APPENDIX F

HYDROLOGY

HYDROLOGY APPENDIX

The purpose of this Hydrology Appendix is to document the model runs, assumptions made, and the data and analysis used by the U.S. Fish and Wildlife Service to make determinations set forth in the Upper Colorado River programmatic biological opinion.

BACKGROUND

The reach of the Colorado River between the diversion headgate of the Grand Valley Irrigation Company and the confluence of the Colorado River with the Gunnison River is known as the 15-Mile Reach. The 15-Mile Reach has been identified as important habitat for endangered fish. The Service and others involved in development of the Recovery Program have been investigating various proposals to maintain flows for the endangered fish in this habitat as part of their responsibility under the Endangered Species Act. Various alternatives for flow enhancement in this reach have been suggested by the technical working groups. This Hydrology Appendix documents the evaluation of some of those alternatives using a surface water modeling system (STATEMOD) for the Colorado River developed as a part of the State of Colorado's - Colorado River Decision Support System (CRDSS).

STATEMOD was developed in part to evaluate the effect of scenarios of future water use and reservoir operations on flows. STATEMOD for the mainstem of the Colorado River Basin was used by the staff of the Colorado Water Conservation Board in cooperation with Service staff to model and evaluate scenarios as described below for the biological opinion. The CWCB staff has provided the following documentation of the CRDSS modeling undertaken for the biological opinion (the documentation has been edited slightly for continuity with terms used in the biological opinion).

STATEMOD 15-Mile Reach Modeling Documentation

Introduction

STATEMOD was run on a monthly basis for the study period of 1975 to 1991 (water years - October 1 through September 30). The following scenarios were implemented.

- Base Case (defined in the biological opinion as baseline)
- C_1 scenario
- C_1 + 60,000 acre-feet future depletion
- C_1 + 60,000 acre-feet future depletion + RIPRAP items
- C_1 + 120,000 acre-feet future depletion
- C_1 + 120,000 acre-feet future depletion + RIPRAP items

These scenarios are described below.

Base Case

The STATEMOD Base Flow Module creates a set of "base stream flows" which have the impact of historic diversions, return flows, and reservoir storage, release, evaporation and seepage removed. The Service requested that base streamflows be prepared for two locations, (1) the Cameo gage, and (2) at the top of the 15-Mile Reach. The Service defines the base case streamflow at the top of the 15-Mile Reach as baseline flow for purposes of discussion in the biological opinion.

C_1 Scenario

The C_1 scenario includes all depletions as of September 30, 1995. The C_1 scenario is a modification of the C, or Calculated scenario (the C scenario is one of the standard STATEMOD data sets; it reflects historic gage conditions, with the main exception that the irrigation demands are calculated from average irrigation efficiencies for the study period, 1975 to 1991).

The C_1 scenario expands on the C scenario by taking the major diversions and operations in the basin, and backcasting their current (as of the end of water year 1995) level of demand throughout the study period. For example, Windy Gap started operating in water year 1985. With data from the Northern Colorado Water Conservancy District, CWCB has implemented a 1995 level of demand for Windy Gap in the model for 1975 to 1991. Other major diversions that have been backcasted are shown below.

Existing projects with backcasted demands (for their 1995 demand level) in C_1 scenario, with their minimum, maximum and average annual depletion (acre-feet) in the C_1 run (1975-91)

	Minimum	Maximum	Average
>Roberts Tunnel	8,594	127,570	59,154
>Moffat Tunnel	27,948	78,107	58,389
>Colorado Big-Thompson Project diversions through the Adams Tunnel	175,800	281,839	236,489
>Windy Gap diversions through the Adams Tunnel	2,498	32,568	18,779
>Homestake Project	6,439	51,997	29,538
>Independence Pass Tunnel	16,934	82,687	49,527

>Hoosier Pass Tunnel	7,712	14,560	10,345
>Boustead Tunnel/Fry-Ark	14,427	120,000	78,978

These projects divert water out of the Colorado River Basin and are modeled as 100% consumptive use.

