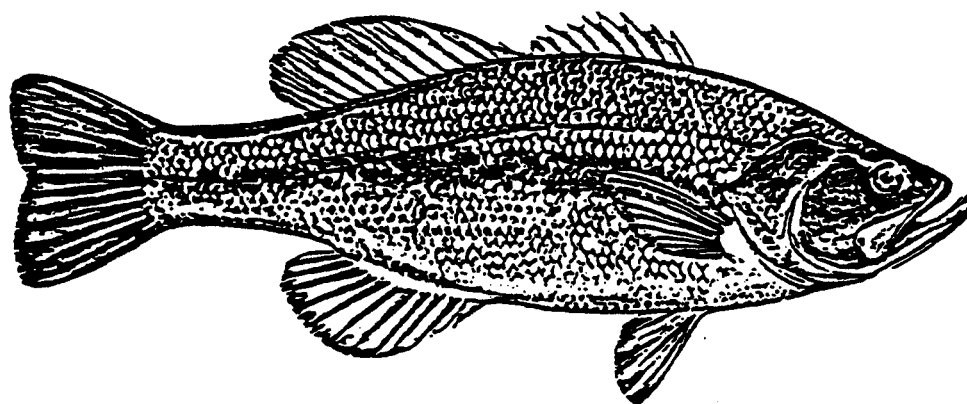


APPENDIX E.

FISHERIES SUBCOMMITTEE REPORT

**BILL WILLIAMS RIVER CORRIDOR
Fisheries Subcommittee
Final Recommendations**



**Prepared By:
Fisheries Subcommittee
Chairman: Brad Jacobson**

Revised: February 24, 1994

Acknowledgements

I would like to thank the members of the Bill Williams River Corridor Fisheries Subcommittee for their assistance in putting together the following subcommittee report. This effort involved fitting meeting into their busy work schedule with very little advanced notice along with returning comments on short turn around schedule. The individuals that were members of this subcommittee were Al Doelker, Havasu Resource Area of the Bureau of Land Management; Carvel Bass, Operations Branch of the U. S. Army Corps of Engineer; Tom Burke, Boulder City Office of the U. S. Bureau of Reclamation; Dave La Pointe, Lake Havasu State Park of Arizona State Parks; and Chuck Minckley, Parker Fisheries Resource Office of the U. S. Fish and Wildlife Service.

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BILL WILLIAMS RIVER CORRIDOR

Fisheries Subcommittee

Recommendations

I. Goal and Objectives:

A. Goal:

Develop a water level management prescription for maximizing the fisheries at Alamo Lake and the Bill Williams River below the dam.

B. Objectives:

1. Identify a lake level management prescription for Alamo Lake and a flow regime for the Bill Williams River below the dam which would maximize the various fisheries during optimal water years (wet years).
2. Identify a lake level management prescription for Alamo Lake and a flow regime for the Bill Williams River below the dam which would maximize the various fisheries during acceptable water years (wet enough to maintain the lake elevation).
3. Identify a lake level management prescription for Alamo Lake and a flow regime for the Bill Williams River below the dam which would maximize the various fisheries during adverse water years (not wet enough to maintain the lake elevation).

II. Assumptions made, and limitations considered, in developing recommendations:

A. Recommendation Number 1 [Operate Alamo Dam for maximizing the fisheries for the lake, river below the dam, and maintain the river below Planet Ranch during optimal water years].

1. Lake:

- a. Water availability would be such as to allow for operating the lake elevation at a high and low operation zone, thus maintaining high productivity. Fluctuation between the two operation zones would occur on a 3 to 7 year cycle.
- b. If the lake elevation remains constant or fluctuates frequently the productivity would decline.

- c. The timing of the fluctuation would effect the health of the fishery.
 - d. Spawning will occur during the months of March - May (water temperatures between 60°F and 65°F).
 - e. Optimum operation elevations selected assumes, that sedimentation hasn't changed the bottom profile to render current information invalid.
2. River below the dam (dam to 6 miles below the dam):
- a. Management for the river below the dam will emphasize maintenance of the existing warmwater fishery or establishing a native fish fishery. [The Arizona Game & Fish Department proposal of managing for a cold water trout fishery in the Rawhide Wilderness Area below Alamo Dam is contrary to existing regulations. Therefore, the concept for establishing a trout/native fish fishery was dropped out of this report.]
 - 1) If promoting the existing warmwater fishery, releases from the dam should be stabilized as much as possible.
 - 2) If promoting the native fish fishery, releases from the dam should be patterned after natural events as closely as possible.
 - d. That releases can be maintained and that the dam can be regulated to achieve the desired releases.
 - e. That lake elevations are adequate for providing the release needs without changing the lake operation from optimal to acceptable.
3. River below Planet Ranch:
- a. Water will reach the lower end of the Bill Williams River corridor.
 - b. Planet Ranch pumping will decrease in the future.
- B. Recommendation Number 2 [Operate Alamo Dam for maximizing the fisheries for the lake, river below the dam, and maintain the river below Planet Ranch during acceptable water years].
1. Lake:
- a. Water inflow would only allow for operating the lake at the lower operation zone.
 - b. If the lake elevation remains constant or fluctuates frequently the

productivity would decline.

