

Region F
Water Planning Group

Freese and Nichols, Inc.
LBG-Guyton Associates, Inc.

FINAL MEMORANDUM

To: Region F Water Planning Group

From: Jon S. Albright – Freese and Nichols, Inc.

Re: Region K Coordination

Date: April 16, 2009

1. This memorandum describes coordination activities with the Lower Colorado Regional Water Planning Group's (Region K) surface water availability study.

Activities included:

- Attending a meeting of the Region K Modeling Committee meeting on February 11, 2008
- Reviewing and commenting on materials provided by Region K.
- Review of the Region K model (also referred to as the "cutoff model"), including a comparison to previous modeling of flows coming out of Region F

The remainder of this memorandum discusses the findings of the flow comparisons.

2. Table 1 compares the average annual flows at five locations for the entire simulation period and during the Highland Lakes' critical period. Figure 1 shows the geographic location of these points. The data in Table 1 show that overall the new Region K model assumes that less flow is being passed from Region F to Region K than in the Region F model used in the 2006 Region F Plan. Inflows into Lake Buchanan are about 14 percent lower in the Region K model than in the Region F model. This is most likely because the Region K model assumes that water rights above Lake Ivie and Lake Brownwood do not pass any water to water rights below those reservoirs. The Region F model assumed that only major water rights in

Table 1
Comparison of Annual Flows in the Region F and Region K Models at Selected
Locations
 (Values in Acre-Feet per Year)

Location	Region F Model ^a		Region K Model ^b		Difference ^c	
	Full Period ^d (1/40 - 12/98)	Highland Lakes Critical Period ^e (5/45 - 2/57)	Full Period ^d (1/40 - 12/98)	Highland Lakes Critical Period (5/45 - 2/57)	Full Period ^d (1/40 - 12/98)	Highland Lakes Critical Period (5/45 - 2/57)
Lake Ivie Outflows	65,740	18,475	17,311	2,572	-48,429	-15,902
Lake Brownwood Outflows	67,855	22,075	67,613	25,116	-241	3,040
Brady Creek Reservoir Outflows	5,434	6,856	9,058	14,810	3,624	7,954
Flows Below CA 14-1750 Diversion	82,393	48,230	83,491	49,629	1,098	1,399
Lake Buchanan Inflows	534,240	369,055	459,890	321,148	-74,350	-47,907

a The Region F Model was used for the subordination strategy in the 2006 Region F Water Plan.

b The Region K Model was developed by Region K as a special study in the current round of regional planning. This model is also known as the “cutoff model” because it assumes that water rights above Lake Ivie and Lake Brownwood do not pass water to downstream water rights.

c The annual flows from the Region K model less the annual flows from the Region F model.

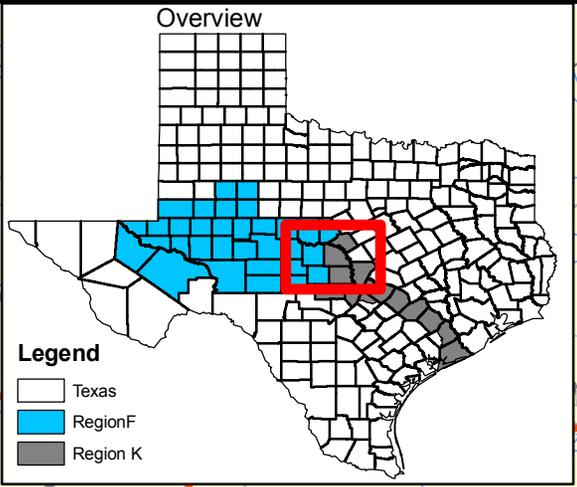
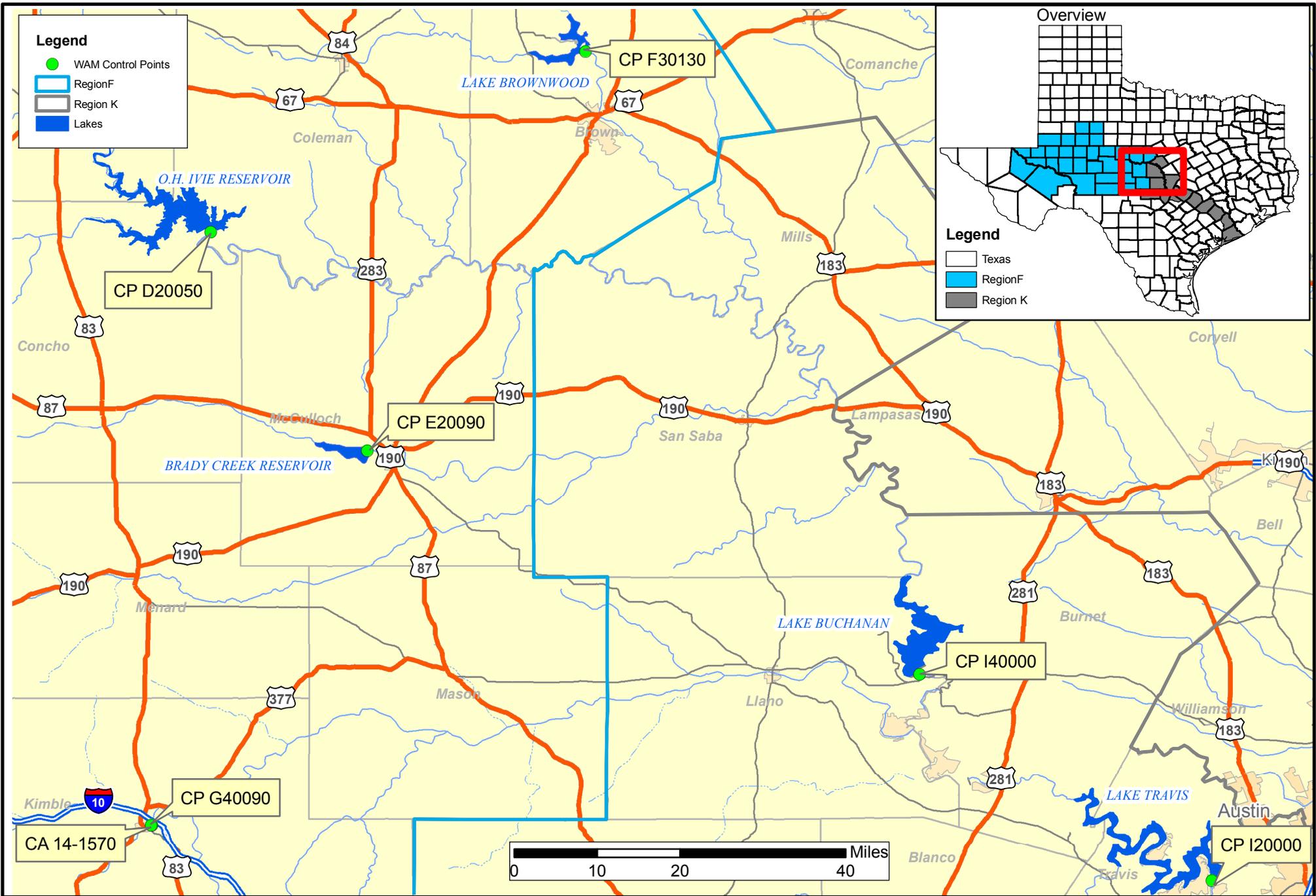
d The analysis period of the Colorado Water Availability Model that is the basis for the Region K model. The Region F model extended flows through 2004 for water rights located in Region F.

