



## Memorandum

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Date: October 9, 2009

To: APWRA Scientific Review Committee

cc: Sandra Rivera

From: Jesse Schwartz and Doug Leslie

Subject: **Baseline and current study comparisons using APWRA strings and surveys**

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The monitoring team is tasked with supporting the Scientific Review Committee (SRC) and others in assessing the status of and changes in bird fatalities at the Altamont Pass Wind Resource Area (APWRA). An overarching question is whether actions taken by the wind turbine owners and operators (i.e., decommissioning of hazardous turbines, seasonal shutdowns, and repowering) have reduced fatality rates in comparison to baseline rates. The baseline rates have been defined as the rates estimated from data collected during the period of October 1998 through September 2005. These rates are compared to rates estimated from the current study, defined as the period of January 2005 through October 2009. Because information from September and October 2009 have not collected /entered, this memo summarizes information collected through August 2009.

A fundamental problem in making this comparison is that the distribution of the sampling effort in both time and space, the intensity of the sampling effort, and the allocation of search effort are quite variable between the two periods. For example, some regions monitored during the baseline period are no longer monitored; similarly, areas that were not monitored during the baseline study are regularly monitored as part of the current study. Moreover, some of the baseline monitoring was temporally sporadic, due in part to an effort to complete at least some sampling from as many parts of the APWRA as possible.

The monitoring team has summarized the string and search information to characterize the variation in sampling effort and intensity and to evaluate the quantity (number of searches per string) and quality (average search interval) of the searches from which fatality rates can be estimated. A complete appendix describing the search interval, number of searches, and other relevant information for each individual string is being prepared for inclusion in the pending 3-year monitoring report. The purpose of this memo is to summarize those data, to make some general recommendations regarding the use of different strings for addressing the question of evaluating whether a 50% reduction in avian mortality between the baseline period and the current study has been achieved, and to respond to questions being posed by the SRC and others.

Across the entire search record, the search interval (days between searches) is highly variable. Figure 1 shows the distribution of 16,079 search intervals for searches conducted (A) during the baseline, (B) during the current study, and (C) at the Diablo Winds set of turbines, which were repowered in 2004. Search intervals longer than 180 days were categorized as *first searches*, and therefore excluded from the search interval data set.

The baseline and current study search intervals differ in their means and distributions. This is due in part to decreased search intervals in the current study at strings that were also monitored in the baseline period, but it is also an artifact of sporadic and short study periods at some strings during the baseline period.

Sampling intensity (i.e., the total number of searches) has increased steadily over the past 11 years and was significantly greater during the current study than during the baseline period (Figure 2). In addition, the number of strings being searched has generally increased over time, with a peak in 2002 (Figure 3). However, the large number of strings monitored during 2002–2005 generally reflects a relatively small number of searches conducted at a large number of strings. Searches of this type were in most cases of short duration (i.e., were not representative samples of seasonal variation in fatality rates); indeed, the number of searches per string was very low during this period. In general, the number of searches conducted per string during the baseline study was low in comparison to the current study (Figure 4).

Strings that were searched only a handful of times in a given year also have a tendency to be characterized by long search intervals. Accordingly, data from these strings *are not representative* of an annual fatality rate at the APWRA. In some cases, these data may be useful in estimating trends in fatalities per search, geographic patterns, or the effects of turbine conditions.

Given the variation in allocation of sampling effort, sampling intensity, and the temporal and spatial distribution of sampling described above, strings were classified into the following categories.

- Data rich—long time series and consistent monitoring
- Data moderate—consistent monitoring during a short time series
- Data poor—short time series and inconsistent monitoring

The following criteria were used to derive the categories for all strings on record based on their search history.

If the number of years monitored is greater than or equal to 3 AND the average searches per year is greater than 7.5, the string is categorized as data rich.

If the number of years monitored is greater than or equal to 2 AND the average searches per year is greater than or equal to 6, the string is categorized as data moderate.

If the number of years monitored is less than 2 OR the average searches per year is less than 6, the string is categorized as data poor.

The results of the classification are detailed in Table 1 and summarized in Figure 5.

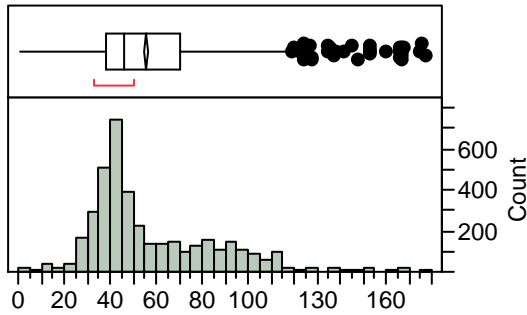
Based on our evaluation of string characteristics and information gained from conversations at the previous SRC meeting, we strongly recommend the following approach to evaluating the 50% reduction question.

