

Annual 2020 Presentation on Lakeside Conditions

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This writing is Part 1 of 5 of the proposed Open Circle (LCS) presentation that was scheduled for 15 Mar 2020, but was canceled due to the coronavirus actions restricting large public gatherings. Part 1 below addresses the condition of the lake and its fish as well as water supply and wastewater treatment in the lakeside villages. Later portions of this presentation in the near future will address the following topics:

- A. Desired actions and concerns by frustrated villagers at lakeside
- B. Actions of the past year by Chapala and other counties about the lake
- C. Actions by State and Federal Government that may impact lakeside
- D. The challenges of administering 3-year long county governments with near zero professional staff, no urban planning skills, funding mysteries, complex government project submission formats and the frequent lack of continuity of worthy projects begun by previous administrations.
- E. Status of 3000 children along north east shore of the lake facing fatal kidney disease
- F. Political directions by county, state and federal governments that may impact the Lake Chapala area.
- G. Expected impact and the future of the coronavirus now spreading over the nation
- H. Impact of the pending failure of the 30-year-old water pipeline from the lake to Guadalajara that supplies daily water at 10,000 liters/second around the clock for 3,000,000. How many of them in the face of up to a 30-day stoppage will seek refuge at lakeside?

PLEASE let me know which of the above or another topic you may wish to know better.

Lake Condition: The lake was about 70% full in Mar 2020, 80.5% full in Mar 2019, but never full in the past 40 years. As of 11 Mar 2020, the lake surface is down 7 ' from when full. The lake surface was down 22 ' in 2002 and 23 ' in 1955,

the lowest levels on record. Water pumped from the lake near San Nicholas at a rate of 2500 gal/sec (10,000 liters/sec), 24 hours/day sustains 3,000,000 of the 5,000,000 inhabitants of Guadalajara. That amounts to 12-15"/year off the lake. Little known to the public another 14-16"/year is taken off the lake for agricultural irrigation along the Rio Santiago via pumps at Ocotlan undisclosed to the public. One could extract 2" more off the lake/year if all 330,000 population in the lakeside villages were to gain their drinking and household water at lower cost and with less risk of heavy metal contaminants from the lake rather than from 500' deep wells. This action is recommended in particular for Chapala and nearly all villages eastward to Ocotlan due to excess arsenic and nitrogen ammonia in government well water. Annual evaporation from the lake is about 60." The lake bacteria level is normally 75% below the safety limit for recreational use, thus 4 times better than found at an average California beach. As long as the lake is at least 30% full there are no elements in the water that exceed the safety limits for it being a source for treatment for human consumption. Basic required treatment consists of: (1) settling and filtering out soil particles and (2) destroying bacteria via disinfection such as with bleach. It is economically impossible to adequately treat water from wells drilled into volcanic geologies in household quantities (100 to 250 liters person/day) due to excessive contaminants like heavy metals. Thus, at any time the lake is below 30% full, the inhabitants of Guadalajara should not drink the water whose treatment does not include removing heavy metals, which will never be economical. The fisherman drink the lake water, once observed to be clear at 100-200 meters out from the constant wave stirred up mud along the shore line. Some inter village inhabitants beyond the reach of government well water systems also collect their water from the lake out from the shore where it is clear. My annual demonstrations of drinking the lake water come from such water often taken 100 m out from the shore line. Contrary to claims of aspiring local politicians, Guadalajara's political power as the #2 city in the nation, is the best friend the lake has for it continuing to exist. The day the lake becomes too low is the day Guadalajara must admit 3 million of its 5 million, a population destined in the coming decade to exceed 10 million population, can no longer be sustained in the city. Thus, that will never happen since the lake is the only sustainable water source for 100s of miles to meet the needs of that city's population which will continue to increase in coming decades. Lirio coming down the Lerma River to the lake has been light this year. Those 4 states up the Lerma River from our lake have the capability of collecting 100% of the water flow of the Rio Lerma that might come to the lake via their 500+ dams built since 1930. Since 1990 it is

estimated that there have been 6 years when no water reached the lake at all via the Lerma River. The major reason for periodic infestation of the lake by lirio comes about when the gates of such dams up river are opened to flush out accumulated lirio. As in Asia, someday someone will recognize that lirio, with over 30% protein content, could be combined with the area's abundant chopped corn stalks to create a good livestock feed.