- c. The timing of the fluctuation would effect the health of the fishery.
- d. Spawning will occur during the months of March - May (water temperatures between 60°F and 65°F).
- e. Low operation zone selected assumes, that sedimentation hasn't changed the bottom profile to render current information invalid.
- f. The population dynamics of the lake fishery would be maintained as is indicated in the 1990-1992 lake surveys.

2. River below the dam (dam to 6 miles below the dam):

- a. If promoting the existing warmwater fishery, releases from the dam should be stabilized as much as possible.
- b. If promoting the native fish fishery, releases from the dam should be patterned after natural events (higher releases January - March with declining flows after March, with a monsoon spike later on in the year if a monsoon occurs).
- c. That releases can be maintained below the dam and that the dam can be regulated to achieve the desired releases.
- d. That lake elevations are adequate for providing release needs without changing lake operation from acceptable to adverse.

3. River below Planet Ranch:

- a. Water will reach the lower end of the Bill Williams River corridor.
- b. Planet Ranch pumping will decrease in the future.

C. Recommendation Number 3 [Operate Alamo Dam for maximizing the fisheries for the lake, river below the dam, and maintain the river below Planet Ranch during adverse water years].

1. Lake:

- a. Inflow to the lake will not be adequate to maintain lake elevation with in the lower operation zone on an annual basis.
- b. Inflow to the lake will be adequate to restore lake elevation to the lower operation zone once every 3 years.

2. River below the dam (dam to 6 miles below the dam) and River below Planet Ranch:

- a. If the lake elevation is above the 1,110ft. minimum, releases should be maintained at a minimum of 25cfs..
- b. If the lake elevation is at or below the minimum acceptable level, only legally mandated water right releases will be made.

D. Generalized assumption.

The preferred Operation Zones were selected from the elevations where changes in the lake level would result in minimum change in surface acres of the lake that are less than 6 meters (19.68ft) deep. This was determined from the Alamo Lake capacities table.

III. Water operation recommendations that maximize fisheries opportunity during optimal, acceptable, and adverse water years:

A. Purpose:

To provide the Bill Williams River Corridor Technical Committee with water operation recommendations that would maximize the different fisheries during various water years (optimal = wet years, acceptable = normal years, adverse = dry years).

B. Recommendations:

1. Recommendation Number 1 [Operate Alamo Dam for maximizing the fisheries for the lake, river below the dam, and maintain the river below Planet Ranch during optimal water years].

Alamo Lake

The Bill Williams River Corridor consists of Alamo Lake which provides water for the riverine portions between Alamo Dam and Lake Havasu. The Alamo Lake bass fishery has historically been one of the premier largemouth bass fisheries in the state of Arizona. For the purpose of maximizing the lake fishery it would require the use of two different operating zones to maintain the lake in a highly productive state. These operating zones should be rotated

back and forth on a five to seven year cycle. The high water operation would only be possible during optimal water years. The low water operation zone would be the primary operation zone (Fig. 1).

- a. Primary Operation Zone would consist of the following operational criteria:
 1. Low operation zone would range between the lake elevations of 1,110ft. and 1,125ft. above mean sea level. At these elevations a 15ft. fluctuation would not change the available acres of habitat less than 6 meters (19.68ft.) deep to any great extent (Fig. 1).
 2. Prior to the start of the spawning season the lake elevation should be at or near the top of the operating zone (1,125ft. msl) on or before March 15th. This sets the stage for the start of another years operation which provides a pool of water for the down stream releases through the remainder of the year.
 3. During the spawning season (March 15th - May 31st) the lake elevation should not fluctuate more than 2 inches per day (up or down). Zero fluctuation is preferred. The 2 inch per day fluctuation is the maximum rate of change in order to maintain a 0.5 suitability index or better for the above mentioned spawning season. Zero fluctuation during the spawn is the ideal, producing the highest possible suitability index of 1.0. If during the spawning season a storm event occurs where outflow can't match inflow, reestablish the zero to 2 inch per day fluctuation for the remainder of the spawning season after the storm has passed. [Try to minimize the number of days that large fluctuations occur.]
 4. During the growing season (June 1st - September 30th) lake elevation should not drop more than 4 meters (13.12ft.). For survival of the fry it is generally more important to have an increasing water level for the stimulation of plankton blooms. This would equal a maximum weekly fluctuation of 23cm (9 inches) per week.
 5. If the lake elevation reaches the 1,110ft. elevation, releases from the dam will only be made for legally mandated water rights.
 6. If during any time of the year a storm event occurs which causes the fluctuations to be outside of the prescribed fluctuation for that period the prescription will not be re-initiated until control has be reestablished. If releases have

to be made they should be made as fast as possible to reduce the time that extreme fluctuations occur.