e The drought period in the model that determines the supplies from the Highland Lakes.

Region F did not pass water to Region K. Smaller Region F water rights were assumed to pass water to senior water rights.

3. Table 1 compares flows at five locations:

- *Lake Ivie Outflows* are flows directly below Lake Ivie. Note that the flows in the Region K model are considerably less than in the Region F model. The flows in the Region K model consist entirely of spills from the reservoir or low-flow releases required by the Lake Ivie water right. No flows are being passed for downstream water rights. The Region F model assumes that water is being passed for senior water rights below Lake Ivie.
- *Lake Brownwood Outflows* are flows below Lake Brownwood. These flows are practically identical in the two models because Lake Brownwood is senior to the Highland Lakes. The small amount of difference is probably attributed to passage of water to smaller water rights that are senior to Lake Brownwood.

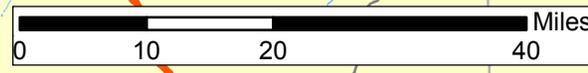


Legend

- Texas
- Region F
- Region K

Legend

- WAM Control Points
- Region F
- Region K
- Lakes



Region K Coordination

Location Map

FN JOB NO	CMD07215
FILE	H:\Region K Coordination.mxd
DATE	November 6, 2008
SCALE	1:950,000
DESIGNED	JJR
DRAFTED	JJR

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FIGURE

- *Brady Creek Reservoir Outflows* are the flows directly below Brady Creek Reservoir. This reservoir was included in the Region F subordination analysis but is not considered to be subordinated in the Region K model. Brady Creek Reservoir is not above Lake Ivie or Lake Brownwood. The Region K model assumes that Brady Creek Reservoir passes all inflow any time the Highland Lakes have empty storage. As a result, the flows below Brady Creek Reservoir are almost twice as high in the Region K model. If this model were used for water availability in Region F, Brady Creek Reservoir would have no reliable supply.
- *Flows below CA 14-1750 Diversion* are the flows directly below the City of Junction's water right on the Llano River (Certificate of Adjudication 14-1570). This water right authorizes diversion of 1,000 acre-feet per year and a small amount of storage, all junior to the Highland Lakes. Like Brady Creek Reservoir, this water right was included in the Region F subordination analysis but is not considered to be subordinate in the Region K model. Because the Junction diversion is relatively small compared to the spring-fed flows at this location, the annual flows are similar in the two models. (The Llano River flows into Lake Lyndon B. Johnson above Lake Travis and below Lake Buchanan.) However, due to priority assumptions and the small amount of storage, the City of Junction would have no reliable supply if the Region K model were used for this water right.
- *Inflows into Lake Buchanan* are the sum of the regulated flows for the seven control points immediately upstream of Lake Buchanan. The Region K model inflows are about 14 percent lower than the Region F model inflows.

Attachment 1 contains graphical comparisons of the flow data for these five locations.

4. The Highland Lakes critical period determines the supplies from the Highland Lakes (Lakes Buchanan and Travis and several smaller reservoirs), which are the primary source of water for Region K. The critical period is the time period from when a reservoir is full to when it reaches its minimum storage during the most severe drought in a yield simulation. This period determines the supply from a reservoir. As shown in Table 1, the total inflows into the Highland Lakes during the critical period are less in the Region K model than in the Region F model. In the Region K model, the critical period for Lake Buchanan and Lake Travis begins in May 1945

and ends in August 1952. However, neither reservoir fills until late in 1957, and both Lake Buchanan and Lake Travis are very low in February 1957. Since it is possible that changes in flows from Region F could impact supplies through February 1957, the critical period for this analysis was extended to cover the period from March 1954 to February 1957.

