Colorado River Citizens' Forum
Yuma, Arizona
June 9, 2008
***Tentative Meeting Notes**

Board Members in attendance:

Tom Davis	Richard Ryan
Bill Plummer	Nancy Wright
Brian McNeece	Stella Mendoza
Wade Noble	Mark Watson
Francisco Zamora	

Board Members absent:
Cary Meister
Kevin Eatherly

USIBWC Staff in attendance:
Al Goff
Anna Morales
Sally Spener

MXIBWC Staff in attendance:
Francisco Bernal

- 16 Members of the public in attendance

Welcome and Introductions
Bill Plummer, Chaired the meeting, welcomed the attendees and asked everyone to introduce themselves.

The Colorado River – A Hydrologic update: Doug Blatchford, Manager, River Operations Group, Boulder Canyon Operations Office, U.S. Bureau of Reclamation

Overview of the Colorado River Basin:

- 16.5 million acre-feet (maf) allocated annually in the system
- 13 to 14.5 maf of annual consumptive use
- 60 maf of storage, most of it in Lake Powell and Mead. Both of those reservoirs have about 25 maf each, the remaining 10 maf are upper and lower basin reservoirs.
- 15.1 maf average annual "natural" inflow into Lake Powell over past 100 years
- Inflows are highly variable year-to-year. Statistics are used quite often to get averages, running means etc.
- There are seven basin states: Upper Basin States are Colorado, Wyoming, Utah, New Mexico; Lower Basin States are California, Arizona, and Nevada.
- 85% of snowfall comes from western Colorado.
- Can store 4 times the average annual inflow
- The system has worked exactly as designed as we have made essentially all of our delivery commitments despite having the worst eight-year drought in the last century

Lower Basin Colorado River Management Objectives:

- Provide flood control and river regulation
- Meet water demands downstream
- Generate hydropower
- Enhance and maintain ecosystem habitat
- Recover and protect endangered species
- Provide recreation

Natural Flow of Colorado River at Lee Ferry Gaging Station, Arizona
Calendar Year 1906 to 2005:

- 100-year historical average is 15.1 maf
- Inflows are highly variable
- Period from 1953-1964 has the lowest 12-year average inflow, with a couple of pretty good years in the period
- Compact was signed in 1920's ratified in 1928, going through one of the wettest years in last 500 years of the Colorado River.

Q (question): Please explain the 100 year average?
A (answer): It's actually a one year moving average.

Q: Is the lower basin using more than their allocation?
A: Consumptive use report available on USBR website at www.usbr.gov/lc Water Operations link.

Summary of drought (1999-2008)

WY	Unregulated inflow into Powell % of Average	Powell &Mead Storage, maf	Powell and Mead % Capacity	
1999	109	47.59	95	
2000	62	43.38	86	- hit drought
2001	59	39.01	78	
2002	25	31.56	63	
2003	52	27.73	55	
2004	49	23.11	46	
2005	104	27.24	54	- wet year
2006	72	25.80	51	
2007	68	24.43	49	
*2008	107	27.04	54	* based on May 24 Month Study

2000 to 2007 is the driest 8 year period on record

Colorado River drought:

- Tree-ring reconstructions show more severe droughts have occurred over the past 1200 years. A Mega drought occurred in the mid 1100's
- Projected 2008 April through July runoff forecast this year of 116% of average (as of June 4, 2008)
- Not unusual to have a few years of above average inflow during the middle of a drought
- In the 1920's Compact was signed during one of the wettest periods.

2008 Upper Colorado Projected April-July inflow:

- Flaming Gorge 66% of average (Wyoming/Utah)
- Blue Mesa 156% of average (Colorado)
- Navajo 131% of average (Colorado/New Mexico)
- Lake Powell 116%of average (Utah/Arizona)

Reason for the Interim Guidelines:

- Eight years of drought
- More consumptive use
- To date, there has never been a shortage in the Lower Basin and there were no shortage guidelines
- Operations between Lake Powell and Lake Mead were coordinated only at the higher reservoir levels

Interim Guidelines – A Robust Solution

- Full operations of the two lakes
- Intentionally Created Surplus (ICS) which is the ability to create surplus water in the system and store somewhere else.
- Strategies for shortages in the Lower Basin
- Last until 2026
- Avoided litigation between the Basin States

Q: Will Mexico be sharing the shortage?
A: Per the 1944 Treaty there is a requirement of 1.5 maf to be delivered.