- b. The secondary operation zone (high elevation) will consist of the following operational criteria:
1. Operation would consist of any twenty foot range above the upper elevation of the primary operation zone (1,125ft. msl) (Fig. 1).
 2. The ideal zone would be from 1,190ft. to 1,210ft. This is the only higher elevation where fluctuation does not change the available acres of habitat less than 6 meters (19.68ft.) deep to any great extent.
 3. Prior to the start of the spawning season the lake elevation should be at or near the top of the operating zone being used on or before March 15th. This sets the stage for the start of another years operation which provides a pool of water for the down stream releases through the remainder of the year.
 4. During the spawning season (March 15th - May 31st) the lake elevation should not fluctuate more than 2 inches per day (up or down). Zero fluctuation is preferred. The 2 inch per day fluctuation is the maximum rate of change in order to maintain a 0.5 suitability index or better for the above mentioned spawning season. Zero fluctuation during the spawn is the ideal, producing the highest possible suitability index of 1.0. If during the spawning season a storm event occurs where outflow can't match inflow, reestablish the zero to 2 inch per day fluctuation for the remainder of the spawning season after the storm has passed. [Try to minimize the number of days that large fluctuations occur.]
 5. During the growing season (June 1st - September 30th) lake elevation should not drop more than 4 meters (13.12ft.). For survival of the fry it is generally more important to have an increasing water level for the stimulation of a plankton bloom. This would equal a maximum weekly fluctuation of 23cm (9 inches) per week.
 6. If the lake elevation reaches the lower margin of the selected operating zone, releases from the dam will only be made for legally mandated water rights.
 7. If during any time of the year a storm event occurs which

causes the fluctuations to be outside of the prescribed fluctuation for that period the prescription will not be re-initiated until control has been reestablished. If releases have to be made they should be made as fast as possible to reduce the time that extreme fluctuations occur.

**Bill Williams River
[Dam to 6 Miles Below the Dam]**

Historically the Bill Williams River was a typical desert river which demonstrated the characteristic of lots of water for short periods of time and little or no water for long periods of time. This was all changed with the establishment of Alamo Dam. The area from the dam down stream for approximately 6 miles now contains water on a year round basis. Fisheries emphasis for this area is to maintain water in this reach to support the existing fishery with the possibility at a later date of looking into developing a native fish fishery. The native fish involved in the fishery would be desert sucker, sonora sucker, roundtail chub, and longfin dace.

c. Release patterns requested for the existing warmwater fishery:

1. Releases averaging 50 cfs per week or greater for the period of June through September. With this release there would be sufficient water in the summer months to prevent any temperature or oxygen problem from occurring.
2. Releases of 25 cfs or greater for the period of October through May. During the cooler months there isn't any possible problem with temperature or oxygen which would allow for lower releases.
3. All releases should be stabilized to hold the surges at a minimum when possible.
4. If the lake elevation reaches the lower margin of the selected operating zone releases from the dam will only be made for legally mandated water rights.

d. Release patterns requested for the development of a native fish fishery:

1. The native fish fishery releases from the dam should be patterned after natural events (higher releases January - March with declining flows after March).
2. If the lake elevation reaches the lower margin of the selected

operating zone, releases from the dam will only be made for legally mandated water rights.

**Bill Williams River
[Planet Ranch to Lake Havasu]**

The management of the lower river will simply be an effort to promote a native fish fishery if possible. The native fish involved in the fishery would be desert sucker, sonora sucker, roundtail chub, and longfin dace. That portion of the Bill Williams River below Planet Ranch is the primary area where permanent water exists on a year round basis. The amount of water present will depend on the amount of releases from Alamo Dam and the amount of pumping at Planet Ranch.

- e. Release patterns requested for the lower river would be as follows:
1. Release enough water from Alamo Dam to maintain a minimum of 25 cfs flows in the Bill Williams River below Planet Ranch on a year round basis.
 2. If the lake elevation reaches the lower margin of the selected operating zone, releases from the dam will only be made for legally mandated water rights.

Resource Outcome for Recommendation # 1

Under this recommendation the fisheries resource in the lake would fluctuate between increased production during the high water elevation operating period and the recharging of the nutrient levels (re-vegetation or previously inundated) during low water operating periods.

The riverine sections below the dam would be managed for maximizing the fisheries and recreational opportunity by providing both a stable flow regime for the existing fishery below the dam and possibly provide an area for establishing a native fish fishery that doesn't exist at this time.

Without a working computer model, exactly what the outcome would be below Planet Ranch is not known. There are too many variables that are unknown at the present time. The desired outcome would be the establishment of a native fish fishery on the lower end of the Bill Williams River also.