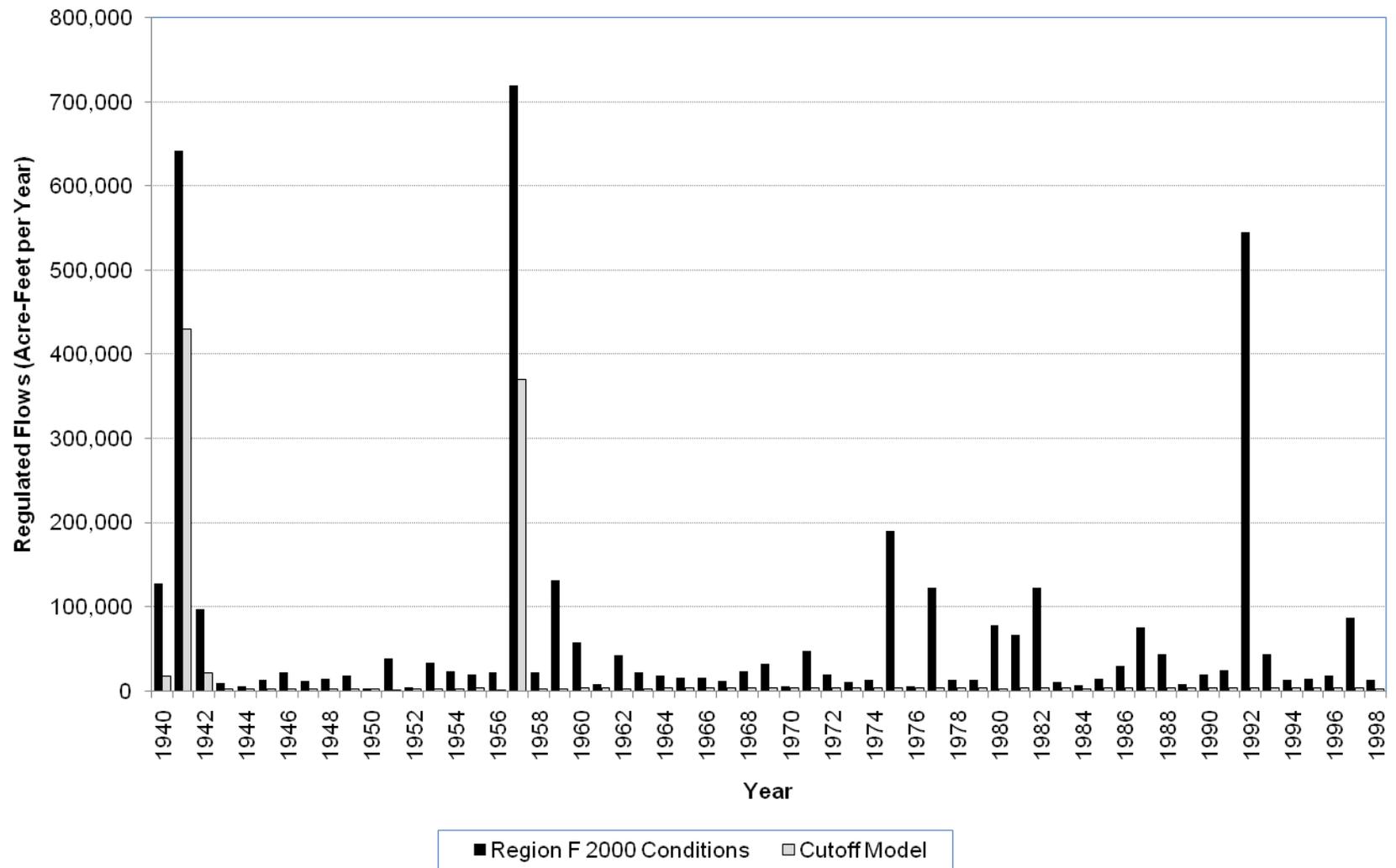
Conclusions and Recommendations

5. It appears that the Region K model assumes that less water is passed from Region F to Region K than the Region F model. Therefore it seems logical to conclude that a water availability analysis based on the Region K model would show more water available in Region F.
6. The Region K model does not include Brady Creek Lake or the Junction water right. However the total amount of flow retained in Region F is more than the impact of these two water rights. Therefore the overall water balance between the two regions should not be impacted.
7. Region F does not intend to change its water availability analysis for the 2011 Region F Plan, and intends to retain the Subordination strategy as described in the 2006 