Sally Spener, USIBWC, elaborated: Per the 1944 Water Treaty, in the event of an extraordinary drought making it difficult for the U.S. to deliver, Mexico would be reduced in proportion to the reductions of the U.S.

Probability of Occurrence of Any Shortage in the Lower Basin – The Final Environmental Impact Statement (EIS) looked at the "No Action" alternative vs, New Interim Guidelines

- Under No Action, by 2012, 40% chance of going into some kind of shortages
- With the new guidelines, by 2012, 22% chance of going into shortage
- Under No Action, by 2026, 49% chance of shortage
- New guidelines, by 2026, 40% chance of shortage

Colorado River Basin Storage as of June 8, 2008:

- Lake Powell 56% full (13.59 MAF)
- Lake Mead 47% full (12.06 MAF)
- Total system storage 56% full (33.13 MAF) – last year 57% (33.78 MAF)

<u>Quagga Mussel – Dealing with an Invasive Species: Leonard Willett, Hoover Dam Water Treatment Group Manager, Lower Colorado Dams Office, U.S. Bureau of Reclamation</u>

Background:

- 1988 Great Lakes experienced massive infestation of the Zebra Mussels
- Difference between Quagga and Zebra Mussels - they are virtually the same but the Quagga likes to go deeper, produce a little more and can survive several conditions. Considered to be stronger and can adapt to the environment.
- USBR Lower Colorado Dams (LCD) Contracted with Quagga Mussel Consultant Renata Claudi (RNT Consulting)
- The things learned on the Great Lakes are not happening here. Great Lakes had two reproductive cycles. Here in this area, 6-7 reproductive cycles have been identified.
- A comprehensive facility review of Hoover, Davis and Parker Dams was conducted
- Reported on findings & potential control/preventive measures.

Site visit to Ontario Hydro Power Facilities:

- Facility is taking reactive approach – Does allow mussels to grow in the system and periodically treats.
- Three of the plants are located along the Niagara River: Sir Adam Beck 1 (SAB1) Sir Adam Beck 2 (SAB2) and Sir Adam Beck Pump Generating Station (SAB PGS). The DeCew Falls 2 plant draws water from the Welland Canal.
- Sir Adam Beck #2, a 1360 MW capacity, is the largest plant in the OPG Hydroelectric portfolio.
- The Pump Generating Station is a type of hydroelectric generating station where water is pumped into a reservoir during low demand times, and then used for generation during high demand times.

Nanticoke Coal Fired Facility Ontario:

- Facility is taking proactive approach – Does not allow growth of mussels in the system and treats to control the mussels.
- Facility is located on shores of Lake Erie in the City of Nanticoke, Ontario
- More sensitive to shut down - $100k/day/unit downtime
- Nanticoke has 4000 MW capacity, is one of the largest plants in Ontario and provides 20% of the power.
- Four stream turbine generator units.

If left untreated (Photo shown of a 6 inch transformer cooling water pipe at Ontario Hydro Power):

- Facility intermittently added chlorine
- PVC pipe plugged with mussels
- Mussels will clam up to protect themselves up to 10 days when sensing danger in the environment
- When treating, need to be very diligent
- It did not take long before PVC piping became brittle, pumps broke down and the automatic system became dysfunctional
- Many other technologies have been evaluated by OPG over the years, but sodium hypochlorite is still the favored and most effective approach in our operating environment
- Over time, because the systems broke down a lot, there was not much “continuous” treatment taking place. The system often ran for a few days, and then broke down, requiring repairs. The “temporary” system was becoming a very labor intensive system to operate, and ultimately a system that resulted in ineffective treatment
- After chlorination treatment began, killed all the mussels but experienced tremendous amounts of dead shells.
- Dead shells ended up in the manifold entrance to the generator coolers.