- Evaluate comparisons to the baseline period in the context of the data quality of different strings.
- Evaluate data rich, data moderate, and data poor strings separately before examining the preponderance of evidence regarding the 50% reduction question.
- Consider uncertainty regarding conclusions surrounding this analysis separately for each of these string types.

For questions regarding the derivation of these summaries, the reader is referred to the draft appendix (to be distributed shortly) and to the online database where the same information is tabularized.

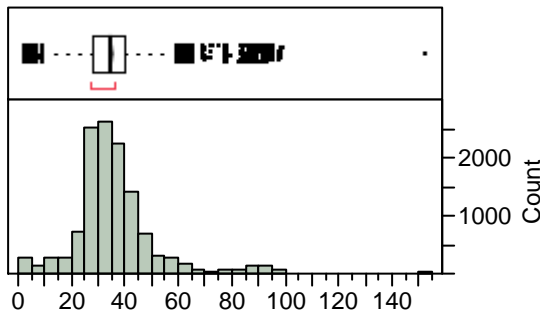
**Figure 1. Distribution of Search Intervals**

**A. Baseline**



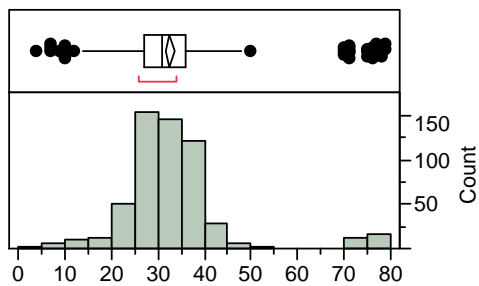
Mean	55.284937
Std Dev	25.10009
Std Err Mean	0.4138752
Upper 95% Mean	56.096385
Lower 95% Mean	54.47349
N	3678

**B. Current Study**



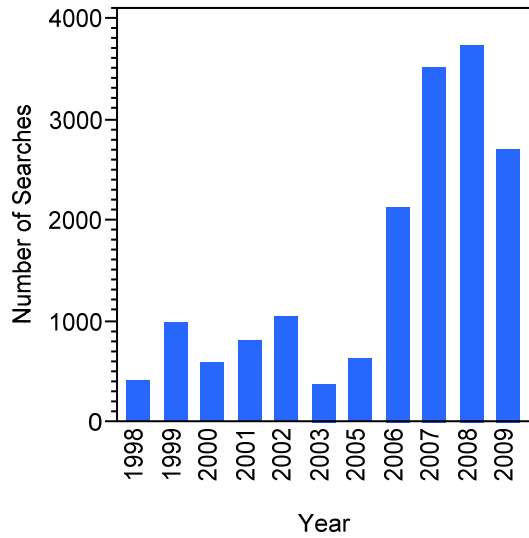
Mean	34.680894
Std Dev	13.609159
Std Err Mean	0.1249915
Upper 95% Mean	34.925898
Lower 95% Mean	34.43589
N	11855

**C. Diablo Winds**

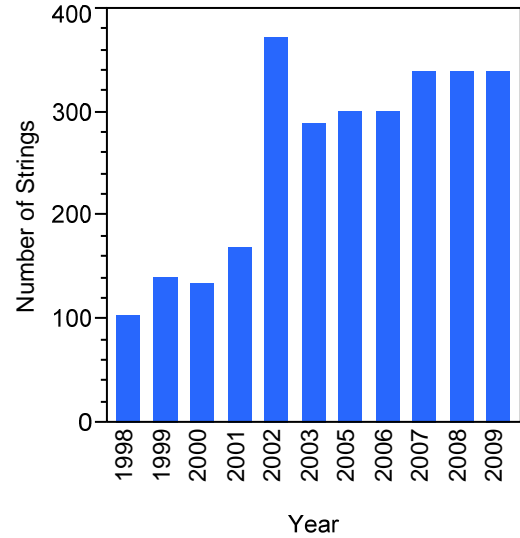


Mean	32.564103
Std Dev	11.432471
Std Err Mean	0.4892646
Upper 95% Mean	33.525178
Lower 95% Mean	31.603027
N	546

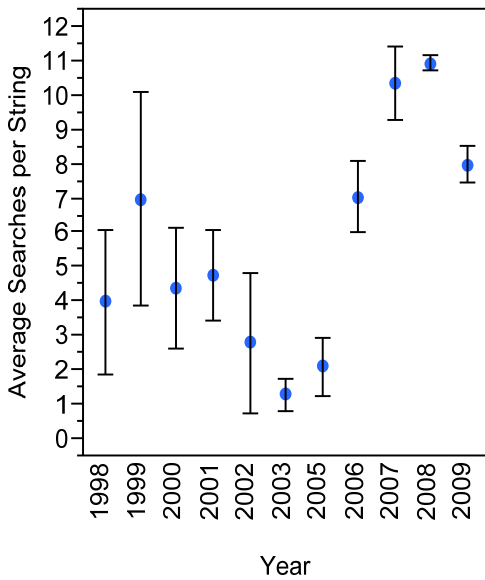
**Figure 2. Number of Searches per Year**