Region F Water Plan, including water provider agreements and system operations. This approach should not have an impact to the supplies in Region K as determined by the new Region K “cutoff” model. Since overall supplies in Region F would likely be higher if assumptions similar to the Region K model were used, the water availability analysis performed for the 2006 Region F plan should be conservative. While there are some differences between the models, the use of the two models in this round of planning should not impact the overall balance of water between the two regions. However, future water availability analyses should address the Brady Creek Lake and Junction water rights.

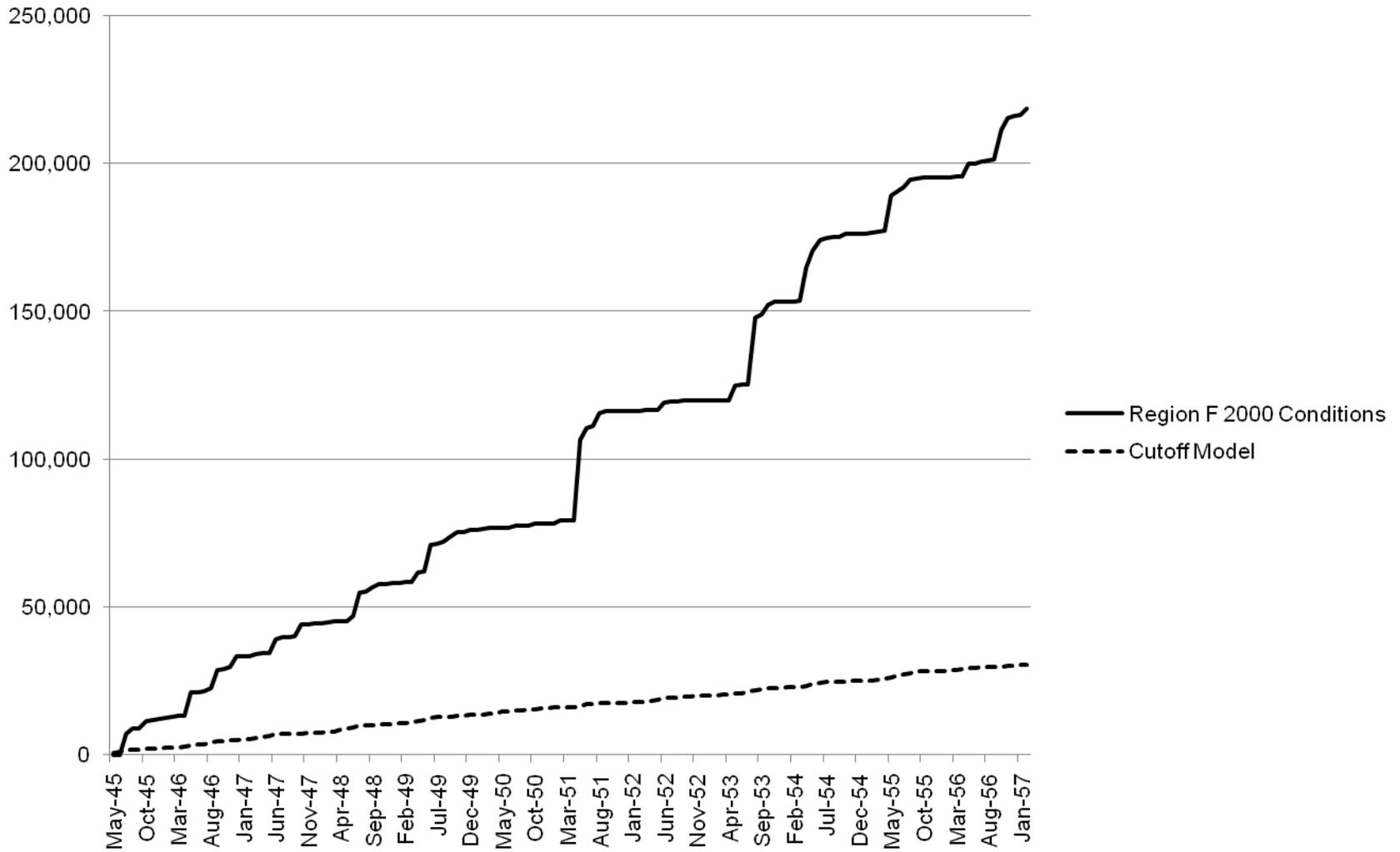
Attachment 1 – Flow Comparison Graphs at Selected Locations