Benefits Resulting from Recommendation # 1

Fisheries:

1. This operational pattern would improve the largemouth bass and catfish population dynamics of the lake fisheries. During the years that the lake elevation is held at the secondary operation zone the populations would increase in size and condition.
2. This operational pattern would result in increases for all other species of fish as well, resulting in possibly making it easier for the foraging bald eagles.
3. This increase in the sport fisheries would result in an increase in the economy of the area.
4. This operational pattern would provide an improved sport fish fishery and a possible native fish fishery that currently doesn't exist.

Others:

1. This operational pattern would result in the recharge of the entire Bill Williams River Corridor aquifer.
2. This operational pattern would result in an increase of the overall biodiversity of the entire Bill Williams River Corridor.

Impacts Resulting from Recommendation #1

1. There would be possible eagle nesting problems during the high water level operation period. This would only be true if low elevation nests were reestablished.
2. Depending on the elevation there may be operation problems for the state park.
3. The improved fishery below the dam may cause an increase in human impacts to the area.
4. It may affect the operation of the Dam by establishing operation zones that may be outside of current Dam operations.

2. **Recommendation Number 2 [Operate Alamo Dam for maximizing the fisheries for the lake, river below the dam, and river below Planet Ranch during acceptable water years].**

Alamo Lake

Operation for optimizing the largemouth bass fisheries in the lake during normal water years should work toward maintenance and stabilization of the bass population at acceptable levels. This would consist of operating the lake continually at the low water operation zone (Fig. 1). Long term operation under this operational plan (10 plus years) will result in a slow decline in the productivity of the system. For the best results the criteria used below for spawning and growing seasons should occur each year, but once every other year would be acceptable.

This recommendation differs from recommendation # 1 in that there is only one Operation Zone; the spawning season has been shortened; and the growing season has been lengthened.

a. **Lake operating zone:**

1. **Low operation zone would range between the lake elevations of 1,110ft. and 1,125ft. above mean sea level. At these elevations a 15 ft. fluctuation would not change the available acres of habitat less than 6 meters (19.68ft.) deep to any great extent (Fig. 1).**
2. **Prior to the start of the spawning season the lake elevation should be at or near the top of the operating zone (1,125ft. msl) on or before March 15th. This sets the stage for the start of another years operation which provides a pool of water for the down stream releases through the remainder of the year.**
3. **During the spawning season (April 1st - May 15th) the lake elevation should not fluctuate more than 2 inches per day (up or down). Zero fluctuation is preferred. The 2 inch per day fluctuation is the maximum rate of change in order to maintain a 0.5 suitability index or better. Zero fluctuation during the spawn is the ideal, producing the highest possible suitability index of 1.0. If during the spawning season a storm event occurs where outflow can't match inflow, reestablish the zero to 2 inch per day fluctuation for the remainder of the**

spawning season after the storm has passed. [Try to minimize the number of days that large fluctuations occur.]

4. During the growing season (May 15th - September 30th) lake elevation should not drop more than 4.6 meters (15.1ft.). For survival of the fry it is generally more important to have an increasing water level for the stimulation of a plankton bloom. This would equal a maximum weekly fluctuation of 23cm (9 inches) per week.
5. If the lake elevation reaches the 1,110ft. elevation, releases from the dam will only be made for legally mandated water rights.
6. If during any time of the year a storm event occurs which causes the fluctuations to be outside of the prescribed fluctuation for that period the prescription will not be re-initiated until control has been reestablished. If releases have to be made they should be made as fast as possible to reduce the time that extreme fluctuations occur.

Bill Williams River
[Dam to 6 Miles Below the Dam]

Historically the Bill Williams River was a typical desert river which demonstrated the characteristic of lots of water for short periods of time and little or no water for long periods of time. This was all changed with the establishment of Alamo Dam. The area from the dam down stream for approximately 6 miles now contains water on a year round basis. Fisheries emphasis for this area is simply to maintain water in the 6 mile area to support the existing fishery with the possibility at a later date of looking into developing a native fish fishery. The native fish involved in the fishery would be desert sucker, sonora sucker, roundtail chub, and longfin dace.

- b. Release patterns requested for the existing warmwater fishery:
 1. Releases averaging 50 cfs per week or greater for the period of June through September. With this release there would be sufficient water in the summer months to prevent any temperature or oxygen problem from occurring.
 2. Releases of 25 cfs or greater for the period of October through May. During the cooler months there isn't any possible problem with temperature or oxygen which would allow for lower releases.

3. All releases should be stabilized to hold the surges at a minimum when possible.
 4. If the lake elevation reaches the 1,110ft. elevation, releases from the dam will only be made for legally mandated water rights.
- c. Release patterns requested for the development of a native fish fishery:
1. The native fish fishery releases from the dam should be patterned after natural events.
 2. If the lake elevation reaches the lower margin of the selected operating zone, releases from the dam will only be made for legally mandated water rights.