Infestations at the Dams:

Hoover Dam

- Inspected 30 ft pipe, 212 feet below Hoover
- Did have mussel colonization in the lower penstock 220 feet below
- Very fine Veligers, never found in the Great Lakes below 68 feet, major concern
- Intake at dam, 66 feet below the water level had heavy colonization; 141 feet below had moderate colonization; 217 feet had no colonization (other then penstock)
- Recommendation: Control strategies

Q: How are the mussels affected by velocity?
A: Mussels do not want to settle down where flow rate is 6 feet per second

Parker Dam

- Sampling plastic plates at Dam in water for 6 weeks, totally colonized
- Water warm enough, calcium high enough, mussels really like environmental conditions
- Dam has major colonization
- Tested using stainless steel 6 inch pipe, in for 6 weeks, only had 5 inch pipe left
- Recommendation: Environmentally friendly treatment. Doing a lot of environmentally friendly research in the area

Davis Dam

- Penstock gate, fully carpeted with mussels
- Drain holes in gates clogged causing it to no longer drain out water. Causing severe weight on gates for lifting mechanism to lift gates, major maintenance problem.
- Recommendation: keep drain holes clear/clean.

When started the review of the dams, figured they had about a year before the mussels would bio-foul. Unfortunately, mussels much faster then they could get the substrates into the dams. They had bio-fouled before the review had even started. Mussels have bio-fouled Davis and Parker Dams.

Findings and Potential Control Measures:

- All three dams used the same settlement substrate on the sampling plates
- Same dimensions
- Same depth
- Examined the plates at the same time
- Multiple strings of sampling plates used

Ontario Hydro used Bio-Box with live mussels in their research. They would add chlorine, the mussels would clam up. After six days, 65% are still alive. After ten days, 100% where killed.

Structures that are in direct contact with external environment, no isolation is possible.

Reactive Options for External Structures:
External structures are the most difficult to clean because you cannot add chemicals to clean them.

- Mechanical cleaning is the best
- De-water and use powerwash. Very hard for divers because they are working against the water pressure and current against them.
- Underwater, scrape and vacuum or powerwash
- Quagga and zebra mussels have bissell threads that are used to attach themselves. This is the difference between any other types of mussels. Bissell's are so strong, when pulled off; they have metal/material attached to them. When analyzed, results show lots of heavy metal. Will eventually be regulated as hazardous waste due to the heavy metal. With the metal coming off, also causes major corrosion.

Proactive Options for External Structures:

- Antifouling coatings
- Toxic, Copper base coatings is the best coating and needs to be registered
- Non-toxic, Silicone based is foul release coating. Doesn't prevent them from sticking but will fall off.
- Life span 5-7 years before topcoat needs to be refreshed
- Currently have 19 different coating plates at Parker Dam. Letting mussels colonize to see which will work better.
- Galvanized plate with low zinc, bio-fouled within 24 hours.

Substrate Preference:
(Decreasing from top to bottom)

- Copper (dislike)
- Galvanized iron
- Aluminum
- Acrylic
- PVC
- Teflon
- Vinyl
- Pressure Treated Wood
- Black Steel
- Polypropylene
- Asbestos
- Stainless Steel (like)

Initial Suggestions for Control:

- Rapid Response Option
  - install portable chlorine skids to protect critical areas
  - Use thermal treatment where possible. Above 90 degrees is lethal to the mussel. Over 104 degrees, lots of less cleaning.
  - Use weak acids to dissolve shells and corrosion products
  - Mechanical cleaning as system performance deteriorates

Oxidizing Chemical Treatment:

- Chlorine, bromine, chlorine dioxide, chloramines, ozone, potassium permanganate
- Metropolitan Water District currently conducting this treatment. Spending $10 million a year to prevent the colonization in their canals. They can chlorinate because the canals do not discharge into the river.

Emerging Option:

- Bacterial product, Pseudomonas by Marrone Organic Innovations
  - Produces organic toxin that is lethal to the mussels.
  - Does not seem to harm fish.
  - Bacteria destroy digestive system when ingested
  - The reason for this to be an "Emerging Option" is because Marrone is still trying to figure out how to produce large quantities of the bacteria.

Proactive Options for Internal Piping systems:

- Sand/media filtration – has to remove all particles greater than 40 micron. A Veliger is 40 microns in size. Only 10% of the Veligers survive using filtration.
- Mechanical filtration – has to remove all particles greater than 40 micron.
- UV systems – radiates the mussels, 90% effective
- Closed loop cooling
- Oxidizing chemicals
- Non-oxidizing chemicals

Q: What is a Veliger?
A: A Veliger is an infant mussel before adult stage. They grow 1 millimeter a week, 10 weeks for adulthood. They can kind of swim around but not like a fish. So when a Veliger is present, that means they are ready to settle and want to attach.

Q: Are they still mobile when they attach?
A: No, they are no longer when they attach.