Other Projects included in the C_1 run, with their average annual depletion (acre-feet) in the C_1 run (1975-91)

	Contract Amount	CRDSS Amount	Modeled
>Green Mountain Reservoir Contracts[1]	20,000	18,694	
>Ruedi Round I Contracts[2]	7,850	7,765	
>Ruedi Round II Contracts[3]	17,000	16,640	
>Wolford Mountain Reservoir Fraser Demands			0
>Wolford Mountain Reservoir Middle Park Demands		338	

Operations that were in place historically for a portion of the 1975-91 study period that were put in place in the C_1 run for the whole period

>Williams Fork Replacement for Dillon Reservoir out-of-priority Storage
>Green Mountain Reservoir to Government Highline
>Green Mountain Reservoir to Orchard Mesa Irrigation
>Green Mountain Reservoir to Orchard Mesa Pumping
>Green Mountain Reservoir to Vail municipal
>Hunter Creek Tunnel to Boustead

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[1]Depletions associated with the total 154,546 acre-foot volume of Green Mountain reservoir, including the power pool (which includes but is not limited to all of the 20,000 acre-foot contract pool and the Historic User's Pool), and the Colorado Big Thompson Project replacement pool are included in the programmatic biological opinion.

[2]Depletions associated with Ruedi Reservoir including but not limited to Ruedi I sales of 7,850 acre-feet are included in the programmatic biological.

[3]Depletions associated with Ruedi Reservoir including but not limited to Ruedi I I sales of 17,000 acre-feet of water as discussed in the Service biological opinion to Reclamation dated May 26, 1995, and as amended on January 6, 1999, and the Fryingpan Arkansas Project replacement pool as governed by the operating principles for Ruedi Reservoir by excluding 21,650 acre-feet from the marketable yield are included in the programmatic biological opinion.

>Ruedi replacement for out-of-priority Diversions through Hunter Creek Tunnel
>Windy Gap

Other operations added for C_1 run

> Green Mountain Reservoir replacement ("future" mode, with somewhat more senior administration number)
> Wolford Mountain Reservoir "turned on" (Wolford Mountain Reservoir operations include the two demands listed above under New Projects, as well as replacement for Green Mountain Reservoir)
> Service fish flow demands at Palisade

Future Depletion Scenarios

Two levels of future demands were added to the model immediately downstream of Cameo: 60,000 and 120,000 acre-feet per year. These demands were imposed in the following distribution:

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1200	1200	1200	1200	1200	1200	1200	19200	24000	6000	1200	1200	60,000
2400	2400	2400	2400	2400	2400	2400	38400	48000	12000	2400	2400	120,000

These distributions were based primarily on when the water would be available. The resulting depletions in the modeling were very close to these demands. The average depletions over the study period were 58,974 and 117,915 acre-feet per year, respectively. The water rights for the future depletions were given an administration number slightly senior to the Service recommended fish flows for the 15-Mile Reach.

Recovery Action Plan Scenarios

The following Recovery Action Plan items were modeled, as per modifications made by Ross Bethel of Leonard Rice Consulting Water Engineers:

> Grand Valley Water Management components, which include a reduction in irrigation demand under the Grand Valley Project, and an operational bypass of 9,000 acre-feet/year at the GVP headgate

> GVP Power demand with a junior priority during summer months

> Orchard Mesa Check operated to only benefit the Grand Valley systems

> HUP Surplus deliveries to the 15-Mile Reach

> Wolford Mountain Reservoir releases from the 6,000 acre-feet fish pool to the 15-Mile Reach

> Ruedi Reservoir releases from storage accounts of 21,650 acre-feet (available every year), 5,000 acre-feet annually and 5,000 acre-feet (available 4 out of 5 years) to the 15-Mile Reach

Priority of use of various reservoir storage accounts in deliveries to the 15-Mile Reach:

1. Ruedi 5,000 acre-feet pool (available 4 out of 5 years)
2. Ruedi 26,650 acre-feet pool
3. Wolford Mountain 6,000 acre-feet pool
4. Green Mountain HUP Surplus pool

Following the release of the preliminary draft biological opinion and comments by water users the following changes were made in model runs.

1. Reassignment of Service flow recommendations to individual water years, based on the Service's wet-dry-average ranking.
2. Initial storage (in October 1974) of fish pools in Ruedi and Wolford set to zero.
3. Demands for Ruedi Round I and II contracts set to full amount of 24,850 acre-feet.
4. Demands for Green Mountain Reservoir contracts set to full amount of 20,000 acre-feet.

