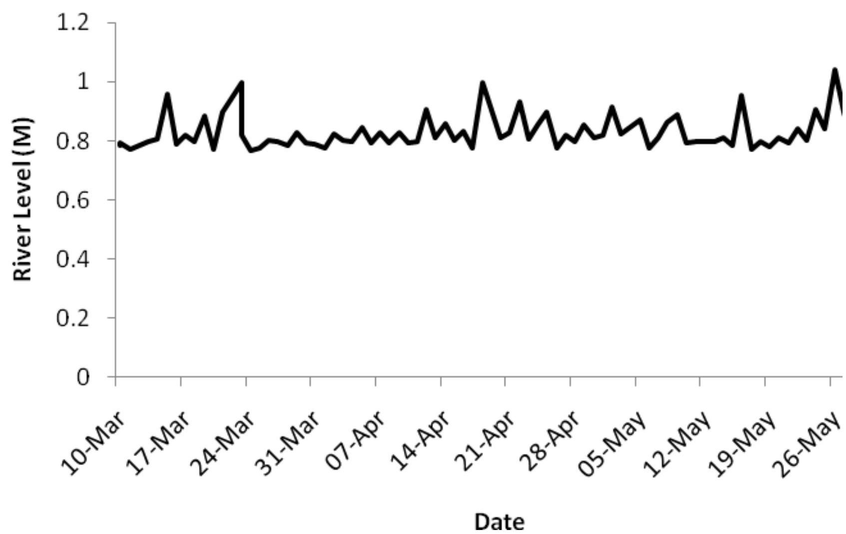

Figure 10 Mean daily river level (meters) in the Kloiya River March 10 to May 31 2011 (Env Canada survey station Kloiya River).

Figure 11 shows steelhead migration through the fish way at various river levels. Graphical analysis did not indicate any obvious linkage between river level and migration through the fishway. As previously noted, visual observations indicated that level in the fishway remained consistent during the project despite fluctuations in reservoir and river levels.

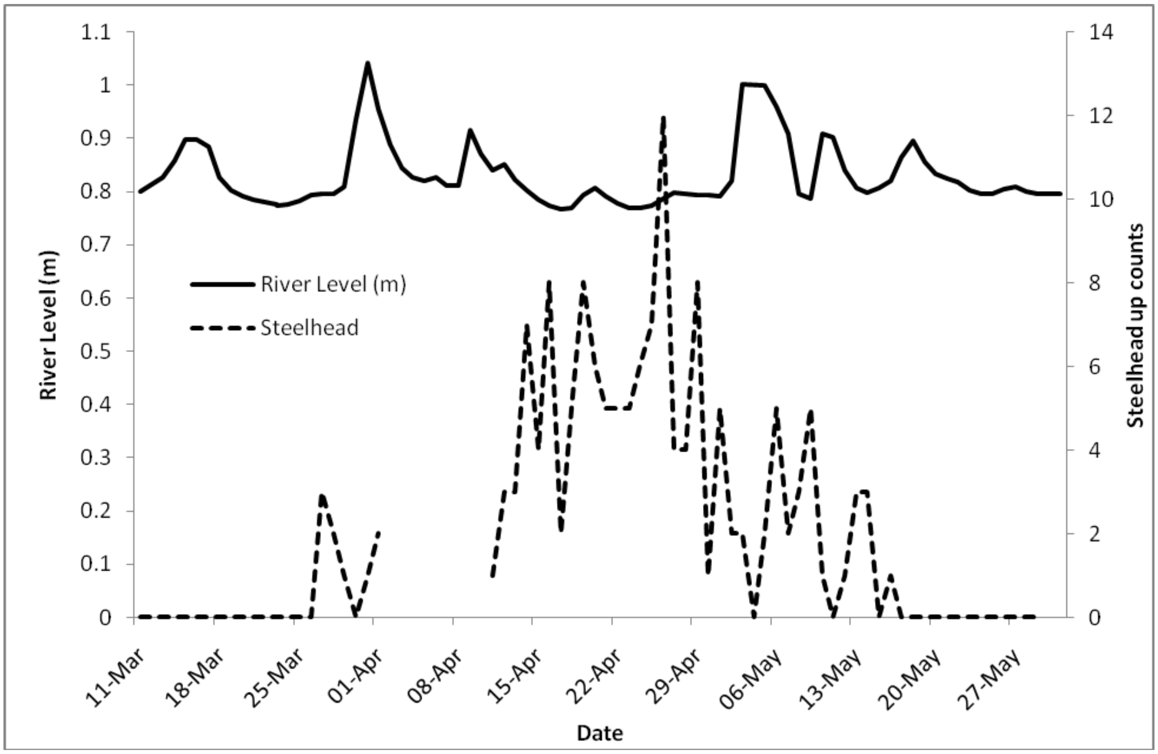

Figure 11 Mean daily river level (m) and daily upstream steelhead migration in the Kloiya River March 18 May 25, 2011. (Env Canada survey station Kloiya River).