**Figure 3. Number of Strings Monitored per Year**

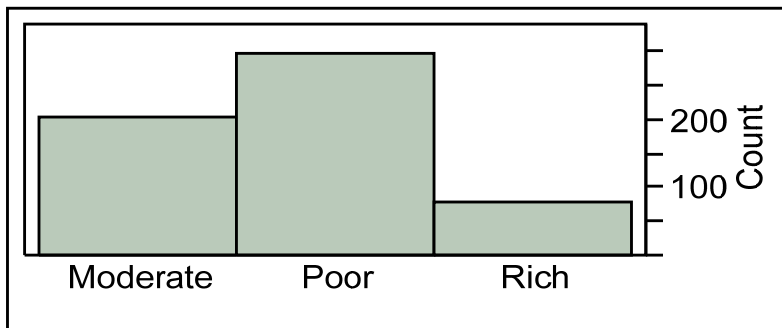


**Figure 4. Average Searches per String per Year**



Each error bar is constructed using 1 standard deviation from the mean.

**Figure 5. Data Richness of Strings That Have Been Monitored in the Altamont Pass Wind Resource Area**



**Frequencies**

Level	Count	Prob
Moderate	200	0.35273
Poor	291	0.51323
Rich	76	0.13404
Total	567	1.00000

N Missing

0

3 Levels

String	Number of Years Monitored	Total Number of Searches	Grand Average Search Interval	Average Searches per Year	Data Richness
206	2	2	105.0	1.0	Poor
207	2	2	105.0	1.0	Poor
208	2	2	105.0	1.0	Poor
209	2	2	105.0	1.0	Poor
210	2	2	105.0	1.0	Poor
211	2	2	105.0	1.0	Poor
212	2	2	105.0	1.0	Poor
214	2	2	106.0	1.0	Poor
215	2	2	112.0	1.0	Poor
216	2	2	111.0	1.0	Poor
217	2	2	111.0	1.0	Poor
218	2	2	111.0	1.0	Poor
219	2	2	111.0	1.0	Poor
220	2	2	111.0	1.0	Poor
221	2	2	111.0	1.0	Poor
222	2	2	111.0	1.0	Poor
223	2	2	111.0	1.0	Poor
235.1	2	2	112.0	1.0	Poor
236	2	2	113.0	1.0	Poor
237	2	2	112.0	1.0	Poor
238	2	2	111.0	1.0	Poor
239	2	2	111.0	1.0	Poor
240	2	2	112.0	1.0	Poor
241	2	2	112.0	1.0	Poor
242	2	2	108.0	1.0	Poor
243	2	2	112.0	1.0	Poor
244	2	2	108.0	1.0	Poor
245	2	2	107.0	1.0	Poor
246	2	2	107.0	1.0	Poor
248	2	2	105.0	1.0	Poor
249	2	2	104.0	1.0	Poor
252	2	2	105.0	1.0	Poor
254	2	2	104.0	1.0	Poor
255	2	2	105.0	1.0	Poor
256	2	2	103.0	1.0	Poor
257	2	2	103.0	1.0	Poor
258	2	2	103.0	1.0	Poor
259	2	2	103.0	1.0	Poor
260	2	2	103.0	1.0	Poor
261	2	2	103.0	1.0	Poor
262	2	2	103.0	1.0	Poor
263	2	2	102.0	1.0	Poor
264	2	2	102.0	1.0	Poor
265	2	2	112.0	1.0	Poor
266	2	2	112.0	1.0	Poor

String	Number of Years Monitored	Total Number of Searches	Grand Average Search Interval	Average Searches per Year	Data Richness
268	2	2	111.0	1.0	Poor
269	2	2	112.0	1.0	Poor
270	2	2	112.0	1.0	Poor
271	2	2	111.0	1.0	Poor
273	2	2	112.0	1.0	Poor
276	2	2	93.0	1.0	Poor
278	2	2	97.0	1.0	Poor
280	2	2	98.0	1.0	Poor
281	2	2	98.0	1.0	Poor
288	2	2	100.0	1.0	Poor
289	2	2	99.0	1.0	Poor
290	2	2	100.0	1.0	Poor
291	2	2	97.0	1.0	Poor
292	2	2	100.0	1.0	Poor
293	2	2	97.0	1.0	Poor
294	2	2	97.0	1.0	Poor
295	2	2	97.0	1.0	Poor
296	2	2	100.0	1.0	Poor
297	2	2	92.0	1.0	Poor
298	2	2	97.0	1.0	Poor
299	2	2	97.0	1.0	Poor
300	2	2	97.0	1.0	Poor
301	2	2	97.0	1.0	Poor
302	2	2	111.0	1.0	Poor
303	2	2	112.0	1.0	Poor
304	2	2	114.0	1.0	Poor
305	2	2	110.0	1.0	Poor
306	2	2	110.0	1.0	Poor
307	2	2	103.0	1.0	Poor
310	2	2	97.0	1.0	Poor
311	2	2	99.0	1.0	Poor
313	2	2	99.0	1.0	Poor
314	2	2	99.0	1.0	Poor
315	2	2	99.0	1.0	Poor
316	2	2	99.0	1.0	Poor
319	2	2	98.0	1.0	Poor
320	2	2	99.0	1.0	Poor
321	2	2	97.0	1.0	Poor
322	2	2	97.0	1.0	Poor
323	2	2	97.0	1.0	Poor
327	2	2	112.0	1.0	Poor
328	2	2	112.0	1.0	Poor
329	2	2	112.0	1.0	Poor
330	2	2	113.0	1.0	Poor
331	2	2	111.0	1.0	Poor

