CAP
CENTRAL ARIZONA PROJECT

2020 BIOLOGY ANNUAL REPORT

Central Arizona Water Conservation District
Water Transmission

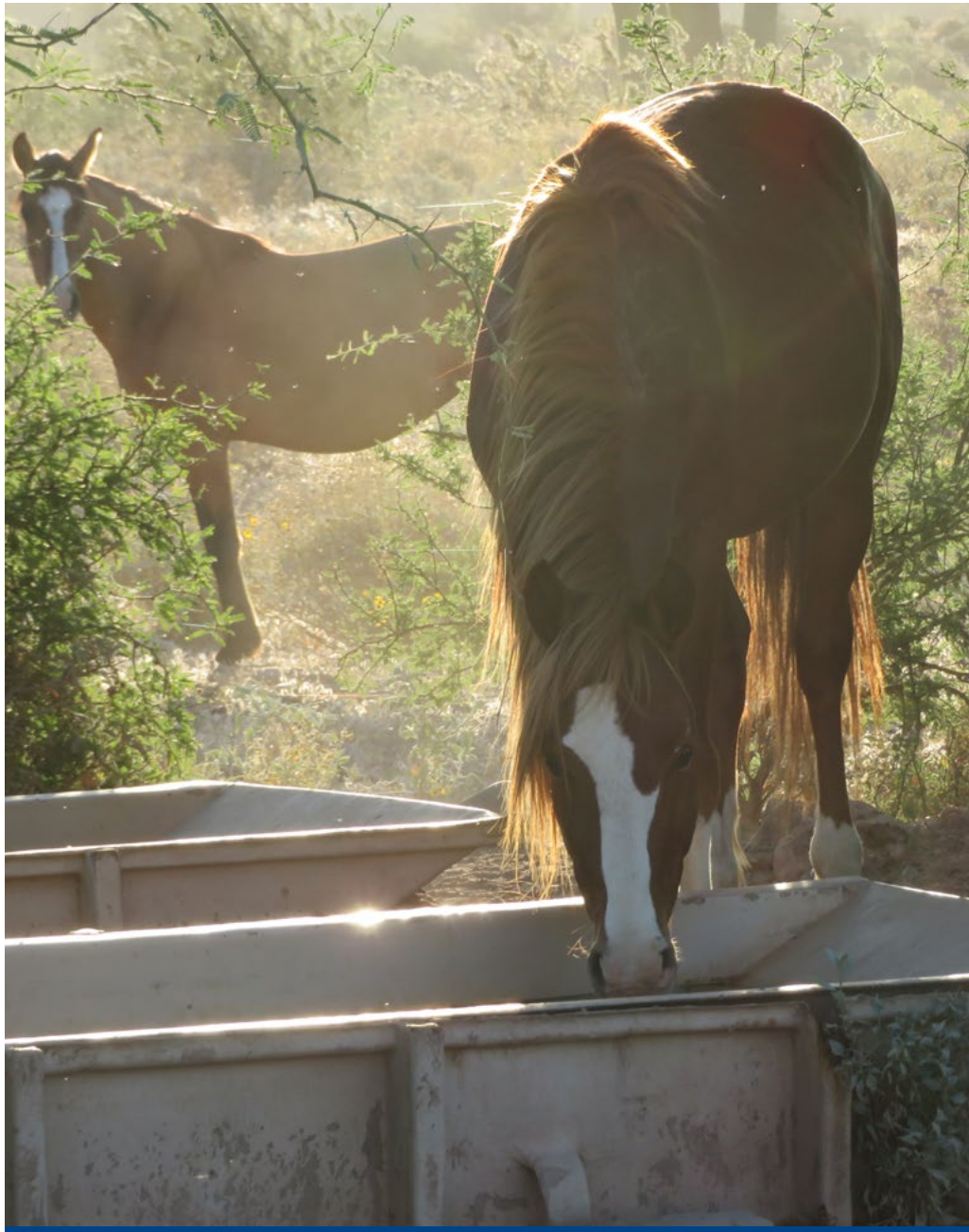
CAP BIOLOGY PROGRAM

The CAP Biology Program was created in 2011 to address the variety of biological issues that can affect CAP's 40,000 acres of property, the 336-mile aqueduct, and CAP's ability to deliver water. The Senior Biologist has implemented a comprehensive monitoring program to provide economically responsible management recommendations based on sound techniques and robust data.

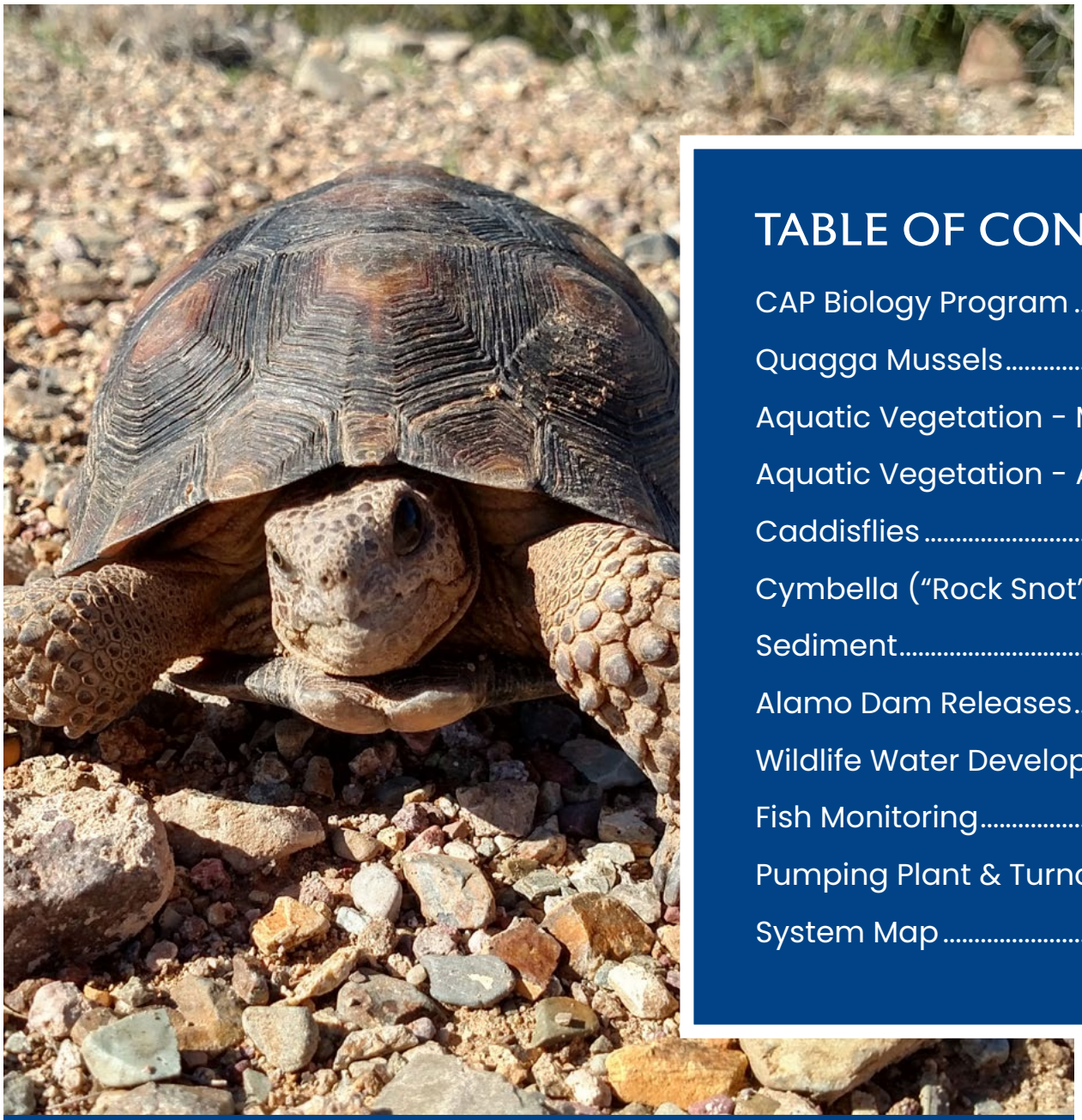
To say that 2020 was a unique year is an understatement. The world-wide pandemic (COVID-19) impacted just about everything and everyone, including CAP employees. Despite the challenges of adjusted work schedules and limited travel, we were able to keep the water flowing to the people of Arizona with no interruptions in service.