Explanation of Tables and Figures in the Biological Opinion

All the tables and figures presented in the biological opinion were based upon information provided by the CRDSS as described in the C_1 scenarios above and the data presented in tables 2 - 7 of this Appendix. The modeling of the scenarios was completed by CWCB staff and results passed to the Service in Excel worksheets for analysis. Because it is difficult to look at the data on a year by year basis, a representative wet, average, and dry year was selected for analysis. The representative years were identified by using CRDSS base case data, summing the data for the runoff months (April, May, June and July), sorting the years by volume and then ranking the years in the 1975 to 1991 period (Table 1). Using this methodology, 1996, 1982, and 1989 were selected as representative wet, average and dry year respectively. These years were then used to develop the data for the tables and figures in the biological opinion. Because of the short period of record, it was difficult to find years where all months within a representative year provided appropriate conditions, for example, April of 1982 (representative wet year) is dryer than April of 1989 (representative dry year).

After examining the data, and the way the Recovery Action items were modeled, the analysis was shifted from a water year basis to a November to October analysis year so that the augmentation provided by the Recovery Action items could be displayed as a continuum for August, September, and

October. The model results are presented on a November to October year in the tables and figures used in the biological opinion.

Tables 4, 5, and 6 display wet, average, and dry years under the various development scenarios with and without RIPRAP items. Figure 3 displays baseline conditions in the Colorado River for a wet, dry, and average year. Figures 4, 5, and 6 display flow scenarios with the addition of Recovery Action items. Figures 7, 8, and 9 display the benefits of adding the Recovery Action items, focusing on the months of August, September, and October.

List of Biological Opinion Hydrology Tables (These Tables were included in the text of the biological opinion)

List of Biological Opinion Hydrology Figures (These Figures were included in the text of the biological opinion)

FIGURE 8. Colorado River near Palisade, flow below GVIC Diversion, from August to October for a wet year (1986) as modeled by CRDSS.

FIGURE 9. Colorado River near Palisade, flow below GVIC Diversion, from August to October for a dry year (1989) as modeled by CRDSS.

TABLE 1. Ranked Baseline Flow at Cameo. Ranked by hydrology (wet years to dry years).

TOTAL WATER YEAR FLOW				APRIL TO JULY FLOW			
Year	Runoff (AF)	Rank	Percentile	Year	Runoff (AF)	Rank	Percentile
1984	6200913	1	100.00%	1984	4743453	1	100.00%
1983	5244334	2	93.70%	1983	3954107	2	93.70%
1985	4991161	3	87.50%	1985	3716626	3	87.50%
1986	4986082	4	81.20%	1986	3642389	4	81.20%
1979	4005004	5	75.00%	1979	3201100	5	75.00%
1975	3833359	6	68.70%	1978	2994921	6	68.70%
1978	3746309	7	62.50%	1980	2879951	7	62.50%
1980	3736812	8	56.20%	1975	2792437	8	56.20%
1982	3632915	9	50.00%	1982	2694133	9	50.00%
1987	3084016	10	43.70%	1991	2243867	10	43.70%
1991	3008692	11	37.50%	1988	2061028	11	37.50%
1976	2910991	12	31.20%	1987	2028529	12	31.20%
1988	2829065	13	25.00%	1976	1991354	13	25.00%
1989	2530787	14	18.70%	1989	1763508	14	18.70%
1990	2359915	15	12.50%	1990	1712140	15	12.50%
1981	2069876	16	6.20%	1981	1414318	16	6.20%
1977	1760410	17	.00%	1977	1057750	17	.00%

TABLE 2. Baseline Flow at Palisade

Approximate Baseflows at Palisade Colorado
Calculated by adding Cameo and Plateau Cr. gage baseflows from StateMod coloupTH.xbg
CFS

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1975	2540	1798	1622	1552	1633	1904	2810	9609	21280	15355	4476	2484
1976	1829	1515	1507	1488	1751	1886	3271	10679	13846	6767	3529	2452
1977	2261	1220	1237	1245	1317	1304	2540	5545	7297	2762	2006	1588
1978	1579	1055	1257	1138	1109	1495	3784	11257	26191	10733	3282	1872
1979	1605	938	1090	1034	1145	1594	3510	14884	25258	12351	4165	2316
1980	1768	1320	1467	1497	1782	1812	3435	13971	24445	8845	3000	2162
1981	1664	1183	1232	1077	1080	1214	2735	6075	11446	4428	2040	2016
1982	1494	1267	1217	1333	1188	1523	2786	10894	21468	12228	4958	3420
1983	2573	2058	1624	1450	1506	1777	2306	11548	35927	21604	8672	3265
1984	2512	1829	1893	1604	1955	2129	3378	27418	34176	19086	8430	5174
1985	4100	2625	2385	1944	1931	2516	7635	23156	24638	9968	4288	2609
1986	3272	2409	1953	1920	2441	3152	7785	17680	26617	12328	4862	3564
1987	3392	2573	1966	1650	1843	2084	4993	13861	12854	4932	3118	2210
1988	1725	1601	1487	1421	1460	1753	3725	10715	16186	5043	2318	1664
1989	1674	1173	1212	1288	1414	2068	4480	10110	10879	5058	2952	1633
1990	1338	1129	1152	1056	1218	1452	2571	6488	15048	5355	2136	1723
1991	1664	1157	915	1136	1181	1458	2369	11427	18552	6587	3244	2394