Q: Can you go over your statement of the filtering out 90%.
A: The mortality of mussels is 90% die off. Veligers are what cause major problems because they are microscopic. They come into your system and they attach, in over 10 weeks they are adults. This is where your bio-fouling comes in. You don't need to have 100% die off to have success. Only 10% survive, those few that survive will not colonize to the point that they will bio-foul.

Q: How are the mussels spread?
A: The #1 way is by river transfer. The second most common is by boat. Inspection stations are being set to inspect boats. If a boat has been at a location for more then a day or two where the mussels have been sighted, , they will have colonization on the boat.

Q: Is it suspected that they were brought by the Great Lakes or Ontario over land to our area?
A: It is suspected they came from Lake Mead. They were inspecting 10% of the boats and did find mussels in the 10% they were inspecting. What they didn't do is inspect 100% when they did find them.

Q: On the boats they did find them on, did they have a history of having been in the Great Lakes or Ontario?
A: Most of the Canada mussels are Zebra mussels and we are experiencing the Quagga mussels.

Q: Where are they indigenous?
A: They came from Ukraine in 1988 in ballast water.

Q: Are they edible?
A: Asian mussels are edible but these are not edible.

The best video available on line is "Don't move a mussel" http://100thmeridian.org/Video/DMAM2008_WM.asp

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Wetland Restoration on the Lower Colorado River: Mark Winterowd, Ecological Coordinator, Yuma East Wetlands Project

The Yuma East Wetlands (YEW) is 1400 acres of riparian habitat on the Colorado River bounded to the west by the historic Yuma Crossing and to the east by the confluence of the Gila and Colorado Rivers. Before restoration, the YEW was a crime-ridden area and dump with a dense thicket of non-native vegetation, such as salt cedar and phragmites. Studies and planning were undertaken. Work is underway to restore native plants, such as bulrush, cottonwood, and willow, restore the channel, and establish marsh habitat. Water control structures allow ag drain and high river flow to be stored at the wetlands. A pipeline delivers one acre-foot of water per day to the YEW.

Project Update and Status Reports:

- ❖ All-American Canal tour: Bill Plummer – Photos where shown of the tour of All-American Canal construction attended by Citizens' Forum Co-Chair Bill Plummer. A portion of the canal is being lined to conserve water. Todd Shields, Project Manager, Imperial Irrigation District, narrated the slides. Reach 1A - majority of lining complete. Reach 2 -- went into service last week. Currently draining existing Reach 2 which will become an offline storage reservoir. Fish recovery will be done Wednesday and Thursday. This is where fish are salvaged which are stranded from the drained canal. Project is on budget and on schedule. Completed 70% of the earned value of the project. Will still need approximately two more years to complete.

- ❖ Morelos Dam Sediment Removal Project: Sally Spener, USIBWC – USIBWC received permit in May for sediment removal from U.S. Amy Corps of Engineers. Currently working on restoration plan which will identify environmental mitigation. USIBWC is required to revegetate and have 17 acres of off-site mitigation. Will be clearing vegetation and dirt from spillway area upstream and downstream of Morelos Dam. For the 17 acres of mitigation, we can partner with another group's project or do it ourselves. Partnering with another group that has their ideas and plans ready is a way to get Federal Government support for the restoration activity and assist our project as well. The restoration plan has to be in place before construction is to begin. Currently working on the design of the project. Will be ready for fist phase of work in late fiscal year 2009. Will take two years to complete project.

  Q: The 17 acres needed, do they need to be all in one site?
  A: Can be discussed.

  Q: Can the 17 acres be in Mexico?
  A: This is something that can be discussed.

  Q: What is Mexico's contribution in the project?
  A: Mexico's cost participation will be transporting and disposing of the material/sediment in Mexico.

Public Comment/Board Discussion – Future agenda items

Next meeting to be held October 6th in Imperial County (location TBA)

Update of environmental mitigation of the All-American Canal

- New River Water Quality updates
- Update on reservoir construction at Drop 2
- Las Arenitas Update
- Conagua's presentation of Mexico's water delivery system
- Detailed presentation of the Morelos Dam sediment removal project

Thank you to all the presenters for their presentations.

*Meeting notes are tentative and summarize in draft the contents and discussion of Citizens' Forum Meetings. While these notes are intended to provide a general overview of Citizens' Forum Meetings, they may not necessarily be accurate or complete, and may not be representative of USIBWC policy or positions.