4.6 Migration Behaviour through the Fishway

When the Kloiya River dam was built in 1949, a vertical slot fishway was incorporated into the construction to facilitate fish migration above the structure. The fishway is approximately 50 meters long with a small entrance in the opposite direction of the natural flow (Picture 2). Halfway along its length the fishway turns 180˚ before reaching the Taylor Lake. To access the lake, fish must migrate through a square hole located in the bottom corner of the stop logs at the head of fishway (*Dave Milino pers. Comm.*).

Picture 2. Entrance to Kloiya River fishway.

In 2011, no migration was recorded until March 18. Migration was intermittent until early April when migration activity increased and became more consistent (Figure 6). Migration timing through the fishway was consistent with the timing recorded in previous years (Figure 7). Increase in migration activity coincided with increasing water temperatures (Figure 9). Since 2006, the data indicate that the majority of steelhead will migrate past the counter when water temperatures are increasing (Peard 2007; Peard 2008; Peard 2010). However, the water temperature that represents the highest proportional steelhead migration has ranged from 31.3% (5.00˚C to 5.99˚C) in 20 06 to 41.0% (8.00˚C to 8.99˚C) in 2010. In 2011, the majority (58%) of upstream migrants were recorded when water temperatures were greater than 5˚C (Table 3).

Temp Range (Celsius)	Up count uncorrected for counter efficiency	%
0-3.00	3	2.00
3.01-4.00	6	4.00
4.01-5.00	52	35.00
5.01-9.50	87	58.00
Total	148	100

Table 3. Table showing fishway uncorrected up counts related to water temperature in 2011.

5.0 Discussion

Prior to 2006, The Ministry of Environment did not have a winter-run steelhead index in the Skeena Region. The Kloiya River was investigated, as a possible winter-run index, due to its size and proximity to Prince Rupert and the Smithers Regional MoE office. It also provided the infrastructure to securely store the equipment while in operation, and the dam provided a potential opportunity to generate electrical power precluding the need to operate generators. Resistivity counter technology was selected as the enumeration method since the technology required limited maintenance, and the successful use of the technology to enumerate steelhead populations on the Keogh, Bonaparte and Deadman Rivers in British Columbia. The Kloiya River design was based on the tube type counter installed in a vertical slot fish way in the Bonaparte River.

In 2011, run timing and migration behaviour through the fishway was consistent with the results in previous years excluding 2009. Since very limited migration was again observed through the fishway until early April, installation of the counter in early March should be sufficient to capture the annual winter steelhead run in the Kloiya River.

One of the challenges of operating electronics in remote locations is securing a consistent source of electricity to keep the equipment powered up. For the last three years power has been supplied via a stream engine that utilizes the reservoir to provide power for the counter operations.

The goals and objectives in 2011 were met. The conclusion is that the goals and objectives of this project were achieved and continues to present a viable opportunity to enumerate winter-run steelhead on a annual basis and should be continued.

4.0 Recommendations

- Install a staff gauge in the fishway to record water levels.
- In future years, when abundance counts are below expectations, a snorkel swim in the two kilometre section of river below the dam may provide some indication of steelhead abundance below the fishway.
- Expand the scope of the project to incorporate genetic and life history information into the analysis.
- Investigate options for facilitating fish migration through the fishway.
- Annual snorkel surveys should be conducted immediately prior to the removal of the resistivity counter to estimate the number of steelhead spawning in the Kloiya River at that time.