One of the things that COVID-19 couldn't affect was the normal biological processes that continue to challenge us year-after-year. Wildlife and fish went about their normal business with no impacts from the virus, aquatic vegetation and Cymbella continued to grow and create problems for our municipal customers, and quagga mussels were as prolific as ever. The Biology Program did its best to continue the research and long-term monitoring program that has been built over the past 9 years.

The following annual report is a summary of the work completed in 2020, including approaches and significant findings, as well as strategies for monitoring and research in 2021. Each section also includes a brief introduction to the issue being addressed, which is carried over from previous annual reports. Strategies for 2021 are based on historical data and lessons learned from sampling efforts in previous years.



WILD HORSES AT THE SALT RIVER SIPHON DRINKER
Photo by Scott Bryan



DESERT TORTOISE NEAR WADDELL DAM
Photo by Brian Fisher

TABLE OF CONTENTS

QUAGGA MUSSELS ON A SETTLEMENT PLATE AT MWP
Photo by Scott Bryan

QUAGGA MUSSELS

The Western invasion of quagga mussels was first discovered in Lake Mead on the Colorado River in January 2007. Soon thereafter, the mussels were found throughout the Lower Colorado River from Lake Mead to Yuma, including CAP's water source, Lake Havasu. In early 2008, microscopic young quagga mussels (veligers) were observed in plankton samples in the CAP aqueduct and its storage reservoir, Lake Pleasant. When CAP began intensively monitoring the mussels in 2009, large numbers of veligers were found throughout the system, but few adult mussels were found.

Although it was originally hypothesized that various factors would restrict mussel invasion in the aqueduct, adult settlement has occurred throughout the system. In most cases, infestations do not impact water deliveries or maintenance of the system. However, there are some instances when more critical systems are affected. CAP's typical response is to increase maintenance frequency (e.g. cleaning of filtration systems, strainers, and cooling systems) to ensure reliability, however, more severe infestation issues in recent years have created the need for alternative approaches, including the use of foul-release coatings and chemical treatment.

APPROACH

Quagga mussel infestations and impacts are typically monitored with bio-box checks and annual trash rack inspections. However, in 2020 travel limitations meant that bio-boxes were only monitored once between March and September (May). In 2020, a chemical injection system was partially installed at MWP to address infestation of quagga and other organics in the cooling water systems. However, due to COVID-19, installation will be completed in 2021.

FINDINGS

Quagga mussel infestation in pumping plant bio-boxes was the highest at MWP, BSH, and SGL that it had been in several years. At BSH, infestation reached its peak in May and then individuals were completely gone for the rest of the year. This may have been the result of higher water temperatures in the bio-box that caused the mussels to translocate (downstream). Higher numbers at MWP are probably indicative of the cyclical nature of the quagga population density in Lake Havasu, while the higher numbers at SGL may be the result of the 2019 sediment removal efforts that made the forebay a more hospitable environment for quagga, as they tend to avoid areas with heavy sediment and turbidity.

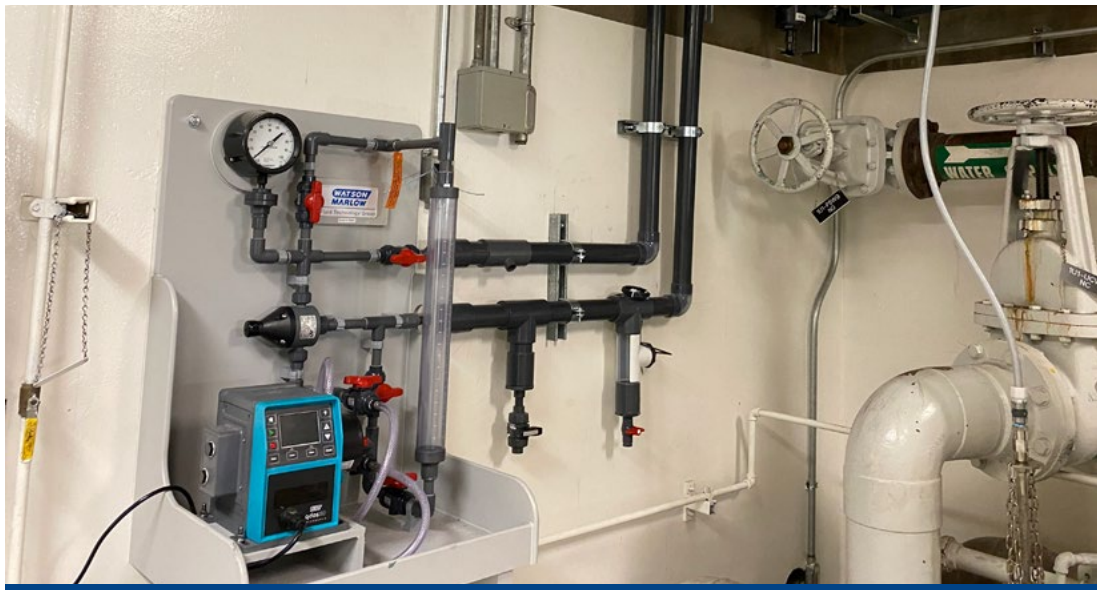
With no treatment at MWP, quagga mussels and colonial hydroids continued to persist in the cooling water systems and caused at least two unforced outages due to overheating. The installation of the chemical injection system is expected to help prevent future settlement of invasives in this critical system.

Turnouts (especially AXPTO) continue to be infested with quagga mussels and impacted by sediment, which effect the flowmeters located within the barrels of the turnouts. As a result, turnouts need to be periodically cleaned, using divers, until a solution can be identified.

STRATEGIES FOR 2021

In 2021, CAP will continue to monitor quagga mussels in bio-boxes, trash racks, and turnouts. We will continue to work on practical solutions for preventing mussel attachment in the turnouts so that flowmeters can operate unimpeded. Additionally, the chemical injection system will be fully installed at MWP, Standard Operating Procedures (SOP's) will be developed and periodic inspections of the cooling units will be performed to determine the effectiveness of the treatment.

A videoscope photo of quagga mussel settlement in the cooling water header boxes at MWP. This level of infestion clogs the cooling tubes and prevents the motor from being properly cooled, eventually causing the motor to trip due to overheating.