**Bill Williams River
[Planet Ranch to Lake Havasu]**

The management of the lower river will simply be an effort to promote a native fish fishery if possible. The native fish involved in the fishery would be desert sucker, sonora sucker, roundtail chub, and longfin dace. That portion of the Bill Williams River below Planet Ranch the primary area where permanent water exists on a year round basis. The amount of water present will depend on the amount of releases from Alamo Dam and the amount of pumping at Planet Ranch.

- e. Release patterns requested for the lower river would be as follows:
1. Release enough water from Alamo Dam to maintain a minimum of 25 cfs flows in the Bill Williams River below Planet Ranch on a year round basis.
 2. If the lake elevation reaches the lower margin of the selected operating zone releases from the dam will only be made for legally mandated water rights.

Resource Outcome for Recommendation # 2

Under this recommendation the fisheries resource in the lake would remain strong, largemouth bass recruitment would be good, and nutrient levels will be stable at first and then slowly decline if this operation continues for an extended period of time.

The riverine sections below the dam would be managed for maximizing the fisheries and recreational opportunity by providing both a stable flow regime for the existing

fishery below the dam and possibly provide an area for establishing a native fish fishery that doesn't exist at this time.

Without a working computer model, exactly what the outcome would be below Planet Ranch is not known. There are too many variables that are unknown at the present time. The desired outcome would be the establishment of a native fish fishery on the lower end of the Bill Williams River also.

Benefits Resulting from Recommendation # 2

Fisheries:

1. This operational pattern would promote a stable largemouth bass and catfish fisheries in the lake.
2. This operational pattern would result in stabilization of all of the other species of fish, including the forage base for the nesting bald eagles.
3. This stabilization of the sport fisheries would result in stabilization of the economy in the area.
4. This operational pattern would provide an improved sport fish fishery and a possible native fish fishery that currently doesn't exist.

Others:

1. This operational pattern may result in the recharge of the entire Bill Williams River Corridor aquifer.
2. This operational pattern would result in an increase of the overall biodiversity of the entire Bill Williams River ecology of the system.
3. The consistent water elevation of the lake would assist the state park in their operation and development of the area.
4. The consistent water elevation of the lake would benefit the eagles in that they would not have to have as many alternate nest sites.
(Artificial nesting sites could also be established)

Impacts Resulting from Recommendation #2

1. As is common with all reservoirs the quality of the fishery will decline with time because of a continual decline in lake productivity.

2. The eventual decline in the lake fishery will result in a decline in the economy for the area.

3. **Recommendation Number 3 [Operate Alamo Dam for maximizing the fisheries for the lake, river below the dam, and river below Planet Ranch during adverse water years].**

Because of the nature of the area there will be periods of time when the watershed receives very little water. During those years it is imperative to strive to protect the lake fisheries (don't continue to drain the lake for reasons other than fisheries). In drought years all operation for down stream activities, other than legally mandated releases, should be discouraged (Fig. 1.).

This recommendation differs from recommendation # 2 in that operation zone should be met at least once every 3 years; growing season constraints have been dropped; and riverine constraints have also been dropped.

Drought Operation

- a. Strive to operate the lake under the criteria set up under the low water operation zone at least once every 3 years to insure spawning success at least once every 3 years.

- b. During the other years maintain the lake elevation as high as possible.

- c. During the spawning season (April 1st - May 15th) the lake elevation should not fluctuate more than 2 inches per day (up or down). Zero fluctuation is preferred. The 2 inch per day fluctuation is the maximum rate of change in order to maintain a 0.5 suitability index or better. Zero fluctuation during the spawn is the ideal, producing the highest possible suitability index of 1.0. If during the spawning season a storm event occurs where outflow can't match inflow, reestablish the zero to 2 inch per day fluctuation for the remainder of the spawning season after the storm has passed. [Try to minimize the number of days that large fluctuations occur.]

- d. If the lake elevation reaches the 1,110ft. elevation, releases from the dam will only be made for legally mandated water rights.

- e. If the lake elevation is below the 1,110ft. msl. mark and a storm event occurs, 25% of that storm event should be released for down stream fisheries needs. The remaining 75%

of the storm should be retained in the lake.

Resource Outcome for Recommendation # 3

Under this recommendation the lake fisheries would be sustained through the low water years with little concern for the river other than the legally mandated water rights.

Benefits Resulting from Recommendation # 3

1. Maintain the fisheries in the lake.
2. Maintain the economy associated with the fishery.

Impacts Resulting form Recommendation # 3

1. If the lake elevation dropped below the 1,110ft. level there would be an effect on the operation of the park.
2. There could be a negative effect on the nesting eagles in the area as it pertains to forage.
3. There would be a decline in the existing fisheries in the lake.
4. There would be a possible adverse effect on the fisheries in the riverine sections of the system.
5. There would be a decline in the economy in the area.