String	Number of Years Monitored	Total Number of Searches	Grand Average Search Interval	Average Searches per Year	Data Richness
332	2	2	112.0	1.0	Poor
333	2	2	100.0	1.0	Poor
336	2	2	113.0	1.0	Poor
337	2	2	113.0	1.0	Poor
338	2	2	111.0	1.0	Poor
339	2	2	110.0	1.0	Poor
340	2	2	110.0	1.0	Poor
341	2	2	99.0	1.0	Poor
343	2	2	104.0	1.0	Poor
346	2	2	102.0	1.0	Poor
351	2	2	112.0	1.0	Poor
352	2	2	113.0	1.0	Poor
353	2	2	113.0	1.0	Poor
354	2	2	102.0	1.0	Poor
355	2	2	102.0	1.0	Poor
356	2	2	102.0	1.0	Poor
357	2	2	102.0	1.0	Poor
358	2	2	99.0	1.0	Poor
359	2	2	99.0	1.0	Poor
388	2	2	94.0	1.0	Poor
401	2	2	103.0	1.0	Poor
402	2	2	103.0	1.0	Poor
406	2	2	103.0	1.0	Poor
409	2	2	99.0	1.0	Poor
410	2	2	99.0	1.0	Poor
411	2	2	99.0	1.0	Poor
683.1	2	2	97.0	1.0	Poor
684	2	2	98.0	1.0	Poor
230.2	4	6	64.5	1.5	Poor
232	4	6	65.8	1.5	Poor
233.1	4	6	65.5	1.5	Poor
233.2	4	6	65.5	1.5	Poor
234	4	6	65.2	1.5	Poor
235.2	4	6	64.2	1.5	Poor
247	1	2	72.0	2.0	Poor
286	1	2	79.0	2.0	Poor
367	1	2	80.0	2.0	Poor
382	1	2	83.0	2.0	Poor
383	1	2	83.0	2.0	Poor
384	1	2	83.0	2.0	Poor
385	1	2	83.0	2.0	Poor
386	1	2	83.0	2.0	Poor
391	1	2	89.0	2.0	Poor
392	1	2	88.0	2.0	Poor
393	1	2	88.0	2.0	Poor

String	Number of Years Monitored	Total Number of Searches	Grand Average Search Interval	Average Searches per Year	Data Richness
396	1	2	89.0	2.0	Poor
416	1	2	79.0	2.0	Poor
417	1	2	85.0	2.0	Poor
418	1	2	85.0	2.0	Poor
419	1	2	85.0	2.0	Poor
420	1	2	85.0	2.0	Poor
497.2	2	4	40.3	2.0	Poor
118	2	6	61.0	3.0	Poor
37	3	10	38.6	3.3	Poor
105	3	10	38.3	3.3	Poor
149	3	10	64.9	3.3	Poor
114	4	14	55.9	3.5	Poor
8	3	11	71.7	3.7	Poor
17	3	11	38.3	3.7	Poor
117	4	15	54.6	3.8	Poor
120	4	15	53.9	3.8	Poor
121	4	15	54.0	3.8	Poor
122	4	15	51.9	3.8	Poor
124	4	15	58.7	3.8	Poor
125	4	15	52.2	3.8	Poor
126	4	15	56.1	3.8	Poor
130	4	15	48.6	3.8	Poor
133	4	15	53.9	3.8	Poor
135	4	15	51.5	3.8	Poor
685	4	15	52.3	3.8	Poor
113	4	16	56.3	4.0	Poor
115	4	16	51.6	4.0	Poor
136	4	16	49.0	4.0	Poor
137	4	16	49.1	4.0	Poor
141	4	16	52.2	4.0	Poor
143	4	16	52.2	4.0	Poor
140	4	17	48.1	4.3	Poor
142	4	17	49.9	4.3	Poor
21	3	13	47.3	4.3	Poor
150	3	13	60.1	4.3	Poor
27	5	22	55.1	4.4	Poor
2	2	9	36.5	4.5	Poor
9	2	9	38.1	4.5	Poor
15	2	9	40.1	4.5	Poor
103	2	9	38.3	4.5	Poor
104	2	9	37.9	4.5	Poor
106	2	9	38.3	4.5	Poor
88	5	23	70.8	4.6	Poor
14	3	14	70.8	4.7	Poor
22	3	14	84.7	4.7	Poor