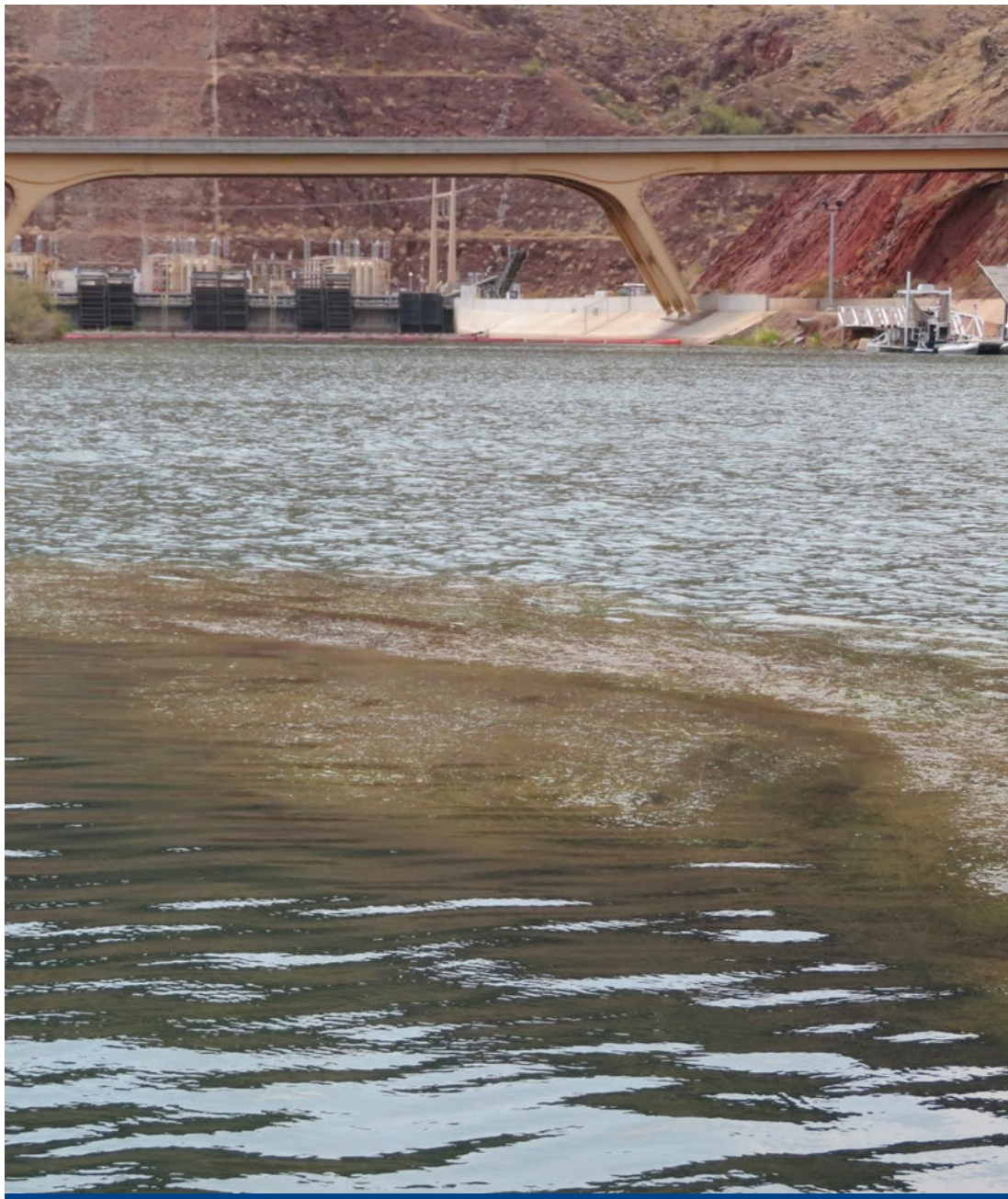
A chemical injection system has been installed on each of the six unit cooling water systems at MWP to help prevent biofouling and subsequent overheating of the motors.

QUAGGA MUSSELS IN BIO-BOXES AT SAN
Photo by Scott Bryan

AQUATIC VEGETATION - MWP

Aquatic vegetation growth in Lake Havasu has increased significantly since the discovery of quagga mussels in 2008. The direct relationship between quagga mussels and vegetation growth has not been proven; however, it is widely speculated that quagga have increased water clarity and nutrient loading in the reservoir, which in turn has led to an increase in weed growth. When the vegetation dies and floats to the surface during summer and early fall, the impacts are felt by CAP. Weeds become entrained in the flow of the intake channel, either as individual plants that have been dislodged or as floating mats of dead material, and threaten the reliability of the pump systems.

In 2010, CAP began collecting weed mats using a weed harvesting boat and long-reach excavator to prevent the mats from approaching and impacting MWP. In spring 2016, CAP installed a trash rake system at MWP to help ensure the reliability of the pumping plant and reduce/eliminate the need for the weed harvesting boat. However, even with a robust design, the rake system had difficulties in handling even moderately sized mats. Due to the frequent breakdowns and the uncertainty in the reliability of the trash rake system, it was largely abandoned in 2018. In 2020, CAP continued to collect vegetation mats with a weed harvesting boat and performed a full-scale aquatic herbicide treatment within the 65-acre intake channel.



FLOATING WEED MATS APPROACH MWP DURING SUMMER MONTHS
Photo by Scott Bryan

Floating weed mats at MWP are collected by a weed harvesting boat.

The vegetation treatment had little impact on weed growth in 2020 at the Salt River Siphon

APPROACH

Aquatic vegetation growth was monitored from April through September within the 65-acre CAP intake channel using downscan sonar (Lowrance HDS-9) and the BioBase® mapping service. In May and July, an aquatic herbicide (Cascade®) was applied in an attempt to minimize vegetation growth within the intake channel. The treatment was applied to ~10 acres in May to control pondweed species and second treatment was applied to ~30 acres in July to control naiad species. The effectiveness of the treatment was measured through vegetation mapping and random sampling. During the "weed season" (July through September), CAP weed collection crews actively collected floating vegetation mats using the weed harvesting boat.

FINDINGS

The weed treatment in 2020 was determined to be unsuccessful in controlling vegetation growth within the intake channel. Mapping showed similar growth to years in which there was no treatment, and random samples showed no browning or deterioration of the plants. There were several factors that likely contributed to these results, including increased turbidity from Bill Williams flow events that altered the timing of vegetation growth, and low application rates. The lower application rates were an attempt to treat a larger area while maintaining the lowest label rate (3 ppm). The full report of findings and recommendations is available upon request.

Despite the ineffectiveness of the vegetation treatment, just 90 cubic yards of weed material was collected in 2020 by the weed harvesting boat. This is the lowest amount since weed collection activities began in 2010. Since weed mat movement is largely attributed to wind events, the lack of significant monsoon storms in summer months is the likely reason for the small amount of weeds being collected.

STRATEGIES FOR 2021

In 2021, CAP will repeat the vegetation treatment with a single application in July at the higher label rate of 5 ppm. Vegetation coverage and plant height will be mapped bi-weekly to evaluate the effectiveness of the treatments and monitor overall vegetation growth. CAP weed collection crews will continue to harvest weed mats as necessary. CAP's weather station will be downloaded monthly to correlate weather/wind events with the movement of vegetation mats.