TABLE 3. C_1 Scenario 5/17/99

952001 Colorado River Avg. Flows (cfs) at Top of 15-Mile Reach (Palisade) C_1 Scenario

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg.
1975	482	1,638	1,695	1,565	1,617	1,862	2,024	4,886	11,793	8,813	1,445	639	3,205
1976	1,168	2,203	1,975	1,925	2,104	2,213	1,432	5,169	6,026	1,868	758	889	2,311
1977	1,027	1,739	1,566	1,490	1,575	1,424	659	1,013	1,078	222	3	16	984
1978	54	1,221	1,443	1,245	1,192	1,471	1,640	5,232	13,218	4,277	559	398	2,662
1979	132	1,259	1,486	1,324	1,443	1,786	1,808	9,122	14,799	6,049	1,146	216	3,381
1980	298	2,174	1,947	1,874	2,065	2,057	1,859	8,646	14,250	4,050	650	289	3,347
1981	970	1,550	1,575	1,386	1,353	1,277	593	2,204	3,772	664	3	211	1,296
1982	1,300	1,092	1,380	1,433	1,308	1,526	1,391	5,570	10,764	5,434	1,477	1,781	2,871
1983	2,180	2,633	2,070	1,901	1,931	2,091	1,961	7,481	26,102	14,553	4,820	985	5,726
1984	1,536	2,494	2,499	2,138	2,386	2,469	2,731	19,158	28,298	13,858	5,018	2,830	7,118
1985	4,125	3,174	2,874	2,387	2,381	2,793	5,887	15,984	16,609	5,773	1,161	1,590	5,395
1986	3,061	2,792	2,420	2,342	2,756	3,043	5,441	11,288	16,579	7,097	1,630	2,220	5,056
1987	2,428	3,047	2,495	2,105	2,297	2,444	2,651	7,528	5,912	1,748	1,156	474	2,857
1988	313	2,261	1,948	1,772	1,788	2,051	1,892	4,276	7,191	765	438	589	2,107
1989	143	1,464	1,559	1,527	1,586	1,927	1,529	3,623	4,049	947	762	105	1,602
1990	182	1,302	1,553	1,375	1,536	1,500	685	1,455	4,974	1,286	69	52	1,331
1991	970	1,636	1,240	1,352	1,390	1,603	1,501	4,406	9,155	2,162	502	872	2,232
Avg.	1,198	1,981	1,866	1,714	1,806	1,973	2,099	6,885	11,445	4,680	1,270	833	3,146

TABLE 4. C_1 + 60,000 Acre-feet Future Depletion 5/17/99

952001 Colorado River Avg. Flows (cfs) at Top of 15-Mile Reach (Palisade) C_1 + 60K Acre-feet Future Depletion

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1975	463	1,618	1,676	1,546	1,595	1,842	2,004	4,574	11,390	8,715	1,425	619
1976	1,149	2,183	1,955	1,906	2,083	2,194	1,411	4,857	5,623	1,771	739	869
1977	1,007	1,718	1,547	1,470	1,554	1,405	639	701	675	124	3	16
1978	34	1,200	1,423	1,225	1,170	1,452	1,620	4,919	12,814	4,179	539	378
1979	113	1,239	1,467	1,304	1,421	1,767	1,788	8,809	14,396	5,951	1,127	196
1980	289	2,154	1,928	1,855	2,044	2,037	1,838	8,334	14,094	3,926	622	262
1981	946	1,508	1,535	1,349	1,308	1,240	549	1,892	3,368	566	3	191
1982	1,281	1,072	1,360	1,413	1,286	1,506	1,371	5,226	10,361	5,370	1,423	1,761
1983	2,161	2,613	2,050	1,881	1,910	2,071	1,941	7,169	25,699	14,455	4,801	965
1984	1,516	2,474	2,479	2,119	2,365	2,449	2,711	18,845	27,895	13,761	4,998	2,810
1985	4,105	3,154	2,855	2,368	2,359	2,773	5,867	15,672	16,205	5,675	1,142	1,570
1986	3,042	2,771	2,401	2,322	2,734	3,023	5,421	10,975	16,176	7,060	1,630	2,182
1987	2,392	3,019	2,467	2,078	2,267	2,417	2,631	7,215	5,509	1,650	1,137	474
1988	313	2,241	1,928	1,752	1,767	2,031	1,876	3,964	6,783	668	438	589
1989	143	1,444	1,540	1,508	1,565	1,909	1,502	3,310	3,646	850	742	104
1990	181	1,281	1,532	1,355	1,514	1,480	685	1,143	4,570	1,189	69	52
1991	951	1,616	1,221	1,333	1,369	1,584	1,481	4,093	8,751	2,065	502	851
Avg.	1,182	1,959	1,845	1,693	1,783	1,952	2,079	6,571	11,056	4,587	1,255	817