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6.0 Appendices

Appendix 1. Counter data

Date	Time	Description	P.S.S
28-Mar	11:40:38	E	19
28-Mar	14:02:50	U	57
28-Mar	15:21:56	U	41
28-Mar	15:55:38	U	60
28-Mar	16:28:16	E	125
29-Mar	12:40:11	U	59
29-Mar	13:28:22	U	49
29-Mar	13:33:27	D	125
29-Mar	14:06:07	E	34
30-Mar	15:08:42	D	37
30-Mar	16:32:06	U	42
02-Apr	8:49:48	U	44
02-Apr	9:37:07	E	126
03-Apr	13:36:39	U	77
03-Apr	14:04:21	E	125
03-Apr	14:07:54	U	33
05-Apr	3:27:11	E	127
05-Apr	4:32:06	D	49
13-Apr	15:03:28	U	50
14-Apr	9:34:38	E	84
14-Apr	18:27:51	U	66
14-Apr	18:39:16	U	54
14-Apr	18:55:38	U	51
15-Apr	0:50:58	U	42
15-Apr	2:42:12	E	124
15-Apr	2:54:09	E	112
15-Apr	3:37:51	U	117
15-Apr	14:25:01	U	56
15-Apr	14:56:13	D	53
15-Apr	18:45:36	E	125
16-Apr	7:41:37	U	55
16-Apr	9:59:51	U	55
16-Apr	13:09:13	U	47

16-Apr	14:18:37	U	50
16-Apr	16:37:12	U	55
16-Apr	23:13:44	U	53
16-Apr	23:59:23	U	127
17-Apr	8:07:39	D	53
17-Apr	15:26:03	U	51
17-Apr	15:50:41	U	47
17-Apr	16:37:29	U	59
17-Apr	16:51:29	U	49
18-Apr	4:01:26	U	111
18-Apr	5:53:40	U	78
18-Apr	6:25:06	E	73
18-Apr	6:29:21	D	46
18-Apr	8:20:36	D	55
18-Apr	10:46:43	U	44
18-Apr	11:45:26	U	55
18-Apr	14:05:35	U	46
18-Apr	14:08:46	U	45
18-Apr	20:10:36	U	49
18-Apr	20:34:38	U	44
18-Apr	21:07:38	D	127
18-Apr	22:26:21	E	35
19-Apr	13:09:41	U	40
19-Apr	19:43:18	U	48
19-Apr	21:15:37	E	125
19-Apr	23:25:11	D	40
20-Apr	0:00:46	E	127
20-Apr	2:39:30	U	62
20-Apr	11:17:23	U	44
20-Apr	11:33:54	U	48
20-Apr	12:24:49	U	57
20-Apr	16:40:32	U	59
21-Apr	0:38:18	D	76
21-Apr	1:23:07	U	47
21-Apr	1:28:40	U	74
21-Apr	3:29:12	U	127
21-Apr	5:13:12	U	79
21-Apr	10:06:03	U	52
21-Apr	12:29:19	U	83
21-Apr	12:59:02	U	49
21-Apr	18:30:41	U	71
22-Apr	0:04:58	E	26
22-Apr	0:14:49	D	52

22-Apr	2:38:44	U	63
22-Apr	3:22:50	E	125
22-Apr	3:36:27	U	81
22-Apr	3:43:34	U	54
22-Apr	12:16:24	E	125
22-Apr	13:33:16	U	48
22-Apr	13:46:54	D	54
22-Apr	14:59:13	U	50
22-Apr	15:15:16	U	58
23-Apr	11:10:09	U	48
23-Apr	11:27:00	D	53
23-Apr	11:40:04	U	45
23-Apr	14:58:10	U	53
23-Apr	17:49:54	U	59
23-Apr	23:48:07	U	53
24-Apr	0:33:23	D	123
24-Apr	1:46:10	U	87
24-Apr	4:26:20	U	53
24-Apr	10:23:30	U	62
24-Apr	13:42:07	U	49
24-Apr	18:40:09	U	61
24-Apr	18:45:54	D	112
25-Apr	5:13:16	U	47
25-Apr	5:38:27	D	127
25-Apr	5:45:36	D	47
25-Apr	9:36:22	U	56
25-Apr	10:13:40	U	49
25-Apr	10:55:39	U	58
25-Apr	16:48:07	U	46
26-Apr	2:33:06	U	68
26-Apr	3:12:41	D	127
26-Apr	3:24:40	D	37
26-Apr	3:36:01	U	127
26-Apr	5:07:14	U	76
26-Apr	5:44:53	E	127
26-Apr	6:14:52	D	53
26-Apr	8:58:14	E	117
26-Apr	22:07:17	U	125
26-Apr	22:18:59	U	127
26-Apr	22:57:15	E	125
26-Apr	23:30:30	U	74
26-Apr	23:38:07	D	125
26-Apr	23:55:41	E	125