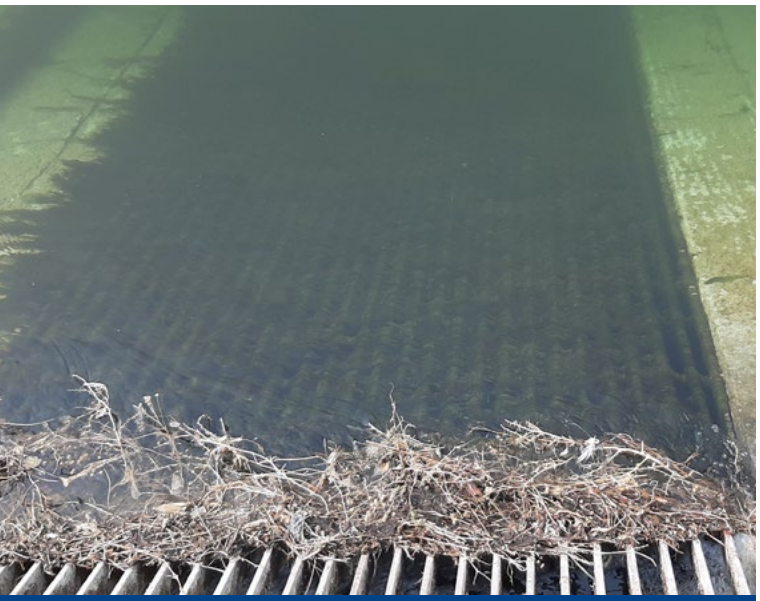
AQUATIC VEGETATION GROWTH IN THE CAP INTAKE CHANNEL IN JULY 2020
Photo by Michael Rogers

ALGAE GROWTH IN WADDELL CANAL IN JUNE 2020
Photo by Scott Bryan

AQUATIC VEGETATION - AQUEDUCT

Weed growth within the aqueduct has historically been somewhat sporadic, but can be substantial. At times, filamentous algae will bloom in various sections of the canal, while rooted aquatic vegetation growth is generally restricted to slower moving areas. Pool Bouse has traditionally been a problem area for rooted vegetation, and Waddell Canal appears to go through cycles of filamentous algae problems. Chemicals have not typically been utilized in the canal to suppress vegetative growth. Instead, grass carp are stocked as a biological control.

Triploid (sterile) grass carp are stocked to control aquatic vegetation in the CAP Aqueduct.



Filamentous algae and debris builds up on turnout grates and could potentially restrict flow.

Algae fouling on a filter at LHQ in August 2020.

APPROACH

Visual inspections are conducted periodically by Aqueduct crews and any potential issues are reported to the Senior Biologist. Additionally, CAP stakeholders often provide information to CAP during times when vegetation is impacting turnouts. Control of aquatic vegetation in the aqueduct is achieved utilizing triploid (sterile) grass carp; however, filamentous algae is not a preferred food item for grass carp so control is sporadic.

FINDINGS

Relatively heavy algae growth was observed from June through September 2020 in the Waddell Canal and throughout the canal in the Phoenix metropolitan area. In late July, the City of Glendale reported that algae was restricting water flow at their turnout, then Phoenix reported similar findings in early August, and Mesa and Chandler experienced troubles in mid-August. The algae, which was primarily growing in Waddell Canal, was detaching from the canal liner and floating downstream, eventually clogging the trash racks at these turnouts. CAP maintenance crews manually scraped the debris from the racks several times each week (and more often when needed) through mid-September. The factors contributing to the heavy algae growth in Waddell Canal during the summer months are only speculative at this time, and may be related to nutrient release from Lake Pleasant. The Arizona Center for Algae Technology and Innovation (AzCATI) at Arizona State University (ASU) is currently studying algae and Cymbella issues in the CAP System and may provide insight into the conditions that contribute to the algae growth and potential solutions at the conclusion of their study (in 2022).

Grass carp were stocked throughout the canal in early March to maintain population levels for effective control of aquatic vegetation. As a result, no other vegetation issues were experienced in the CAP System in 2020.

STRATEGIES FOR 2021

Aqueduct crews will continue to visually monitor the system for growth of rooted aquatic vegetation, filamentous algae, and Cymbella. The Senior Biologist will continue to work with ASU to identify factors contributing to algae growth and proliferation, as well as potential solutions. Grass carp stocking will continue and will target specific reaches of the canal where populations are less than optimal.

AQUATIC VEGETATION ISSUES LIKE THIS HAVE NOT BEEN AN ISSUE IN THE CAP SINCE GRASS CARP NUMBERS WERE INCREASED IN 2012
Photo by Scott Bryan

CADDISFLIES

In 2004, a nuisance insect was reported to CAP by Phoenix and Scottsdale residents. The insects were identified as Smicridea, a common genus of caddisfly that is indigenous to the Colorado River. Although 2004 was the first record of complaint by nearby residents, caddisflies were found in relatively high numbers in the CAP as early as 1993. It is likely that caddisfly swarms have been common since the canal was constructed, but were largely undetected because people did not live near the canal. The emergence of large numbers of adult caddisflies causes a nuisance because they tend to swarm around people, making outdoor dining and entertaining uncomfortable during periods of high activity.

Based on recommendations from an RNT Consultants report, CAP has stocked the canal since 2011 with channel catfish to help control the caddisfly population. Although the fish stocking does not eliminate the nuisance caddisflies, it does provide some level of relief for residents living adjacent to the canal.

CHANNEL CATFISH STOCKED INTO POOL 20 IN MARCH 2020
Photo by Scott Bryan

APPROACH

Channel catfish are stocked annually during late February/early March. In 2020, approximately 8,600 catfish were stocked into Pools 20, 21, and 22 . These fish averaged 8-12" and weighed approximately 0.50 pound each.

Names and addresses of residents calling with concerns about the caddisflies are recorded to determine where the caddisflies are creating a significant nuisance.

FINDINGS

Field crews noted typical "swarms" of caddisflies during spring and fall, and the Senior Biologist observed a relatively heavy hatch of caddisflies west of Tonopah in late April. Because many residents were spending more time at home in 2020 (due to COVID-19), it was expected that there would be a high number of phone calls received from concerned neighbors. However, CAP did receive a single report related to nuisance caddisflies in 2020. There were two calls in late spring inquiring about catfish stocking, but no reports of nuisance hatches. Catfish stocking was initiated in Pool 20 based on 2019 reports of nuisance caddisfly hatches, and stocking continued in Pools 21 and 22, so the catfish may have been able to provide some level of control in these areas.

There was a single phone call from a neighbor in early September who thought that caddisflies were infesting their property, however, after talking with the resident, it was determined that the insect was likely a midge species (Cricotopus spp.) rather than a caddisfly.

STRATEGIES FOR 2021

The catfish continue to provide a level of control, which appears to be improved with the stocking of smaller fish. CAP will continue to stock small catfish (~0.5 lb) in Pools 20-24. CAP Communications employees will notify the public about stocking events.

CAP continues to work closely with specialists around the country, including Bullhead City, in an effort to find relief for residents adjacent to the canal. An online submission form is now that allows residents to provide CAP with valuable information for determining where caddisflies are causing the biggest nuisance.

Caddislfies were found in the CAP as early as 1993, and were identified as Smicridea in 2004.

Channel catfish are stocked annually to help control nuisance caddisfly populations.