String	Number of Years Monitored	Total Number of Searches	Grand Average Search Interval	Average Searches per Year	Data Richness
24	3	14	37.0	4.7	Poor
1	2	10	41.6	5.0	Poor
12	2	10	42.6	5.0	Poor
16	2	10	40.5	5.0	Poor
18	3	15	39.8	5.0	Poor
36	5	25	61.6	5.0	Poor
195	2	10	70.3	5.0	Poor
196	2	10	70.2	5.0	Poor
197	2	10	67.8	5.0	Poor
198	2	10	67.8	5.0	Poor
28	5	26	50.3	5.2	Poor
38	5	26	49.1	5.2	Poor
108	5	26	55.9	5.2	Poor
144	7	37	42.1	5.3	Poor
89	5	27	55.3	5.4	Poor
101	5	27	53.9	5.4	Poor
6	2	11	52.7	5.5	Poor
194	2	11	57.8	5.5	Poor
127	9	50	41.8	5.6	Poor
35	5	28	55.0	5.6	Poor
56	5	28	55.1	5.6	Poor
57	5	28	58.9	5.6	Poor
78	5	28	52.5	5.6	Poor
102	5	28	57.8	5.6	Poor
3	3	17	52.1	5.7	Poor
19	3	17	48.8	5.7	Poor
74	10	57	48.1	5.7	Poor
224	7	40	48.9	5.7	Poor
225	7	40	48.9	5.7	Poor
226	7	40	48.9	5.7	Poor
227	7	40	48.9	5.7	Poor
228	7	40	48.9	5.7	Poor
229	7	40	48.7	5.7	Poor
230.1	7	40	48.7	5.7	Poor
231	7	40	49.5	5.7	Poor
250	7	40	48.0	5.7	Poor
283	7	40	47.7	5.7	Poor
284	7	40	47.7	5.7	Poor
344	7	40	49.6	5.7	Poor
345	7	40	49.4	5.7	Poor
363	7	40	49.8	5.7	Poor
364	7	40	49.8	5.7	Poor
399.99	7	40	49.6	5.7	Poor
463	7	40	48.7	5.7	Poor
112	9	52	43.9	5.8	Poor

String	Number of Years Monitored	Total Number of Searches	Grand Average Search Interval	Average Searches per Year	Data Richness
30	5	29	48.9	5.8	Poor
34	5	29	50.5	5.8	Poor
48	5	29	56.5	5.8	Poor
285	5	29	46.9	5.8	Poor
287.1	5	29	49.8	5.8	Poor
287.2	5	29	49.8	5.8	Poor
308	5	29	48.3	5.8	Poor
309	5	29	48.3	5.8	Poor
312.1	5	29	48.8	5.8	Poor
312.99	5	29	48.8	5.8	Poor
374.99	5	29	49.9	5.8	Poor
387	5	29	49.8	5.8	Poor
389.99	5	29	49.8	5.8	Poor
405	5	29	48.4	5.8	Poor
407	5	29	48.4	5.8	Poor
408	5	29	49.7	5.8	Poor
675	5	29	48.8	5.8	Poor
251	7	41	48.3	5.9	Poor
253	7	41	48.1	5.9	Poor
267	7	41	49.6	5.9	Poor
272	7	41	49.5	5.9	Poor
274	7	41	44.1	5.9	Poor
275	7	41	44.1	5.9	Poor
277	7	41	44.7	5.9	Poor
279	7	41	42.2	5.9	Poor
282	7	41	44.9	5.9	Poor
317	7	41	47.0	5.9	Poor
324	7	41	49.0	5.9	Poor
325	7	41	49.2	5.9	Poor
326	7	41	49.2	5.9	Poor
334	7	41	49.0	5.9	Poor
335	7	41	49.0	5.9	Poor
342	7	41	47.4	5.9	Poor
347	7	41	47.8	5.9	Poor
348.99	7	41	49.4	5.9	Poor
350	7	41	49.4	5.9	Poor
360	7	41	49.4	5.9	Poor
361	7	41	49.4	5.9	Poor
362	7	41	46.9	5.9	Poor
369	7	41	44.2	5.9	Poor
370	7	41	44.2	5.9	Poor
371	7	41	44.2	5.9	Poor
372.99	7	41	44.2	5.9	Poor
377.99	7	41	46.9	5.9	Poor
397.99	7	41	45.9	5.9	Poor