IV. Information Needs and Deficiencies:

During the course of the discussions several needs and deficiencies were brought out. The list is as follows:

- A. Need for establishing some type of gaging station on the lower end of the Bill Williams River below Planet Ranch in order to fill the void in flow information at the bottom end of the system.
- B. Surveys are needed to establish a base line for the current fisheries and other aquatic organisms in the riverine sections.

- C. It was not known what releases would be required to establish a surface flow on the Bill William River below planet ranch (25cfs, 10cfs or ???).
 - D. What pool size would be required in the lake in order to maintain a surface flow in the river below Planet Ranch and still keep the lake at an elevation above 1,110ft.
 - E. Temperature information on the lake to determine the effects of various storm events.
 - F. The entire process would have been easier if a hydrological model had been available for use by the various subcommittees during their effort to come up with the various flow requirements.
- V. Issues, Concerns, and Opportunities Regarding Water Management for the Fisheries Resources:
- A. The importance of the Alamo Lake fisheries.
 - B. The importance of the fisheries resource as it relates to the nesting bald eagles.
 - C. The issue of trout in the artificial cold water riverine system below the dam as it pertains to the wilderness.
 - D. The issue of park operation and maintenance.
 - E. The issue of recharging the aquifers below the dam.
 - F. Flood control issues and concerns.
 - G. The issues associated with the development and maintenance of riparian area along the river.
 - H. The potential of increased public use on the lake and in the area below the dam.
 - I. Problems associated with the enforcement of the various regulations in the area, above and below the dam.
 - J. The etched in stone "1,100ft elevation" !!!!!!!