CADDISFLIES SWARM DURING EARLY MORNING HOURS NEAR SALOME ROAD IN APRIL 2020
Photo by Scott Bryan

CYMBELLA GROWS ON THE CANAL LINER IN SUMMER MONTHS
Photo by Scott Bryan

CYMBELLA ("ROCK SNOT")

Since the time of their discovery in the CAP (1997), stalk-forming diatoms have occasionally become a nuisance for both CAP and its customers. Cymbella can cause issues when mats detach from the canal liner and are floating on the water surface. When attached to the liner, the long stalks create excessive friction and reduce the flow of water. This impacts the ability of CAP Operations to deliver the requested volume of water to downstream water users. When floating on the surface, the mats of organic material may be drawn into pumping plants. Critical filters, strainers, and pumps have the potential to become clogged, which in turn affects the ability to properly cool motor components and provide service water throughout the plant. CAP customers can also be impacted, as clogged intakes, filters, strainers, and pumps reduce their ability to effectively deliver water to end users.

Based on the timing of issues related to Cymbella, it appears that the proliferation of the diatom blooms and subsequent floating mats may be related to the frequency and intensity of water releases from source reservoirs (both Lake Havasu and Lake Pleasant) and the associated nutrient levels.

APPROACH

Although diatoms are one of the most prolific groups of algae in the world, relatively little is known about the factors that contribute to their growth and life cycle. Because of this, CAP partnered with the Arizona Center for Algae Technology and Innovation (AzCATI) at ASU to further study the Cymbella found in canal and determine potential methods of control.

Crews from ASU developed a study plan, began sampling the periphyton (attached organisms) on the canal liner, and tested a new technology for detecting organic activity in 2020.

CAP field crews were asked to report any instances of "Rock Snot" observed in the canal.

FINDINGS

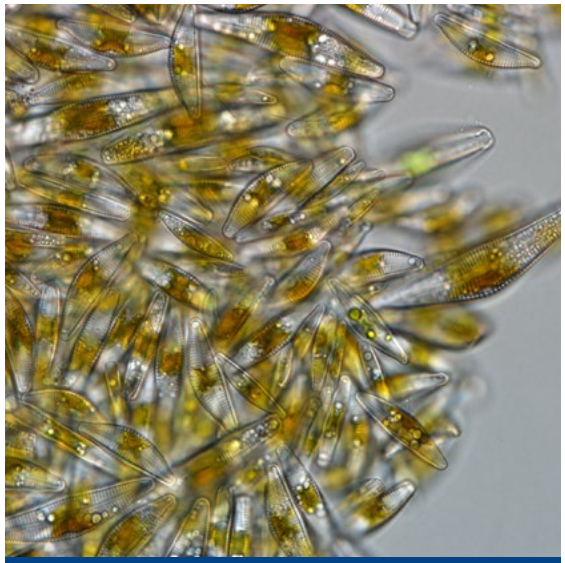
Within the canal, a relatively minor bloom of Cymbella was observed in the Scottsdale area during June, with a small amount of material breaking off and floating on the surface. The event was short-lived (less than one month) and did not create any problems for municipal customers.

Although limited due to COVID-19, AzCATI researchers were able to collect samples of Cymbella throughout the summer months. One of their goals was to isolate the nuisance diatom, identify the species, and propagate it in the laboratory for future experiments. Although the species has not yet been identified (Genus: Cymbella), AzCATI was able to successfully propogate the diatom. Researchers also deployed new sensors that detect organic activity in the canal and were able to successfully identify a late-season phytoplankton bloom. They hope that this technology can be used to identify when Cymbella and other algae blooms may be occurring.

STRATEGIES FOR 2021

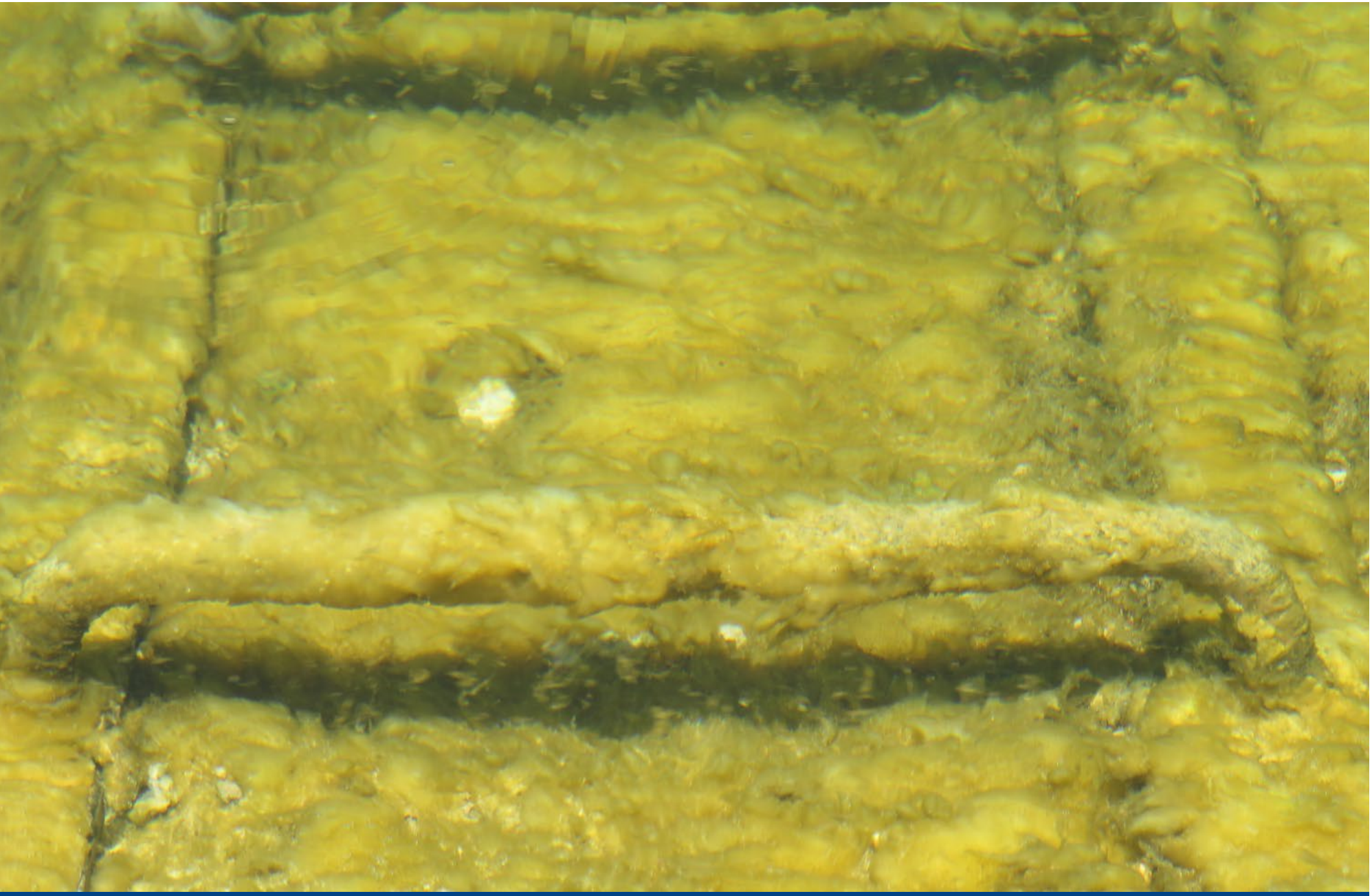
Field personnel will continue to report any observed Cymbella growth and the Senior Biologist will periodically check specific areas for activity. AzCATI will also continue their research to identify the factors contributing to diatom growth and search for potential methods of control. Their final report will be generated in late 2021.