String	Number of Years Monitored	Total Number of Searches	Grand Average Search Interval	Average Searches per Year	Data Richness
403	7	41	46.5	5.9	Poor
404	7	41	46.7	5.9	Poor
423	7	41	46.7	5.9	Poor
426	7	41	46.4	5.9	Poor
427	7	41	46.4	5.9	Poor
428	7	41	47.9	5.9	Poor
436	7	41	46.6	5.9	Poor
438	7	41	43.8	5.9	Poor
439	7	41	46.6	5.9	Poor
440	7	41	43.7	5.9	Poor
441	7	41	43.7	5.9	Poor
444	7	41	46.2	5.9	Poor
445	7	41	46.2	5.9	Poor
446	7	41	46.2	5.9	Poor
456	7	41	46.2	5.9	Poor
457	7	41	46.2	5.9	Poor
482	7	41	47.1	5.9	Poor
483	7	41	47.1	5.9	Poor
484	7	41	47.1	5.9	Poor
502	7	41	42.9	5.9	Poor
680	7	41	49.4	5.9	Poor
4	3	18	44.6	6.0	Moderate
7	3	18	42.9	6.0	Moderate
10	3	18	42.9	6.0	Moderate
13	3	18	44.2	6.0	Moderate
23	3	18	43.5	6.0	Moderate
60	5	30	53.0	6.0	Moderate
110.99	9	54	46.5	6.0	Moderate
111	9	54	43.4	6.0	Moderate
116	9	54	44.2	6.0	Moderate
119	9	54	43.6	6.0	Moderate
128	9	54	38.8	6.0	Moderate
131	7	42	42.6	6.0	Moderate
132	9	54	42.8	6.0	Moderate
134	9	54	42.9	6.0	Moderate
148	9	54	42.0	6.0	Moderate
153	8	48	50.0	6.0	Moderate
154	8	48	50.0	6.0	Moderate
155	8	48	50.0	6.0	Moderate
139	9	55	41.7	6.1	Moderate
147	9	55	41.0	6.1	Moderate
152	8	49	48.5	6.1	Moderate
156	8	49	48.2	6.1	Moderate
145	7	43	43.0	6.1	Moderate
146	7	43	42.1	6.1	Moderate

String	Number of Years Monitored	Total Number of Searches	Grand Average Search Interval	Average Searches per Year	Data Richness
33	5	31	53.7	6.2	Moderate
50	10	62	55.6	6.2	Moderate
99	10	62	43.2	6.2	Moderate
462	5	31	50.0	6.2	Moderate
138	9	56	41.4	6.2	Moderate
151	8	50	43.1	6.3	Moderate
67	10	63	46.6	6.3	Moderate
414	6	38	41.7	6.3	Moderate
26	10	64	44.0	6.4	Moderate
49	5	32	51.8	6.4	Moderate
71	10	64	45.9	6.4	Moderate
76	5	32	49.3	6.4	Moderate
79	5	32	50.5	6.4	Moderate
80	5	32	48.4	6.4	Moderate
81	5	32	50.5	6.4	Moderate
92	10	64	53.6	6.4	Moderate
5	2	13	44.1	6.5	Moderate
40	10	65	47.0	6.5	Moderate
61	8	52	51.3	6.5	Moderate
87	10	65	45.0	6.5	Moderate
107	2	13	38.8	6.5	Moderate
42	10	66	46.4	6.6	Moderate
46	10	66	46.4	6.6	Moderate
58	5	33	47.7	6.6	Moderate
59	5	33	49.2	6.6	Moderate
64	10	66	42.7	6.6	Moderate
65	10	66	42.8	6.6	Moderate
72	10	66	45.2	6.6	Moderate
73	10	66	44.0	6.6	Moderate
75	10	66	43.3	6.6	Moderate
77	5	33	50.1	6.6	Moderate
82	10	66	45.2	6.6	Moderate
84	10	66	44.4	6.6	Moderate
85	10	66	44.6	6.6	Moderate
86	10	66	44.6	6.6	Moderate
91	10	66	44.6	6.6	Moderate
213	6	40	43.2	6.7	Moderate
451	6	40	41.7	6.7	Moderate
452	6	40	41.1	6.7	Moderate
453	6	40	42.9	6.7	Moderate
454	6	40	41.3	6.7	Moderate
460.2	6	40	44.5	6.7	Moderate
464.1	6	40	45.5	6.7	Moderate
464.2	6	40	45.5	6.7	Moderate
464.3	6	40	45.5	6.7	Moderate