ALAMO LAKE BASS HABITAT

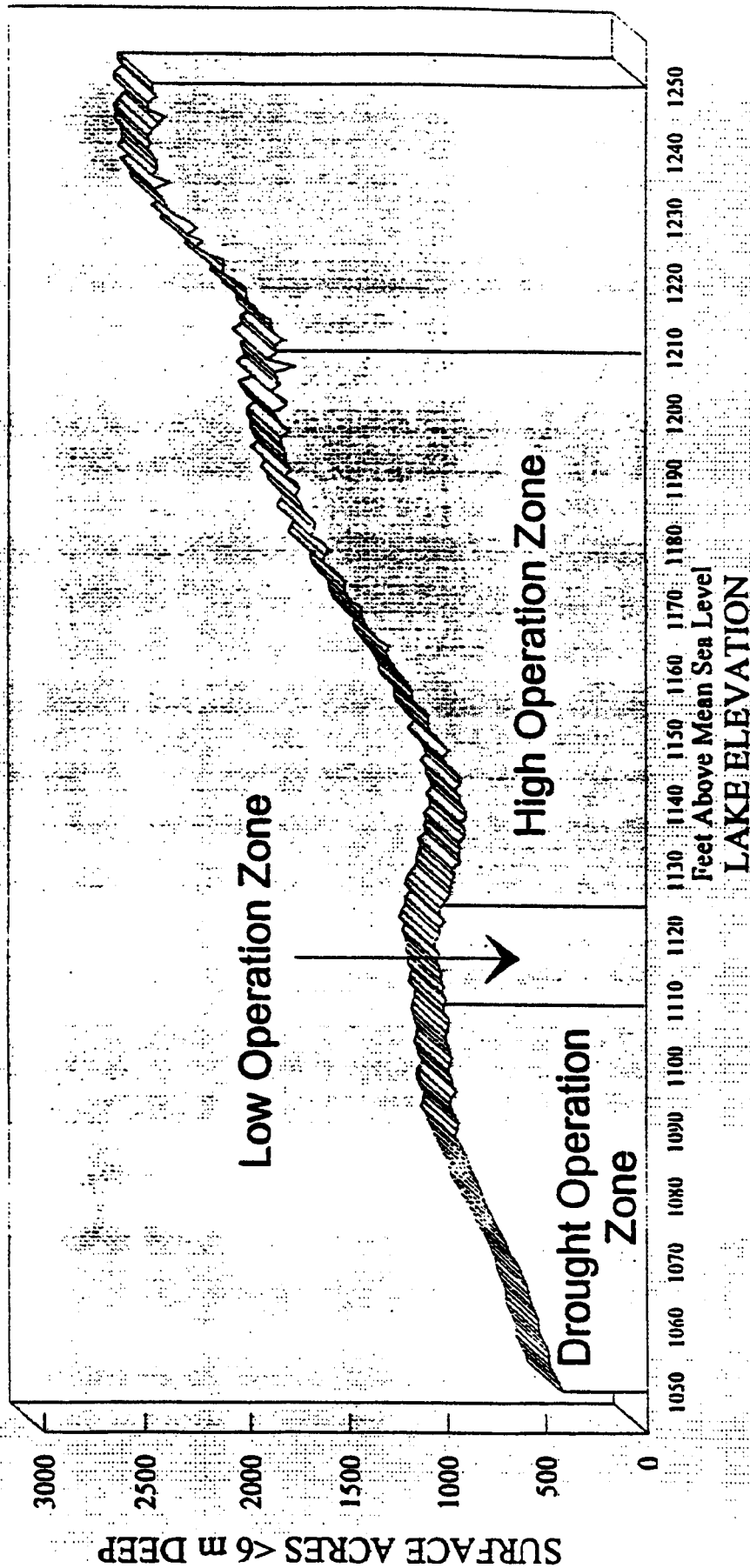


Figure 1: Alamo Lake largemouth bass operation zones:

SUMMARY OF SPAWNING CRITERIA

	WET WATER YEARS	NORMAL WATER YEARS	DRY WATER YEARS
Lake Elevations:	Low Zone : 1,110 - 1,125ft. msl High Zone: Above 1,125ft. msl Preferred High Zone: 1,190 - 1,210ft, msl	Low Zone : 1,110 - 1,125ft. msl every year for best results; once every other year would be acceptable	Low Zone : 1,110 - 1,125ft. msl at least once every 3 years
Season Dates:	March 15 - May 31	April 1 - May 15	April 1 - May 15
Lake Fluctuations:	Maximum of 2 inches per day (Zero fluctuation is the best)	Maximum of 2 inches per day (Zero fluctuation is the best)	Maximum of 2 inches per day (Zero fluctuation is the best)

SUMMARY OF GROWING SEASON CRITERIA

	WET WATER YEARS	NORMAL WATER YEARS	DRY WATER YEARS
Lake Elevations:	Low Zone : 1,110 - 1,125ft. msl High Zone: Above 1,125ft. msl Preferred High Zone: 1,190 - 1,210ft, msl	Low Zone : 1,110 - 1,125ft. msl	No Requirement
Season Dates:	May 16 - Sept. 30	May 16 - Sept. 30	No Requirement
Lake Fluctuations:	Maximum Weekly fluctuation of 9.5 in.	Maximum Weekly fluctuation of 9.5 in.	No Requirement

ATTACHMENT I

All comments were appreciated and taken into consideration. The types of comments that were received were both general and specific. Several of the suggestions were made in the new report that is enclosed with this memorandum. Comments that were more in the form of questions will be addressed in the remainder of this memorandum.

Comment # 1:

Currently a suggested maximum elevation change is 2 inches per day with a maximum shift of 4 meters. How does this compare to current operations? It seems like such a shift would greatly affect aquatic macrophytes, which provide both food and cover.

Answer: Any elevation change indeed will have some affect on the aquatic macrophytes. It is recommended that there be zero fluctuation if possible or the maximum of 2 inches per day during the spawning season. Current operations change from year to year. In general, the release patterns have had a tendency to exceed 2 inches per day and macrophyte production has not been a problem in the past.

Comment # 2:

Native fish fishery releases from the dam should be patterned after natural events. This I am sure will benefit native fishes, but will also benefit non-natives.

Answer: You are correct in your assumption.

Comment # 3:

Is there enough water in Alamo to support the proposed flows to begin with? And with what probabilities can we expect normal, wet, and dry years?

Answer: For the fisheries recommendations there is enough water. If water availability starts to become a concern the operation of the dam shifts to the next recommendation. Once the water elevation reaches 1,110ft. msl the dam is closed to maintain the lake.

As for the probability of expecting the different water years your guess is as good as mine.

Comment # 4:

In the fisheries technical report there are many references to the possibility of native fish reintroduction below the dam, however there is nothing stated about water temperature being a limiting factor for this effort.

Answer: Temperatures have been collected with various water releases from the dam and it was determined that it would not be a factor. Therefore, there was no mention of temperature in the report.

Comment # 5:

Define hydrologic conditions or parameters that constitute "optimal water years" (wet years), "acceptable water years" and adverse water years". Are these designations based on peak discharge levels into alamo or on lake elevations?

Answer: I am not quit sure how to respond to this question. I would like to see, at least for the fisheries, all reference to the different water years dropped. In fisheries, the state of the resource is dependent of the stability of the lake and the use of different lake elevations during various years. The elevations that were selected in the fisheries report are ones that appeared to be feasible. They are not the only ones or even the best ones, they are the most acceptable ones for fisheries under existing constraints.

Comment # 6:

Identify adverse conditions and limitations within each of the recommendations (i.e., minimum and maximum allowable rates, beyond which adverse impacts to the resource are likely).

Answer: These rates that you request are in each recommendation. Minimum = "0" fluctuation Maximum = "2 inches per day" for the spawning season. There are similar criteria was established for the growing season.