TABLE 5. C_1 + 60,000 Acre-feet Future Depletion and Recovery Action Items (RIPRAP) 5/17/99

952001 Colorado River Avg. Flows (cfs) at Top of 15-Mile Reach (Palisade) C_1 + 60K Acre-feet + RIPRAP

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg.
1975	608	1,630	1,676	1,564	1,610	1,842	1,992	4,574	11,360	8,715	1,630	1,630	3,236
1976	1,240	1,970	1,715	1,847	2,019	2,151	1,353	4,736	5,608	1,772	1,240	1,240	2,241
1977	1,188	1,703	1,504	1,482	1,578	1,446	597	701	563	74	810	108	980
1978	171	1,160	1,383	1,185	1,124	1,401	1,491	4,808	12,581	3,955	1,630	934	2,652
1979	92	1,070	1,322	1,166	1,265	1,634	1,655	8,707	14,288	5,951	1,630	1,278	3,338
1980	280	1,906	1,697	1,667	1,852	1,871	1,807	8,214	13,959	3,927	1,630	1,001	3,317
1981	1,005	1,403	1,411	1,240	1,240	1,215	463	1,756	3,195	566	810	432	1,228
1982	1,426	1,027	1,299	1,354	1,216	1,466	1,267	5,080	10,291	5,196	1,630	1,879	2,761
1983	2,334	2,457	2,056	1,893	1,934	2,113	1,927	7,168	25,743	14,462	4,801	1,630	5,710
1984	1,630	2,326	2,421	2,128	2,386	2,491	2,645	18,792	27,836	13,761	5,127	2,966	7,042
1985	4,294	3,053	2,909	2,428	2,437	2,781	5,880	15,672	16,174	5,675	1,630	1,652	5,382
1986	3,172	2,641	2,139	2,371	2,843	3,107	5,412	10,975	16,182	7,060	1,636	2,383	4,993
1987	2,675	2,989	2,525	2,142	2,348	2,510	2,628	7,203	5,403	1,650	1,240	1,240	2,879
1988	1,018	2,014	1,765	1,630	1,630	1,856	1,629	3,965	6,743	668	1,240	793	2,079
1989	121	1,332	1,423	1,402	1,471	1,827	1,096	3,311	3,645	850	810	810	1,508
1990	810	1,240	1,341	1,202	1,316	1,343	357	1,047	4,690	1,189	810	732	1,340
1991	1,101	1,539	1,118	1,248	1,272	1,545	1,419	3,997	8,273	2,028	1,240	1,240	2,168
Avg.	1,363	1,850	1,747	1,644	1,738	1,918	1,977	6,512	10,973	4,559	1,738	1,291	3,109