String	Number of Years Monitored	Total Number of Searches	Grand Average Search Interval	Average Searches per Year	Data Richness
465	6	40	44.5	6.7	Moderate
466	6	40	45.5	6.7	Moderate
467.1	6	40	45.7	6.7	Moderate
467.2	6	40	45.7	6.7	Moderate
468.1	6	40	44.6	6.7	Moderate
468.2	6	40	44.6	6.7	Moderate
469	6	40	44.6	6.7	Moderate
470.1	6	40	45.7	6.7	Moderate
470.2	6	40	45.7	6.7	Moderate
471	6	40	45.5	6.7	Moderate
472.1	6	40	45.7	6.7	Moderate
472.2	6	40	45.6	6.7	Moderate
485	6	40	45.7	6.7	Moderate
486	6	40	45.5	6.7	Moderate
41	10	67	45.0	6.7	Moderate
47	10	67	46.5	6.7	Moderate
53	10	67	44.9	6.7	Moderate
54	10	67	43.2	6.7	Moderate
93	10	67	50.3	6.7	Moderate
94	10	67	45.2	6.7	Moderate
62	8	54	46.2	6.8	Moderate
25	10	68	41.2	6.8	Moderate
39	10	68	49.4	6.8	Moderate
51	10	68	47.0	6.8	Moderate
55	10	68	46.8	6.8	Moderate
83	10	68	46.7	6.8	Moderate
90	10	68	43.0	6.8	Moderate
95.1	10	68	41.8	6.8	Moderate
95.2	10	68	41.8	6.8	Moderate
95.3	10	68	41.8	6.8	Moderate
98	10	68	41.0	6.8	Moderate
100	10	68	41.2	6.8	Moderate
365	6	41	42.7	6.8	Moderate
368	6	41	42.9	6.8	Moderate
394	6	41	41.9	6.8	Moderate
395	6	41	42.2	6.8	Moderate
412	6	41	41.0	6.8	Moderate
413	6	41	41.0	6.8	Moderate
421	6	41	43.4	6.8	Moderate
422	6	41	43.4	6.8	Moderate
424	6	41	43.4	6.8	Moderate
429	6	41	43.9	6.8	Moderate
430	6	41	42.9	6.8	Moderate
431	6	41	43.9	6.8	Moderate
432	6	41	43.0	6.8	Moderate

String	Number of Years Monitored	Total Number of Searches	Grand Average Search Interval	Average Searches per Year	Data Richness
433	6	41	43.9	6.8	Moderate
434	6	41	43.7	6.8	Moderate
435	6	41	43.6	6.8	Moderate
437	6	41	43.6	6.8	Moderate
442	6	41	41.6	6.8	Moderate
443	6	41	42.2	6.8	Moderate
447	6	41	42.2	6.8	Moderate
448	6	41	42.2	6.8	Moderate
449	6	41	40.6	6.8	Moderate
450	6	41	41.2	6.8	Moderate
455	6	41	42.2	6.8	Moderate
458.1	6	41	42.2	6.8	Moderate
458.2	6	41	42.2	6.8	Moderate
459	6	41	42.2	6.8	Moderate
461	6	41	42.7	6.8	Moderate
473	6	41	42.7	6.8	Moderate
474	6	41	42.7	6.8	Moderate
475	6	41	42.7	6.8	Moderate
476	6	41	42.9	6.8	Moderate
477	6	41	42.9	6.8	Moderate
478	6	41	42.7	6.8	Moderate
479	6	41	42.9	6.8	Moderate
480	6	41	42.9	6.8	Moderate
481	6	41	42.9	6.8	Moderate
681	6	41	43.9	6.8	Moderate
178.1	7	48	46.7	6.9	Moderate
178.2	7	48	46.7	6.9	Moderate
179	7	48	46.4	6.9	Moderate
183.1	7	48	46.6	6.9	Moderate
183.2	7	48	46.5	6.9	Moderate
184	7	48	46.2	6.9	Moderate
200	7	48	47.2	6.9	Moderate
201	7	48	47.9	6.9	Moderate
202	7	48	47.9	6.9	Moderate
203	7	48	47.2	6.9	Moderate
204	7	48	47.2	6.9	Moderate
45	10	69	46.6	6.9	Moderate
68	10	69	45.6	6.9	Moderate
11	2	14	42.6	7.0	Moderate
70	10	70	45.2	7.0	Moderate
157	7	49	46.7	7.0	Moderate
158	7	49	46.7	7.0	Moderate
159	7	49	43.9	7.0	Moderate
160	7	49	44.2	7.0	Moderate
161	7	49	44.1	7.0	Moderate