Comment # 7:

The sections for recommendations # 1, 2, and 3 are highly repetitive thus adding unnecessarily to the length of the document and making it difficult to determine the generally minor changes between the recommendations. A better approach might be to keep recommendation #1 as is, but for recommendations #2 and 3 summarize the changes from #1 and delete the redundant sections.

Answer: This could be done easily as you mentioned. The reason it wasn't is that it was felt that each one could be able to stand alone. I will go

ahead and include a statement in **Bold** for recommendation #2 and 3 that will indicate the differences.

Comment # 8:

On Page 4, D. Provide justification for the use of the 6 meter figure. Don't most bass spawn at 1-2 m depths?

Answer: When looking at just the spawning season you are basically correct with your 1-2 meters comment. However, the 6 meters figure is referring to the water area that the bass use the entire year not just during the spawning season.

Comment # 9:

On Page 5, a.1. Provide justification for the 1,110ft. minimum range. How is this better for the fishery than the existing 1,100ft. level?

Answer: This question was basically answered under comment # 5. In general any elevation that provides more surface acres of water that is less than or equal to 6 meters deep is better. An elevation of 1,110ft. is better than 1,100ft. as 1,100ft. is better than 1,090ft.

Comment # 10:

On Page 5, a.6. This recommendation could be highly debated. If a substantive flood event occurs that raises the lake significantly, wouldn't it be better to use the new lake elevation to establish the high operation zone?

Answer: Yes, if the lake has been down for several years and there is a commitment from the Corps of Eng. to maintain that higher elevation for three to seven years if water availability permits. This would establish a new low water elevation for those years which is higher than 1,125ft.

If the lake elevation rose 10 or more feet in a few days, how would it benefit the fisheries to release these waters as soon as possible to the original elevation?

Answer: I am not sure where you came up with this question. What is said is that once the storm event is over reestablish the prescribed fluctuation rates. The rates will depend on the time of year that the storm event occurred. "If releases have to be made (for other than fisheries reasons) they should be made as fast as possible to reduce the time that extreme fluctuations occur." There is no mention of returning to the original elevation following a storm event.

Should the seasonality of flooding events be considered in determining how rapidly waters are released from the dam?

Answer: This is basically answered in the bold print above. In short "YES" but that is the Corps of Eng. call not the BWRC Fisheries Subcommittee's.

Comment # 11:

Page 6, b.2. This recommendation fails to account for the Corps Flood Control pool operation criteria.

Answer: You are correct. This is a fisheries recommendation and it simply states that the zone between 1,190ft. and 1,210ft. elevations would be "ideal". Just above there in b.1. it is stated that any 20 foot range above the upper elevation of the primary operation zone (1,110ft. - 1,125ft.) would be OK.

Page 6, b.2. The logic behind the selection of the 1,190ft to 1,125ft. range is unclear and appears ill-advised particularly during the spawning season. For acres of habitat to remain relatively stable during a 35 foot fluctuation would mean that bottom slopes in water <6 meters would be relatively steep.

Answer: You have your elevation numbers backwards and the area that we are looking at is a 65ft. area not a 35ft. area of which we are only targeting 20ft of it in there somewhere (depending on water availability when implementing the secondary operation zone).

As for the logic, in order to stimulate the productivity in the lake one has to inundate areas that have been high and dry for a period of years. Therefore any 20ft. operation zone higher than the primary operation zone would accomplish that end.

Comment # 12:

Page 14,e. Specify what is intended by 25% and 75% of storm events. Is this based on total storm inflow volume? Over what period of time should downstream releases occur and water be retained in the lake?

Answers: The intent is to use 75% of any particular storm event to build the lake back up to the operating zone and 25% of the storm event to keep water in the system below. This is based on total volume of each storm. The down stream releases and periods should be made in accordance with other down stream requests.

Comment # 13:

Page 14, Recommendation #3, Benefit #1 "Sustain a fisheries in the lake." and Impact #3 "There would be a decline in the existing fisheries in the lake." appear contradictory.

Answer: Maybe the word should be maintain instead of sustain. The word change will be made in the text. As far as the contradiction, there is none. The implication is that the fisheries will be maintained but the population numbers will be smaller.

Comment # 14:

How does the Corps of Eng. know what scenario they are in?

Answer: They will know by the amount of water they are able to maintain during the year. If during the year they are not able to maintain the lake elevations in the Primary Operation Zone they are in the Drought Operation Scenario. If they receive a large inflow and they have been operation under Drought or Primary Operation Scenario for a period greater than 3 years they should start operation under the Secondary Operation Scenario of Recommendation # 1. If the Corps of Eng. have been operating under the Secondary Operation Scenario of Recommendation # 1 for a period of 3 to 7 years if is possible that it is time to return to the Primary Operation Zone of Recommendation # 1. In short the availability of water will indicate what Scenario to operate under and when a change should be made.