The Arizona Center for Algae Technology and Innovation (AzCATI) at Arizona State University is studying the Cymbella issues in the CAP



Cymbella cells under the microscope.
Photo by Taylor Weiss (AzCATI)

Cymbella detaches from the canal liner and floats to the water surface as a gelatinous mass



CYMBELLA CAN GROW IN A THICK MASS ON THE CANAL LINER AND COMPLETELY COVER STRUCTURES SUCH AS THIS SAFETY LADDER
Photo by Scott Bryan

SEDIMENT

During the design phase of the CAP, it was recognized that sediment deposition could be problematic. Engineers looked into the inclusion of structures like sediment traps and de-silting plants, but ultimately determined that they were ineffective. Instead, forebays were designed to collect sediment near the intakes and it was suggested that regular cleaning would ensure that sediment deposition did not become a problem. However, due to costs, logistics, and the perception that sediment was not causing operational or maintenance issues, there was no formal removal process implemented. Occasionally, attempts have been made to remove sediment using a variety of methods, including clamshell dredging, highline buckets, pump dredges, "mucking" with loaders and excavators, and "vacuuming" using divers. Although each method has had various levels of success, most would consider these attempts to be ineffective and inefficient. Furthermore, there is considerable debate as to whether sediment removal is even necessary.

CAP Operations has indicated that water deliveries are rarely affected by sediment deposition. However, from a maintenance perspective, anecdotal evidence suggests that the sediment renders flow meters inoperable, clogs strainers and filters, causes premature wear to critical components (such as wear rings, impellers, and casings), degrades piping in cooling water systems, and causes wear and misalignment to trash rake systems. Nonetheless, increased maintenance and replacement of parts has not been quantified with data, so the impact of sediment deposition remains disputable.

SEDIMENT FROM RUNOFF ENTERS THE CANAL THROUGH DRAINAGE STRUCTURES
Photo by Scott Bryan

APPROACH

As part of CAP's process to better understand patterns of sediment loading within the aqueduct, bathymetric mapping is conducted in each forebay and major turnout on an annual basis (since 2013). Data from the mapping is used to estimate total sediment volume in each forebay. Sediment removal is only attempted when opportunities arise, such as a forebay dewatering, or when conditions become degraded to a point where removal is necessary (e.g. flows in turnouts are restricted).

In November 2020, CAP Engineering initiated a study to determine potential sources of sedimentation in the canal, including a comprehensive look at the drainage in areas adjacent to the canal.

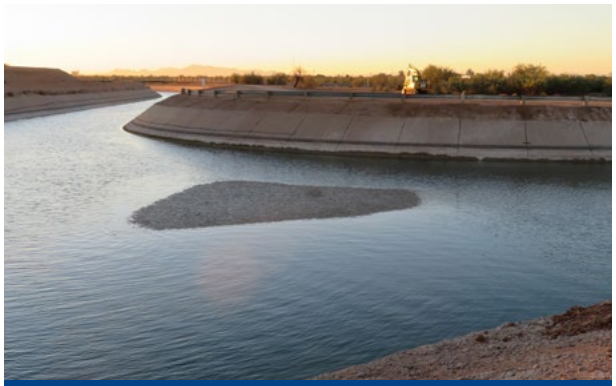
FINDINGS

Sediment mapping in May shows that sediment volumes continued to vary greatly among pumping plants. SGL was completely dredged in November 2019, but the mapping survey in May indicated that over 4,450 cubic yards (7.5% of forebay volume) of material had already been deposited in the 6-month span. Similarly, major turnouts (SROTO, CMATO, SMATO) were dredged in 2019, but sediment volumes were already at or above pre-dredging levels. BRD and PIC have sediment volumes that are over 30% of the forebay capacity, and SAN is nearly 30%. The sediment volume in WAD forebay fluctuates depending on when water is being discharged from Lake Pleasant. During the May 2020 survey, WAD sediment volume was higher (23.4%) than any previuos year. BRW and SXV continued to have the lowest sediment volumes in 2020, and other forebays were similar to previous years.

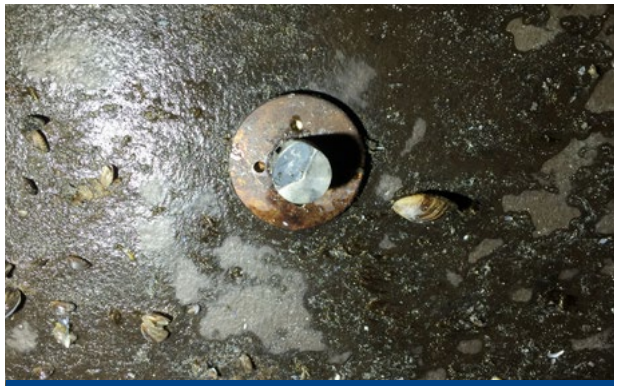
During summer 2020, CAP Instrumentation and Controls (I&C)indicated that flowmeters were not operating correctly in some smaller turnouts, such as AXPTO and PLPTO. It was determined that sediment and quagga mussels are blocking the signal. In the past, divers have been used to clear out the sediment and clean the flowmeter sensors. However, this method is expensive and not long-lasting. The Senior Biologist is working with Engineering and I&C to evaluate potential solutions.

STRATEGIES FOR 2021

Sediment mapping in the pumping plant forebays will continue so that long-term trends can be evaluated. In addition, the study undertaken by Engineering will provide some insight into the sources of sediment in the canal. Large turnouts continue to build significant sediment deposits and "mounds" regularly appear above water levels. Sediment removal will be recommended as necessary.



Sediment deposition at SMATO and other large turn-outs create mounds that reach the water surface.



Example of a flowmeter that can get fouled by sediment deposition and quagga attachment

Bathymetric mapping at BRW. Maps are generated each spring to estimate sediment volume.

SEDIMENT PLUMES MOVE THROUGH THE CANAL DURING VARIOUS TIMES OF THE YEAR
Photo by Scott Bryan

VIEW OF ALAMO DAM AND RELEASES INTO THE BILL WILLIAMS RIVER
Photo by The Nature Conservancy

ALAMO DAM RELEASES

Releases from Alamo Dam into the Bill Williams River creates a degradation of water quality in both the river and in the lower portions of Lake Havasu. The degradation of water quality can have significant impacts to the CAP System and its customers. During past events, the increase in suspended sediments has resulted in increased maintenance to critical infrastructure, clogging of recharge basins, and an increase in costs related to operational changes. For CAP customers, past high flow events have led to increased maintenance frequency and costs, as well as increases in chemical costs related to high turbidity, total organic carbon (TOC) and alkalinity.

In Spring 2020, the US Army Corps of Engineers (Corps) needed to reduce the water elevation in Alamo Lake by approximately 11 feet. The Corps determined that they may be able to reduce downstream impacts by implementing a moderate flow release (500-1,000 cfs) over an extended period of time (~60 days).