There is great unrecognized potential use of the 9000 acres of shoreline/beach now exposed, as the lake at this time is 70% full. In 2002 the lake was so low that the exposed beach area was 43,000 acres thus 15% of the total full lake area of 281,000 acres was exposed, when the lake volume was down to 15% full. All water in Mexico to include its lakes/arroyos are under federal control via the Federal Water Commission (CONAGUA). The lake plus the exposed shoreline up to the lake edge when full plus 10 meters is ALL under federal control and defined as the "Federal Zone." Thus, legally no person or organization one can build a commercial business near the lake's edge. In the lake's 40 years of not being full the distance from its upper beach edge to the water's edge has at times exceeded distance of a mile. It is likewise thus also not possible to build a marina out into the lake. Consequently, Mexico's largest lake appears UNUSED by the public as for recreation and tourism. To correct this situation, the 9 counties about the lake, need to appeal to Jalisco and Michoacán States to seek authorization from the Federal Water Commission (CONAGUA) of the government to be permitted to create appropriate commercial facilities along the lake shore for the public which can accommodate elevation flocculation's of the lake's surface .

Lake's Fishing Potential: Over 15 year ago near 3000 lakeside families gained their livelihood from fishing the lake. That number is now down below 1000. Three factors stand out: (1) with no concern for the future of taking fish of any size and age this practice of unregulated overfishing has basically has resulted in no adult fish to produce young; (2) The volume of the lake in 2001-2 was down below 14% full; and (3) the government has failed to effectively stocked the lake to sustain the fishing industry. On the up side our pilot floating cage aquaculture project developed cage designs, anchoring against currents and 6 'high waves in the night, appropriate feeding, sizing to avoid cannibalization and proof that 5 tons of high value fish could be economically raised in each 20 'diameter, 6 'deep cage. The future now awaits discovery of the potential for our lake accommodating similar cages to provide up to 15,000 jobs with just the use of 1% of lake surface area for fish cages. Given this application at the lake it could inspire extension to

the other surface water bodies of this nation. Interior to Mexico it is believe possible to create as many as 1 million new jobs for impoverished villagers via such aquaculture. Fishing is like hunting while aquaculture is like farming. It is best that the development of aquaculture focusses on families and women rather than the traditional fishing coops promoted by the Federal Secretary of Agriculture (SAGARPA). Despite lingering false reports, the internationally reported testing of over 200 fish from 20 locations in the lake has proven that heavy metal contamination of the fish does not exist, but rather it is 60% below the international limit for safety.

Village Well Water: For over 10 million years or more the inhabitants about the lake for the most part gained their water from the lake. Some smaller settlements away from the shore developed because they had a natural spring that flow from the hills. Up until 1978 the lake could be counted on being full and thus with a constant volume and fixed shoreline. Further, this sustained flow of incoming water each year assured that any contaminants were flushed out each 18 months. In the millions of years before that time the full flow of the 750 km long Rio Lerma reached the lake and the excess water flowed out the northeast corner at Ocotlan to the Rio Santiago. Such outward flow to that river has not happen for over 40 years due to the excessive consumption of the states along the river above Jalisco State.