The following graphs compare regulated flows from the Region F and Region K models. The comparison of annual regulated flows is simply the sum of the flows passing each location every year in the simulation. The cumulative flow graphs show how the flows vary over time during the critical period of the Highland Lakes. It should be noted that not all of the flow in these graphs would necessarily be appropriated by the Highland Lakes. Some of the flow could be appropriated by other water rights senior to the Highland Lakes.

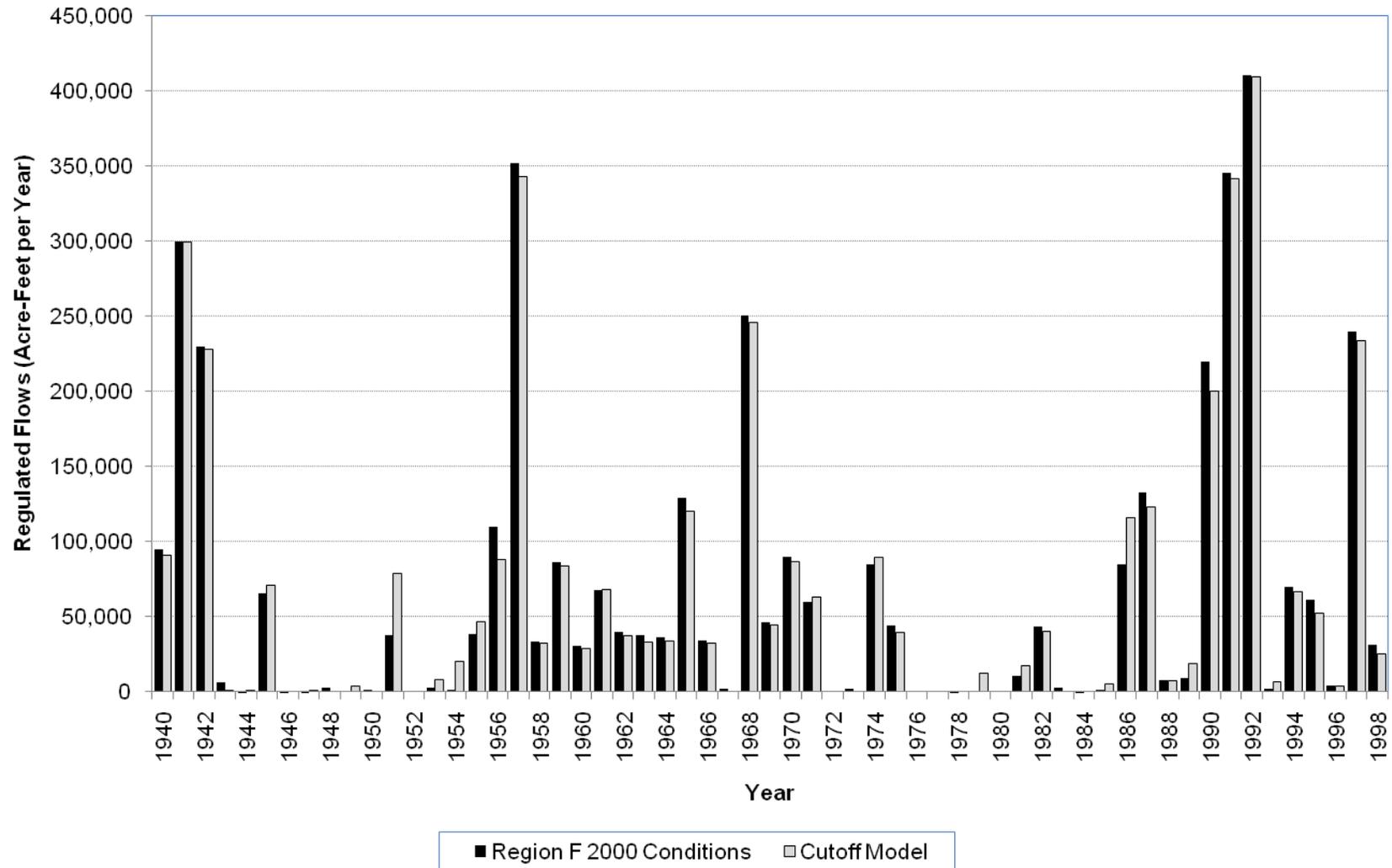
Regulated Flows Below Lake Ivie



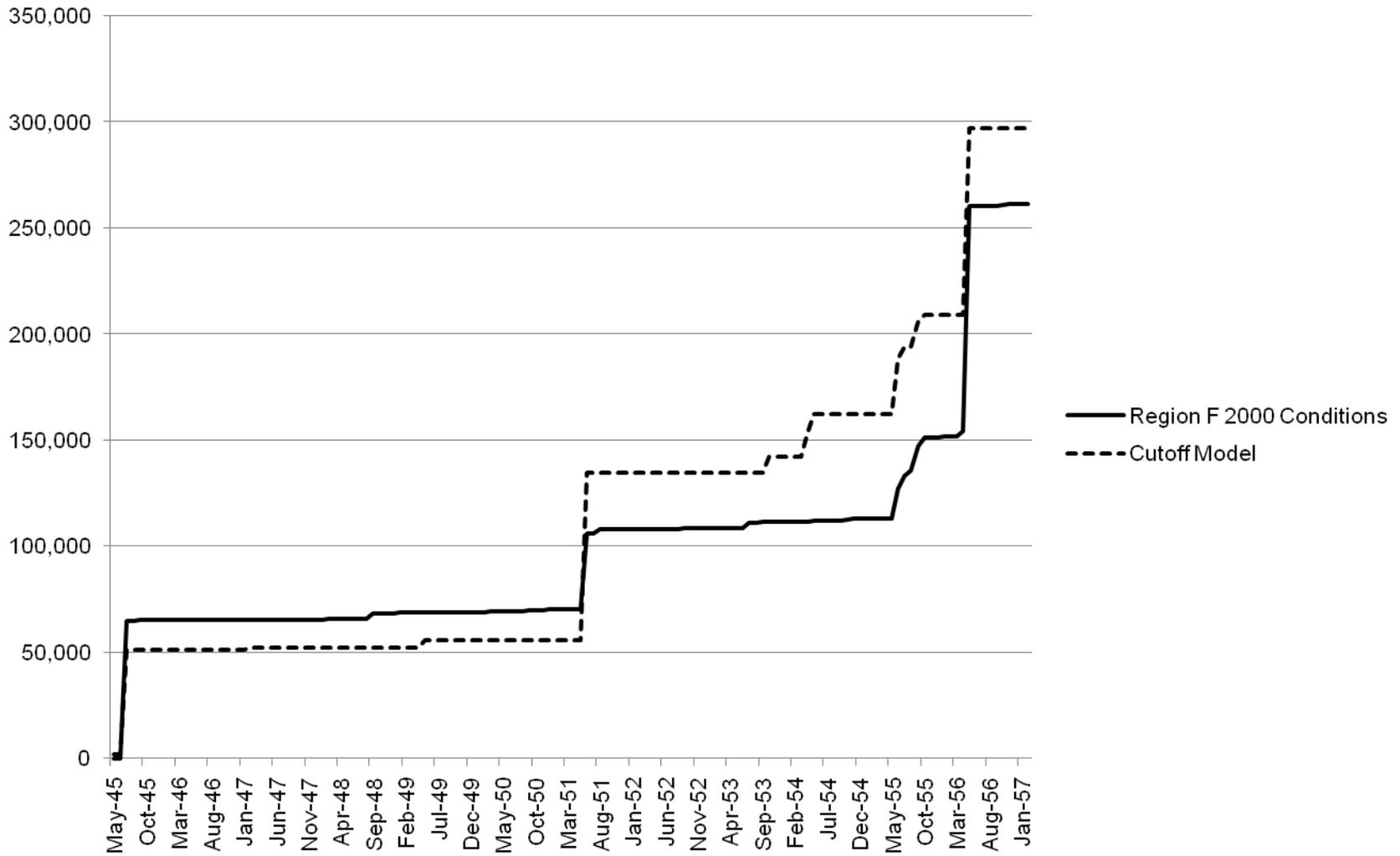
Cumulative Lake Ivie Outflow during Buchanan Critical Period