In July, the Corps initiated a second intermittent flow release to facilitate dam maintenance activities. Maximum flows would be 300 cfs over a 30 day time period.

Planet Ranch Road is flooded just upstream of Lake Havasu when Alamo Dam is discharging.

APPROACH

CAP actively monitors turbidity and total organic carbon (TOC) at various locations when significant dam releases occur. If conditions warrant, pumping from Lake Havasu is modified in an attempt to minimize water quality impacts in the canal system. However, any modifications to pumping create a significant financial burden to CAP.

During the spring event, CAP monitored turbidity at three locations within Lake Havasu. Similarly, CAP measured TOC at two locations within the lake, and one location west of Tonopah. Municipalities provided additional turbidity and TOC data.

During the smaller summer event, CAP measured turbidity and TOC near the MWP intakes, and TOC at two canal locations near Phoenix. Municipalities again shared their own data.

FINDINGS

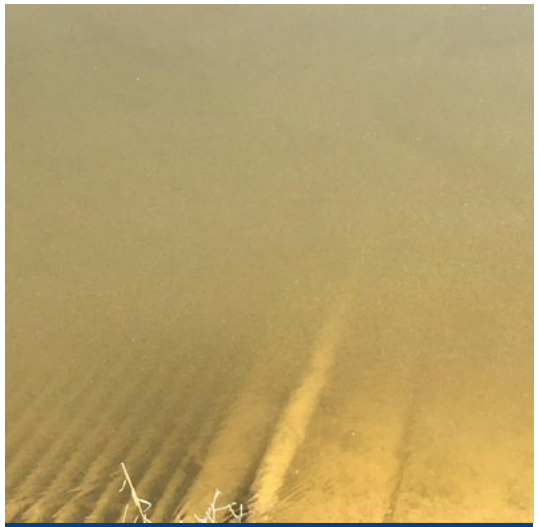
The Spring 2029 release increased turbidity and TOC levels in Lake Havasu, and subsequently in the CAP canal system. The high levels of turbidity created the need for increased maintenance of critical CAP infrastructure, while downstream water users experienced significant financial and operational impacts as a result of high turbidity and TOC. More importantly, the high TOC experienced at municipal water treatment plants threatened their ability to comply with EPA Drinking Water Standards, which in turn could have significant negative impacts to public trust.

There were no observed impacts from teh July 2020 release event.

STRATEGIES FOR 2021

The Spring 2029 release increased turbidity and TOC levels in LakeThere are no planned Alamo Dam releases for 2021. CAP will continue to work with the Corps as they modify their Operating Manual so that downstream impacts can be minimized and communication can be improved.

Turbidity in the CAP increased significantly during April 2020 when there was an extended moderate-level discharge from Alamo Dam.



CAP water users were impacted by increased turbidity resulting from Alamo Dam releases in 2020

CAP sampled turbidity and Total Organic Carbon during release events

VIEW OF THE BILL WILLIAMS RIVER AS IT FLOWS THROUGH PLANET RANCH; DISCHARGE FROM THE DAM IS APPROXIMATELY 1,000 CFS AT THE TIME OF THIS PHOTO.
Photo by The Nature Conservancy

WILDLIFE WATER DEVELOPMENTS

During construction of the CAP, it was recognized that the canal would create a man-made barrier to important wildlife corridors. This “barrier” would have the potential to alter migration patterns, segregate populations of wildlife, and restrict access to natural waters. An environmental impact study was completed prior to canal construction to determine these potential impacts and ensure compliance with state and federal regulations protecting fish, wildlife, and native plants. As a result of the various studies, wildlife bridges were constructed at strategic locations to maintain wildlife migration corridors, drainage structures were constructed to be “wildlife friendly,” and water developments (drinkers) were created at several locations to ensure access to fresh water.

CAP is responsible for maintenance at a number of these drinkers to support wildlife populations. However it is not known how frequently the tanks are being utilized by wildlife or how often the tanks run out of water. The Biology Program began to monitor wildlife usage of drinkers in 2019 at various locations and altered maintenance schedules based on that usage. In 2020, the study continued at drinkers at the Salt River Siphon.

WILD HORSES USING THE DRINKER AT THE SALT RIVER SIPHON
Photo by Scott Bryan

Coyote at the Salt River Siphon drinker

Bobcat at the wildlife drinker at the Salt River Siphon

Squadron of javelina (collared peccary) near the wildlife drinker at the Salt River Siphon drinker

APPROACH

The side-by-side wildlife drinkers at Salt River Siphon were constructed at the request of the Salt River Pima Maricopa Indian Community and are periodically maintained by CAP maintenance personnel. Wildlife usage was captured using Browning Strike Force Pro XD trail cameras. Cameras were mounted in concealed locations near the water drinkers at a distance of approximately 20 feet.

Cameras were downloaded every two weeks. Once downloaded, photos were grouped by animal species and the number of individuals in each photo were counted. Due to the large number of "wild" horses using the drinkers, numbers were estimated based on a calculated average.

FINDINGS

Over the four month period, nearly 35,000 photos captured animals using the drinkers. There were 6,365 unique visits, with over 83% of photos capturing the "wild" horses. Because the horses visited in large groups (usually 5-20 individuals), it was difficult to determine exactly how many different horses used the drinkers. Various bird species (primarily dove and raven) made up the bulk of the remaining visits. Coyotes, javelina (collared peccary), jackrabbits, and bobcats were occasional visitors.

Based on the documented visits, it is apparent that these water developments are important for the horse population, as well as a variety of wildlife species. CAP aqueduct crews should maintain these tanks on a quarterly basis to ensure that there is always proper water flow.

STRATEGIES FOR 2021

No additional tanks are scheduled to be monitored in 2021.

WILD HORSE COOLING OFF IN THE WILDLIFE DRINKER AT SALT RIVER SIPHON IN 2020
Photo by Scott Bryan

LARGEMOUTH BASS FROM SXV IN NOVEMBER 2020
Photo by Kent Mosher (USBR)

FISH MONITORING

The 1994 Biological Opinion (and subsequent versions) considered the impacts of transportation and delivery of Colorado River water through the CAP canal. It required that Reclamation develop and implement a baseline and long-term monitoring plan to detect the species composition and distribution of non-native fish in the CAP aqueduct and selected river, stream, and canal reaches in Arizona. The original plan called for the annual monitoring of the canal at seven locations (pumping plant forebays); however, in 2015 sampling frequency was reduced to every 5 years because species composition had not changed over time.

BLUEGILL SAMPLED FROM SXV DURING 5-YEAR FISH MONITORING IN NOVEMBER 2020
Photo by Kent Mosher (USBR)

APPROACH

Fish are sampled every five years at BSH, LHQ, HSY, SGL, BRD, RED, and SXV. However, because SGL was dewatered in 2019, fish removal efforts took the place of normal monitoring. The remainder of the sites were scheduled to be sampled in 2020. Travel restrictions due to COVID-19 forced the cancellation of sampling at BSH, LHQ, and HSY in summer 2020, but sampling proceeded as planned at BRD, RED, and SXV in November 2020. Historically, boat-mounted electrofishing, minnow trapping, trammel netting, and trot-lines were used at all stations. In 2020, trot-lines were not utilized.

Sampling was coordinated with the CAP fall outage to take advantage of the zero flow conditions, which allowed for more effective netting efforts.