String	Number of Years Monitored	Total Number of Searches	Grand Average Search Interval	Average Searches per Year	Data Richness
162	7	49	43.8	7.0	Moderate
164	7	49	46.2	7.0	Moderate
165	7	49	47.1	7.0	Moderate
168	7	49	46.3	7.0	Moderate
169	7	49	47.2	7.0	Moderate
170	7	49	47.1	7.0	Moderate
171	7	49	46.9	7.0	Moderate
172	7	49	46.9	7.0	Moderate
174	7	49	46.7	7.0	Moderate
175	7	49	46.7	7.0	Moderate
176	7	49	46.7	7.0	Moderate
180.1	7	49	44.5	7.0	Moderate
180.2	7	49	44.5	7.0	Moderate
182.1	7	49	44.6	7.0	Moderate
182.2	7	49	44.6	7.0	Moderate
187	7	49	43.7	7.0	Moderate
188	7	49	43.7	7.0	Moderate
189	7	49	43.7	7.0	Moderate
190	7	49	43.7	7.0	Moderate
191	7	49	43.7	7.0	Moderate
192	7	49	43.7	7.0	Moderate
199	7	49	46.7	7.0	Moderate
205	7	49	46.7	7.0	Moderate
43	10	71	45.6	7.1	Moderate
44	10	71	45.5	7.1	Moderate
52	10	71	44.1	7.1	Moderate
66	10	71	43.4	7.1	Moderate
69	10	71	44.4	7.1	Moderate
181.1	7	50	43.7	7.1	Moderate
181.2	7	50	43.7	7.1	Moderate
185	7	50	42.5	7.1	Moderate
63	10	72	42.3	7.2	Moderate
460.1	5	36	45.2	7.2	Moderate
366	4	29	45.5	7.3	Moderate
376	4	29	44.4	7.3	Moderate
379.99	4	29	44.4	7.3	Moderate
381	4	29	44.4	7.3	Moderate
415	4	29	43.9	7.3	Moderate
186	7	51	41.7	7.3	Moderate
612	5	37	36.1	7.4	Moderate
20	2	15	41.8	7.5	Moderate
496	5	38	36.0	7.6	Rich
505	5	38	36.6	7.6	Rich
506	5	38	36.6	7.6	Rich
507	5	38	36.6	7.6	Rich

String	Number of Years Monitored	Total Number of Searches	Grand Average Search Interval	Average Searches per Year	Data Richness
566	5	38	40.4	7.6	Rich
567	5	38	40.4	7.6	Rich
570	5	38	40.6	7.6	Rich
617	5	38	36.1	7.6	Rich
667	5	38	36.1	7.6	Rich
425	5	39	35.0	7.8	Rich
501	5	39	32.1	7.8	Rich
515	5	39	34.3	7.8	Rich
517	5	39	34.3	7.8	Rich
573	5	39	33.2	7.8	Rich
574	5	39	33.2	7.8	Rich
575	5	39	33.2	7.8	Rich
596	5	39	32.8	7.8	Rich
597	5	39	32.7	7.8	Rich
598	5	39	32.6	7.8	Rich
608	5	39	35.0	7.8	Rich
609	5	39	35.0	7.8	Rich
610	5	39	35.0	7.8	Rich
611	5	39	35.0	7.8	Rich
613	5	39	35.3	7.8	Rich
614	5	39	35.5	7.8	Rich
615	5	39	35.4	7.8	Rich
616	5	39	35.3	7.8	Rich
625	5	39	35.4	7.8	Rich
634	5	39	36.1	7.8	Rich
652	5	39	35.3	7.8	Rich
653	5	39	35.3	7.8	Rich
654	5	39	35.3	7.8	Rich
658	5	39	35.3	7.8	Rich
659	5	39	35.3	7.8	Rich
660	5	39	35.3	7.8	Rich
665	5	39	33.2	7.8	Rich
670	5	39	30.6	7.8	Rich
671	5	39	30.5	7.8	Rich
672	5	39	30.6	7.8	Rich
674	5	39	34.8	7.8	Rich
682	5	39	35.9	7.8	Rich
683.2	5	39	32.1	7.8	Rich
497.1	3	26	33.1	8.7	Rich
580	3	26	32.4	8.7	Rich
504	3	27	31.8	9.0	Rich
508	3	27	31.8	9.0	Rich
509	3	27	31.8	9.0	Rich
572	3	27	31.2	9.0	Rich
577	3	27	31.2	9.0	Rich

String	Number of Years Monitored	Total Number of Searches	Grand Average Search Interval	Average Searches per Year	Data Richness
578	3	27	31.2	9.0	Rich
581	3	27	31.2	9.0	Rich
582	3	27	31.4	9.0	Rich
583	3	27	31.2	9.0	Rich
588	3	27	31.5	9.0	Rich
618	3	27	31.7	9.0	Rich
619.99	3	27	31.7	9.0	Rich
628	3	27	31.7	9.0	Rich
629	3	27	31.7	9.0	Rich
630	3	27	31.2	9.0	Rich
642	3	27	31.3	9.0	Rich
643	3	27	31.1	9.0	Rich
647	3	27	31.2	9.0	Rich
648.99	3	27	31.2	9.0	Rich
1001	5	46	31.0	9.2	Rich
1002	5	46	31.0	9.2	Rich
1003	5	46	31.0	9.2	Rich
1004	5	46	31.0	9.2	Rich
1005	5	46	31.0	9.2	Rich
1006	5	46	31.6	9.2	Rich
1007	5	46	31.6	9.2	Rich
1008	5	46	31.6	9.2	Rich
1009	5	46	31.6	9.2	Rich
1010	5	46	31.6	9.2	Rich
1011	5	46	31.6	9.2	Rich
1012	5	46	31.6	9.2	Rich
1013	5	46	31.6	9.2	Rich