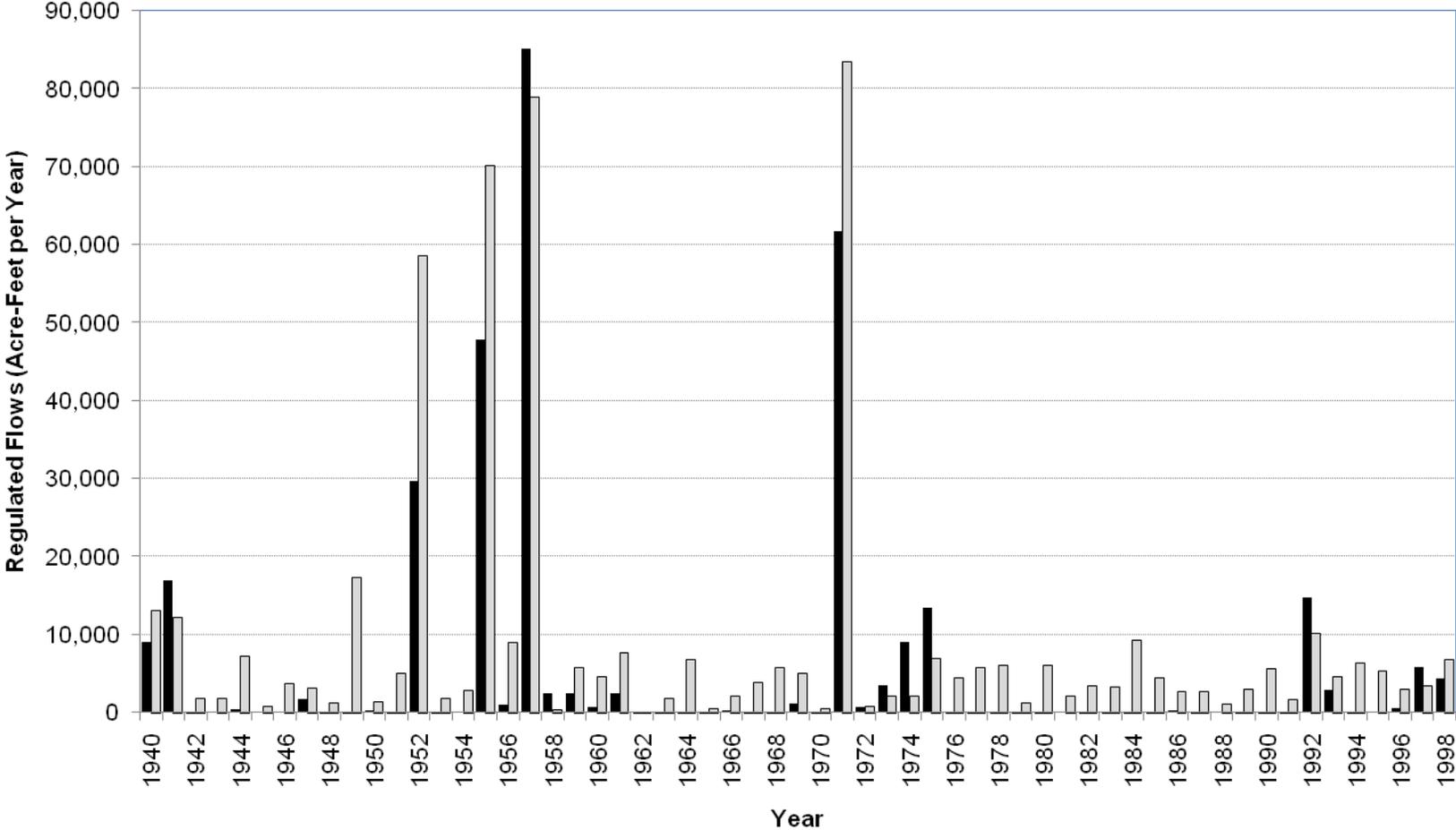
Regulated Flows Below Lake Brownwood



Cumulative Lake Brownwood Outflow during Buchanan Critical Period

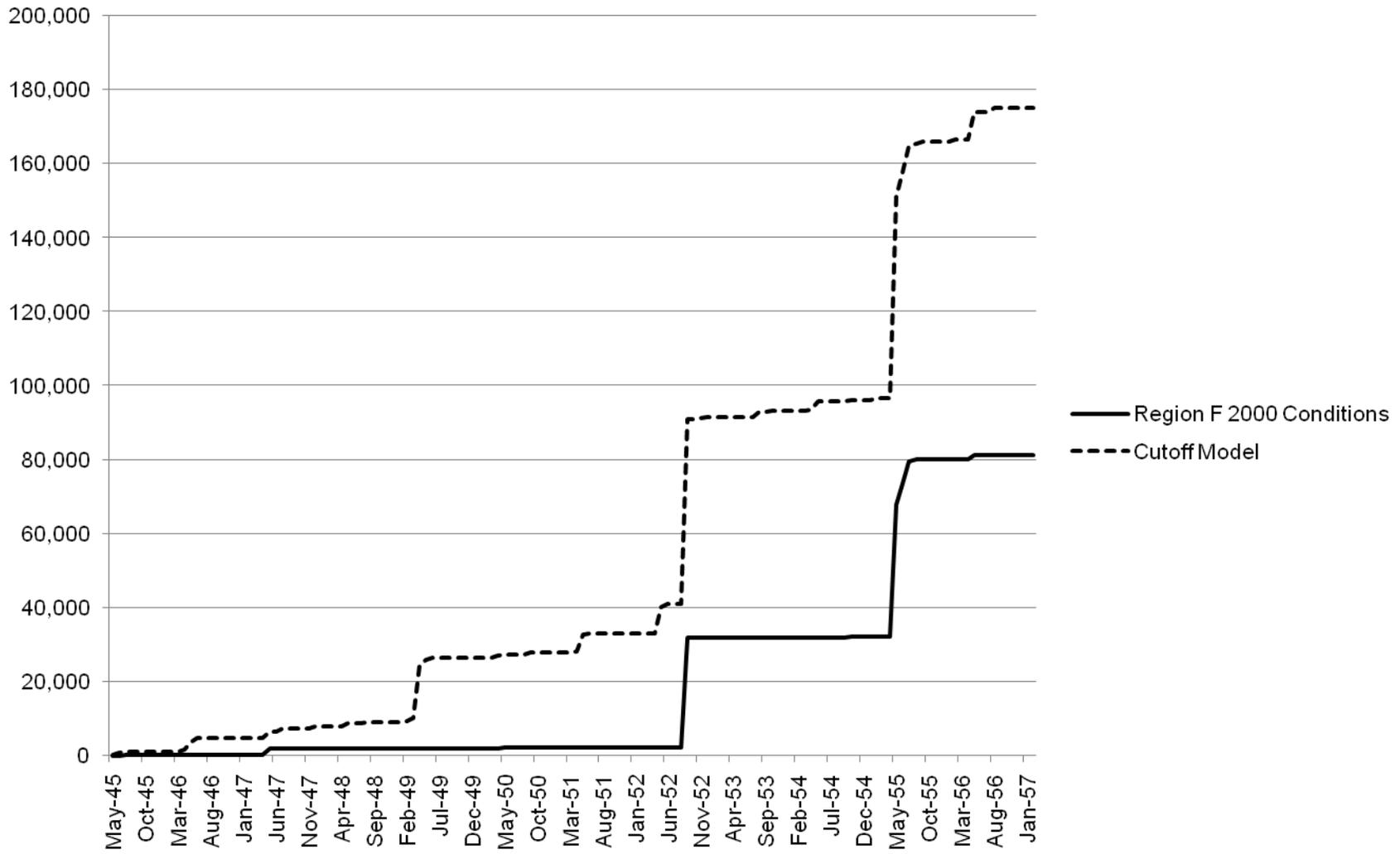


Regulated Flows Below Brady Creek Reservoir

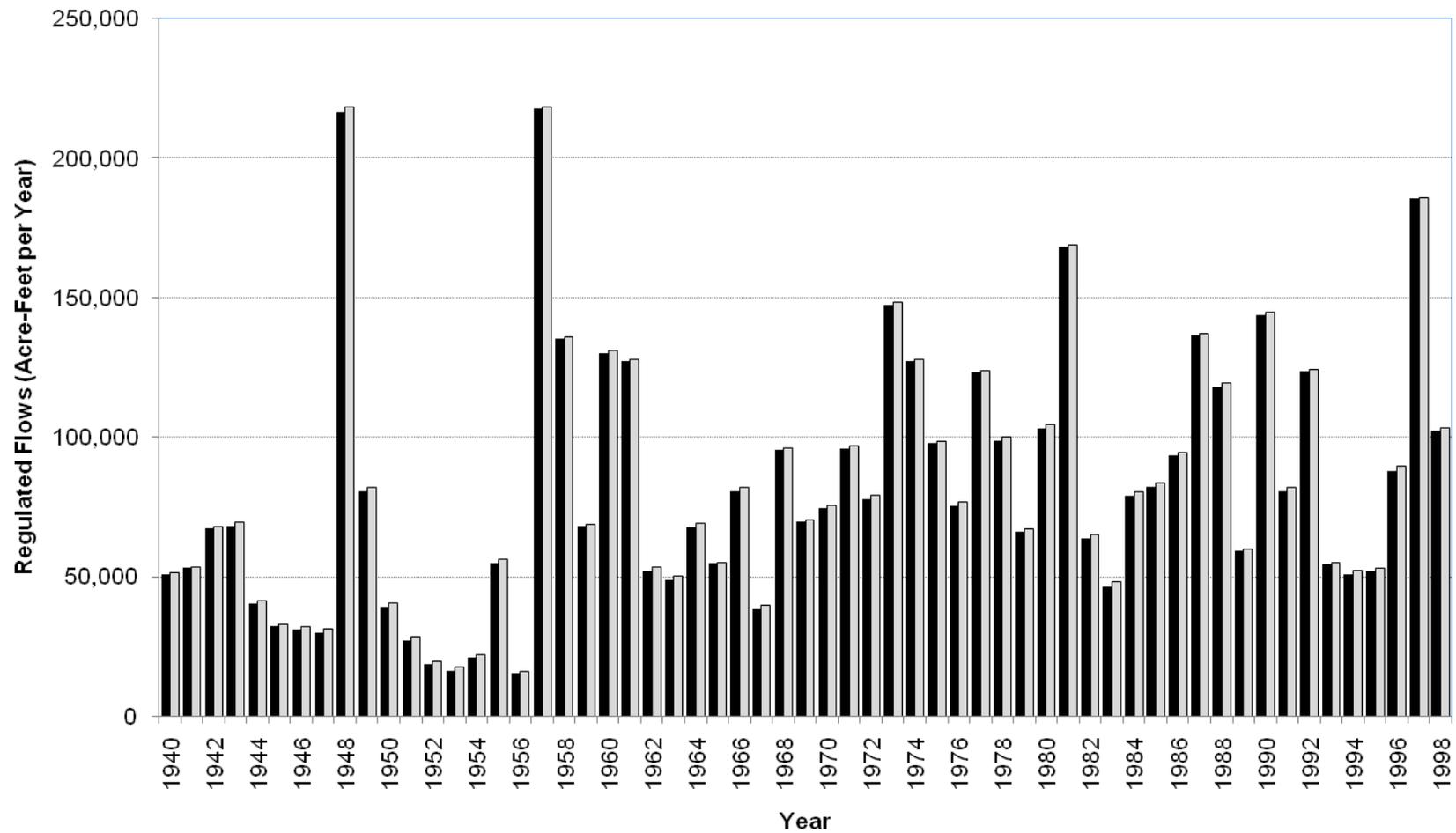