It is understood that perhaps 50-70 years in the past the federal government decided to support the drilling of wells for the 30 or so villages about the lake. This appeared to be a logical direction for village water supply throughout the nation. It must have been recognized that the 9 counties about the lake would not have the technical ability to treat the lake water to meet desired national safety standards. Given normal earth conditions, rock and soil conditions, this federal mandate that wells be drilled up to 500 ' deep seemed logical. Unfortunately, given the 20 inactive, but heated rock of volcanoes from Chapala to the east end of the lake their emerged a risk for such wells often producing water containing hazardous heavy metals. Chief among these injurious contaminants has been arsenic at up to 3 time the safe health limit. Further, the choice of well locations easily accessed below villages near to the lake edge, has resulted in a second hazard. From such sites the wells while intercepting ground water flowing down from the hills and beneath the lakeside villages, they also encounter nitrogen ammonia at up to 5 times the safe health limit. This contaminant is a by-produce of often centuries of communities back yard defecation being carried downward by annual rainy seasons to then reach the water flowing below a village. The more prudent action

should have been for the well drilling rigs to select sites above each village to thus only encounter the natural underground water flow from the mountains down to the lake.

The third challenge with many of these village wells, beyond arsenic and human waste by-products has been the discovery that very large amounts of costly electric are required to lift well water 500 to 800 ' from these deep wells to then send it on to hill side storage tanks. If water was obtained from the nearby lake, perhaps less than 20 ' below a village, it would be possible to reduce electrical power pumping costs by up to 90%. For some villages, like La Questa, because of the challenge of facing the very costly electrical power costs the result is such poor villages are only being able to pump water 5-8 hours/week.

Water from deep wells in these village is most often sensed as being safe because it appears clear. What few in the villages have never been told is that water quality tests by the state, recognizing various excessive contaminant levels, have not been able to economically to remove these injurious substances from such government wells. Those in the villages who do know of the danger of these contaminants in the well water, who also have the money to purchased bottled water at 5 times what they pay annually for the well pumped water, are able to avoid these dangerous substances in the government provided water. In turn those without such income must live with the life-long dangers of their well water, which can be especially challenging to the delicate organs of children, and result in their death often in 5-15 years.

For villages of less than 1000 population it seems normal for the government to target water supply at about 100 liters/day/person (26 gallons). For village with up to 8000 inhabitants water supply may be planned to be near 150 liters/person/day (40 gallons). For county capital towns often with population that may exceed 25,000 inhabitants, the target water supply may be up to 250 liters/person/day (66 gallons). This level of water supply also appears to be what the governments seeks for the 5 million inhabitants in Guadalajara.

Village Wastewater Treatment: Culturally it seems that while the nation's citizens will literally go to war over water access, they have very much less interest in their wastewater being treated. Feedback from lakeside villages suggests each household is satisfied if there is a simply a sewer pipe to take wastewater on to the next property house or farther, where gravity hopefully will take it down hill. Essentially Mexico treats at most just 30% of wastewater. Recall that it was only

in the last few years that a treatment plant for the 5 million population of Guadalajara was finally built. Likewise, it was not until about the year 2000 that a treatment plant was built in the Tula Valley for the wastewater of nearly 13 million of Mexico City's 23 million inhabitants. For ages before that all hazardous sewage flow out of that mega city to any place gravity would take it, generally to the south and east in very large, open channels. Remarkably, a major portion of the city's food was grown from this "nutrient rich" untreated wastewater. See <https://www.theguardian.com/cities/2015/nov/12/mexico-city-water-crisis-source-sewer>. Back to lakeside. To its credit treatment of wastewater along the Lerma River on its way to the lake encounters over 100 treatment plants on its banks. As for lake Chapala there is over a dozen wastewater treatment plants related to the communities generally with a population in excess of 5000. That is this region possesses far more than most of Mexico facilities to treat wastewater. Nationally, Mexico in communicating with its international associates on this topic uses the word sewers as its reply to having adequate sanitation, versus admitting that it is definitely a Third World nation when it comes to how backward it is in the actual treatment of wastewater. A local example of the fate of wastewater treatment is that of the city of Poncitlan. It had a treatment plant, which it abandoned after deciding that the high cost of electric from CFE was too much for the city. Thus, for over a decade now each day over 3,000,000 liters of untreated wastewater flows off to the Rio Santiago, the perhaps the most polluted river in all of Mexico. A similar condition existed up until recent years for the 5000-person village of San Pedro Itzican until we were invited to fixed the fouled sewer and inoperative treatment plant.

Comments, additions and corrections are welcomed.

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