Reclamation also initiated a study to determine the effectiveness of eDNA sampling to determine species presence in the forebays. Fin clips were taken from representative sample of fish for DNA analysis and will be compared with DNA found in water samples collected at each location.

FINDINGS

Reclamation has not yet completed the report of its findings. Generally, the three forebays were sampled over a period of 6 days. Catch rates in trammel nets and by electrofishing appear to be relatively low and no new species were detected. No fish were captured in minnow traps. The highest number and greatest diversity of fish were collected at SXV.

STRATEGIES FOR 2021

BSH, LHQ, and HSY are scheduled to be sampled during the summer outage in 2021, which typically occurs during July. Sites will be sampled similarly as described above. Reclamation will produce a final report at the conclusion of sampling activities.

GRASS CARP SAMPLED FROM BRD DURING 5-YEAR FISH MONITORING IN NOVEMBER 2020
Photo by Bill Stewart (USBR)

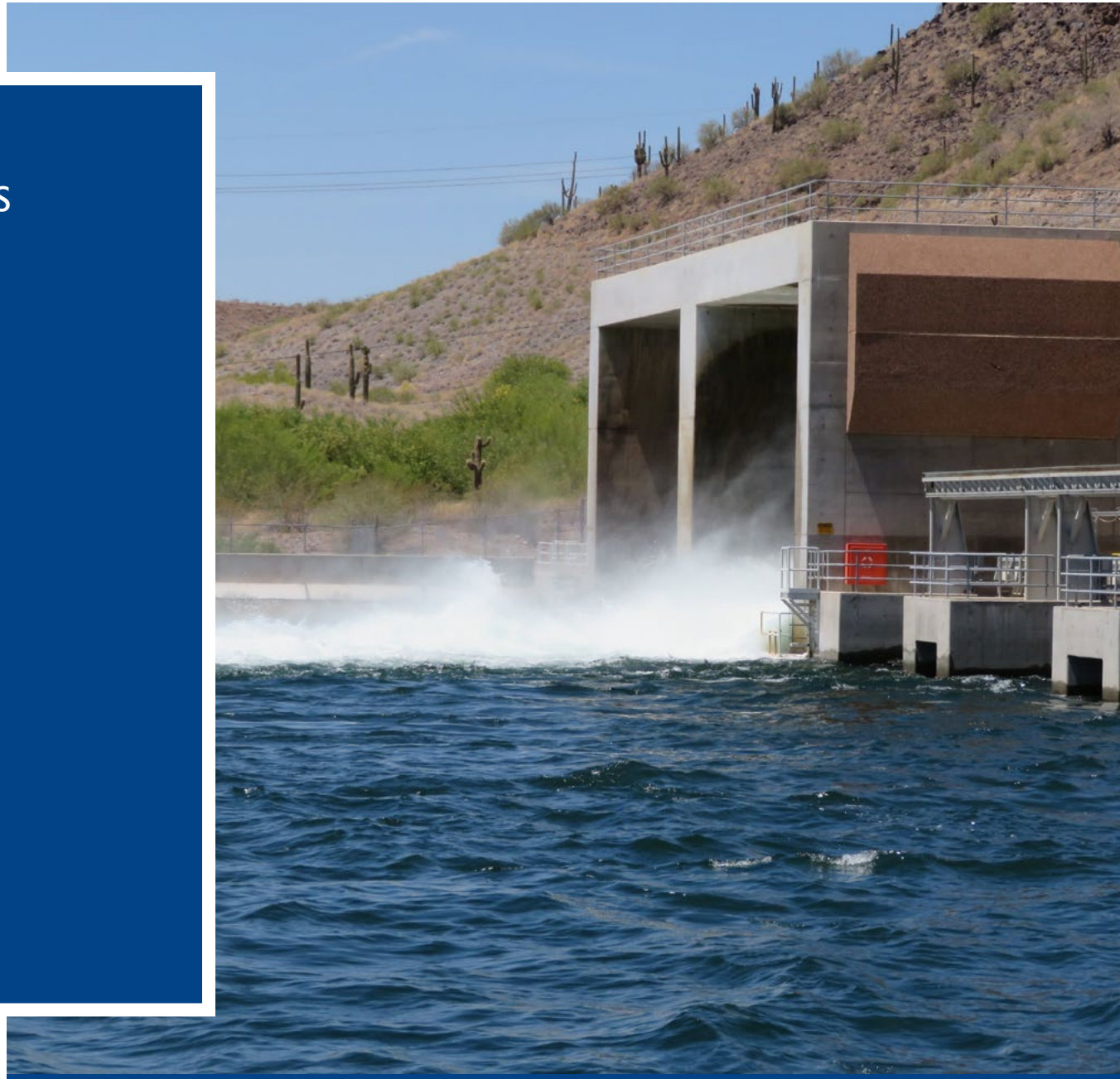
Trammel net set at SXV during 5-year fish monitoring in November 2020

FISH WERE SAMPLED USING AN ELECTROFISHING BOAT AND TRAMMEL NETS IN NOVEMBER 2020
Photo by Bill Stewart (USBR)

APPENDIX

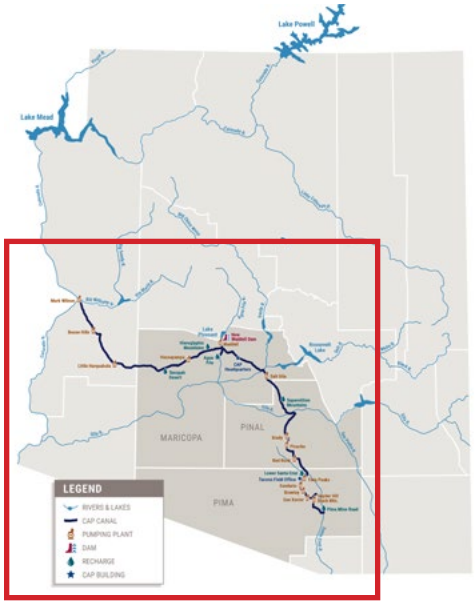
PUMPING PLANT AND TURNOUT ABBREVIATIONS

MWP	Mark Wilmer Pumping Plant
BSH	Bouse Hills Pumping Plant
LHQ	Little Harquahala Pumping Plant
HSY	Hassayampa Pumping Plant
WAD	Waddell Pump/Generating Plant
SGL	Salt Gila Pumping Plant
BRD	Brady Pumping Plant
PIC	Picacho Pumping Plant
RED	Red Rock Pumping Plant
TWP	Twin Peaks Pumping Plant
SAN	Sandario Pumping Plant
BRW	Brawley Pumping Plant
SXV	San Xavier Pumping Plant
BLK	Black Mountain Pumping Plant
AXPTO	Phoenix Anthem Turnout
GLETO	Glendale Turnout
PLPTO	Phoenix Lake Pleasant Turnout
SROTO	Santa Rosa Turnout
CMATO	Central Main Turnout
SMATO	South Main Turnout



WAD BYPASS STRUCTURE
Photo by Scott Bryan

CAP SYSTEM MAP



2020 BIOLOGY ANNUAL REPORT

by Scott Bryan, Senior Biologist

CAP
CENTRAL ARIZONA PROJECT

CENTRAL ARIZONA PROJECT

23636 North 7th Street
Phoenix, Arizona 85024
(623) 869-2333
info@cap-az.com

GET SOCIAL WITH US!

www.CentralArizonaProject.com