27-Apr	0:17:34	U	110
27-Apr	0:27:32	U	64
27-Apr	2:04:02	U	127
27-Apr	3:31:33	U	122
27-Apr	7:07:12	U	67
27-Apr	11:04:51	E	43
27-Apr	19:37:16	U	56
27-Apr	20:42:07	U	74
27-Apr	21:27:15	E	120
27-Apr	21:53:04	D	127
28-Apr	4:04:02	U	77
28-Apr	6:24:48	U	67
28-Apr	6:24:50	U	73
28-Apr	10:43:59	U	53
28-Apr	13:56:08	U	50
28-Apr	14:01:34	U	59
28-Apr	14:06:03	D	56
28-Apr	14:21:55	U	57
28-Apr	14:26:21	U	55
28-Apr	14:36:19	U	49
28-Apr	16:11:04	U	79
28-Apr	16:29:29	U	59
28-Apr	20:55:35	E	33
28-Apr	23:21:40	U	125
29-Apr	0:05:57	U	89
29-Apr	0:35:26	U	127
29-Apr	0:38:32	E	31
29-Apr	7:46:35	D	70
29-Apr	8:20:45	U	60
29-Apr	8:42:18	U	62
29-Apr	19:56:28	D	125
29-Apr	20:06:21	D	28
29-Apr	20:15:12	E	29
29-Apr	23:35:28	E	33
30-Apr	0:57:52	D	26
30-Apr	6:22:57	U	71
30-Apr	6:38:18	U	127
30-Apr	6:52:09	U	50
30-Apr	8:27:54	U	49
30-Apr	16:22:09	D	55
01-May	1:25:55	D	35
01-May	1:36:04	E	125
01-May	2:17:58	U	127

01-May	2:20:39	U	59
01-May	3:25:09	E	118
01-May	3:49:57	U	57
01-May	3:50:19	E	66
01-May	4:09:14	E	125
01-May	5:34:36	U	51
01-May	5:39:10	D	125
01-May	5:50:35	D	99
01-May	11:55:32	U	58
01-May	12:10:11	U	53
01-May	12:12:58	E	104
01-May	15:25:26	U	57
01-May	23:17:58	U	98
02-May	2:06:15	D	76
02-May	2:15:49	D	58
02-May	2:40:20	E	34
02-May	2:47:41	D	31
02-May	9:56:20	U	55
02-May	22:35:06	D	32
03-May	0:12:50	U	127
03-May	0:15:42	D	127
03-May	6:41:23	E	125
03-May	11:30:26	U	48
03-May	14:49:40	U	51
03-May	17:51:50	U	91
03-May	19:55:37	U	86
04-May	15:47:00	U	42
04-May	19:17:00	U	62
06-May	15:09:16	U	81
06-May	15:10:38	D	64
06-May	22:03:47	U	125
06-May	22:50:23	D	35
07-May	23:56:36	E	28
08-May	0:25:43	E	125
08-May	1:02:13	U	115
08-May	1:05:40	D	38
08-May	1:06:09	D	67
08-May	9:14:42	U	52
09-May	1:23:13	U	93
09-May	2:00:10	U	127
09-May	2:00:18	D	87
09-May	15:39:15	U	48
09-May	16:05:05	U	60

09-May	19:35:27	U	63
09-May	22:40:20	E	29
10-May	0:24:16	D	37
10-May	1:33:17	E	125
10-May	1:41:14	E	93
10-May	5:11:41	U	127
10-May	16:48:41	U	57
10-May	22:10:19	E	31
11-May	2:44:31	D	35
11-May	11:10:11	U	58
11-May	14:19:31	U	49
11-May	15:13:23	U	63
11-May	22:52:17	E	14
12-May	9:59:33	U	61
12-May	14:07:43	U	60
12-May	16:05:48	U	29
12-May	16:41:11	U	61
12-May	17:32:23	U	55
13-May	0:54:42	U	61
15-May	0:44:03	U	69
15-May	3:41:57	E	127
16-May	0:06:56	U	51
16-May	11:08:12	U	64
16-May	11:48:32	U	61
17-May	1:04:08	U	121
17-May	4:44:58	U	127
17-May	5:49:54	U	62
17-May	16:31:51	D	80
18-May	1:35:54	E	32
18-May	2:44:51	E	27
18-May	2:46:34	D	85
19-May	19:04:32	U	35
19-May	22:07:13	E	40
20-May	1:58:58	D	30
20-May	3:38:40	E	125
20-May	4:42:58	D	91
20-May	11:26:51	D	76
21-May	0:04:57	D	27
24-May	0:11:39	D	81
24-May	5:20:49	D	49
24-May	15:10:12	D	127
25-May	8:51:03	D	65