TABLE 6. C_1 + 120,000 Acre-feet Future Depletion 5/17/99

952001 Colorado River Avg. Flows (cfs) at Top of 15-Mile Reach (Palisade) C_1+120K Acre-feet Future Depletion

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg.
1975	443	1,598	1,656	1,526	1,574	1,823	1,984	4,261	10,987	8,617	1,406	599	3,040
1976	1,129	2,162	1,936	1,886	2,062	2,174	1,391	4,545	5,219	1,673	719	849	2,146
1977	988	1,698	1,527	1,450	1,532	1,385	619	389	272	27	3	16	825
1978	15	1,180	1,404	1,206	1,148	1,432	1,599	4,607	12,411	4,082	520	358	2,497
1979	93	1,219	1,447	1,285	1,400	1,747	1,768	8,497	14,250	5,650	1,106	176	3,220
1980	289	2,133	1,908	1,835	2,023	2,018	1,818	8,022	13,691	3,829	602	242	3,201
1981	927	1,488	1,516	1,329	1,287	1,235	515	1,575	2,965	469	3	171	1,123
1982	1,261	1,052	1,341	1,394	1,264	1,486	1,351	4,885	9,957	5,370	1,386	1,738	2,707
1983	2,140	2,592	2,030	1,861	1,888	2,051	1,921	6,857	25,233	14,357	4,781	945	5,555
1984	1,497	2,454	2,459	2,099	2,344	2,430	2,691	18,533	27,492	13,663	4,978	2,789	6,953
1985	4,086	3,134	2,835	2,348	2,338	2,753	5,846	15,360	15,802	5,578	1,122	1,550	5,229
1986	3,022	2,751	2,381	2,303	2,713	3,004	5,401	10,707	15,732	7,060	1,630	2,153	4,905
1987	2,364	2,989	2,440	2,050	2,236	2,389	2,611	6,903	5,084	1,552	1,117	474	2,684
1988	313	2,221	1,909	1,733	1,746	2,012	1,864	3,652	6,372	570	438	589	1,951
1989	145	1,426	1,522	1,490	1,545	1,890	1,469	2,998	3,248	752	723	102	1,442
1990	179	1,259	1,511	1,334	1,490	1,458	685	831	4,167	1,091	69	53	1,177
1991	932	1,597	1,202	1,314	1,349	1,566	1,461	3,781	8,348	1,967	502	831	2,071
Avg.	1,166	1,938	1,825	1,673	1,761	1,933	2,059	6,259	10,661	4,489	1,242	802	2,984

TABLE 7. C_1 + 120,000 Acre-feet Fture Depletion + Recovery Action Items (RIPRAP) 5/17/99

952001 Colorado River Avg. Flows (cfs) at Top of 15-Mile Reach (Palisade) C_1 + 120K Acre-feet + RIPRAP

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg.
1975	588	1,612	1,656	1,543	1,588	1,823	1,972	4,261	10,957	8,618	1,630	1,630	3,157
1976	1,240	1,955	1,695	1,808	1,977	2,112	1,332	4,423	5,204	1,674	1,240	1,240	2,158
1977	1,163	1,676	1,487	1,450	1,542	1,414	576	389	160	4	810	75	895
1978	152	1,140	1,364	1,166	1,103	1,382	1,471	4,496	12,178	3,857	1,630	891	2,569
1979	73	1,050	1,303	1,146	1,243	1,627	1,635	8,395	14,066	5,701	1,630	1,236	3,259
1980	258	1,884	1,676	1,647	1,831	1,852	1,784	7,896	13,549	3,830	1,630	961	3,233
1981	985	1,383	1,392	1,240	1,222	1,174	443	1,444	2,791	469	810	392	1,145
1982	1,407	1,007	1,279	1,334	1,194	1,447	1,247	4,768	9,888	5,099	1,630	1,856	2,680
1983	2,312	2,434	2,034	1,871	1,910	2,091	1,904	6,856	25,339	14,364	4,781	1,630	5,627
1984	1,630	2,306	2,401	2,109	2,365	2,471	2,625	18,441	27,433	13,663	5,107	2,945	6,958
1985	4,275	3,032	2,889	2,409	2,416	2,761	5,860	15,360	15,771	5,578	1,630	1,632	5,301
1986	3,153	2,617	2,115	2,348	2,817	3,083	5,392	10,707	15,738	7,060	1,630	2,360	4,918
1987	2,649	2,962	2,506	2,122	2,327	2,490	2,607	6,890	4,898	1,552	1,240	1,240	2,790
1988	963	1,994	1,747	1,630	1,596	1,836	1,609	3,653	6,340	571	1,240	750	1,994
1989	121	1,312	1,403	1,383	1,449	1,807	1,075	2,999	3,244	752	810	810	1,430
1990	810	1,240	1,321	1,182	1,294	1,323	337	734	4,229	1,092	810	732	1,259
1991	1,082	1,518	1,098	1,228	1,250	1,525	1,399	3,685	7,870	1,931	1,240	1,240	2,089
Avg.	1,345	1,831	1,727	1,624	1,713	1,895	1,957	6,200	10,568	4,460	1,735	1,272	3,027