■ Region F 2000 Conditions □ Cutoff Model

Cumulative Brady Creek Reservoir Outflow during Buchanan Critical Period

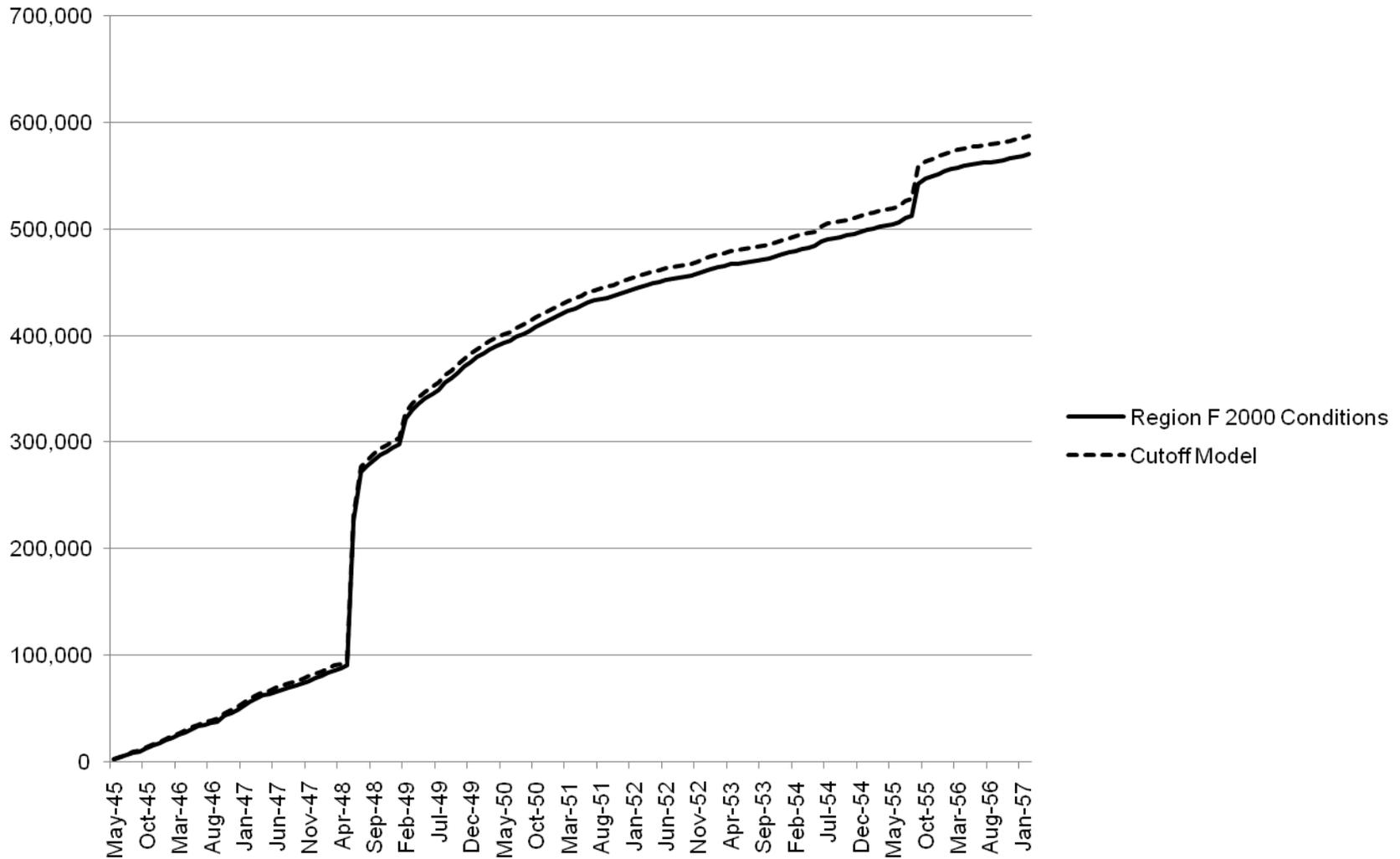


Regulated Flows Below Junction Water Right

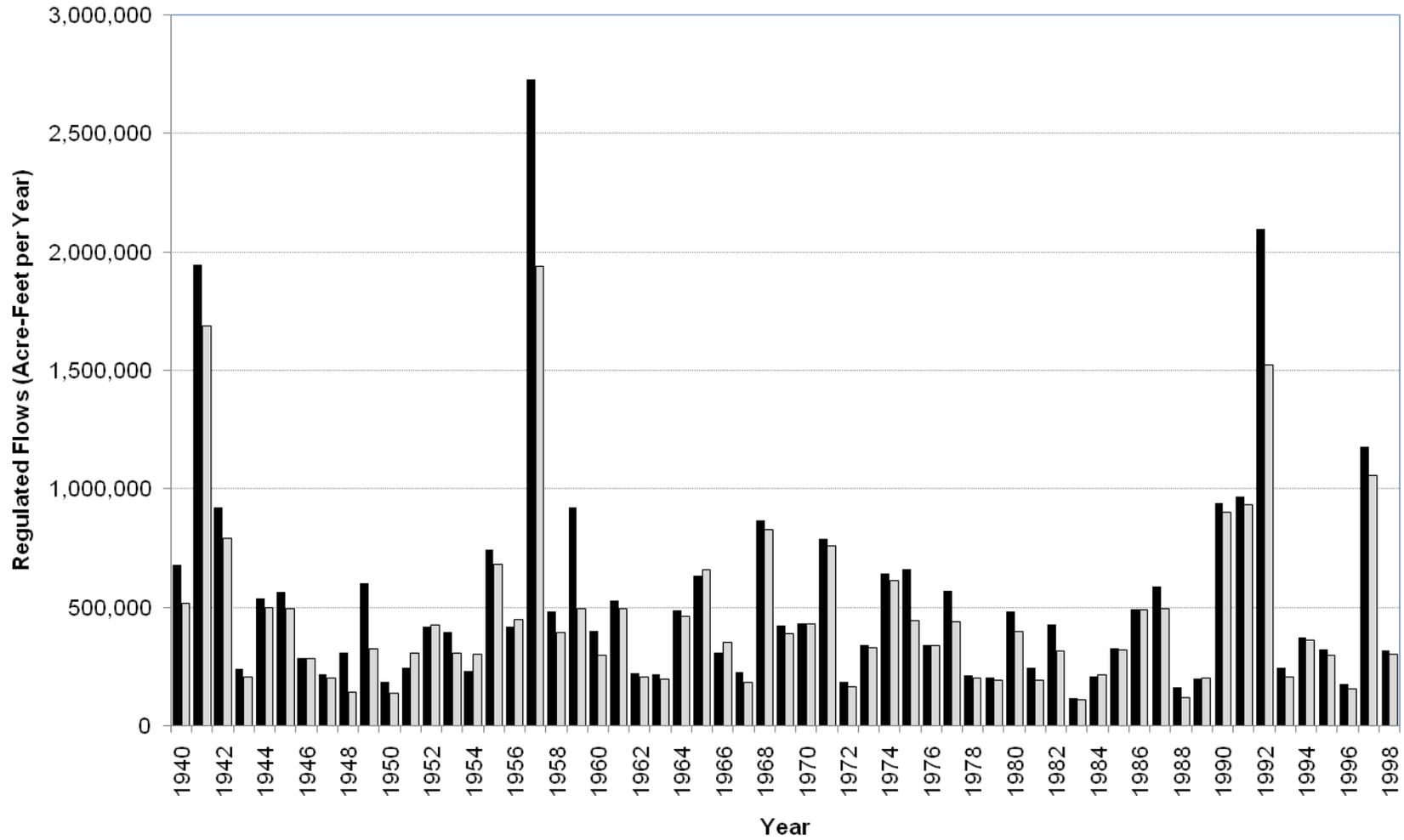


■ Region F 2000 Conditions □ Cutoff Model

Cumulative Flow below Junction Diversion during Buchanan Critical Period



Lake Buchanan Inflows



■ Region F 2000 Conditions □ Cutoff Model

Cumulative Lake Buchanan Inflow during Buchanan Critical Period

