CAP
CENTRAL ARIZONA PROJECT

2021

BIOLOGY

ANNUAL REPORT

Central Arizona Water Conservation District
Water Transmission Division

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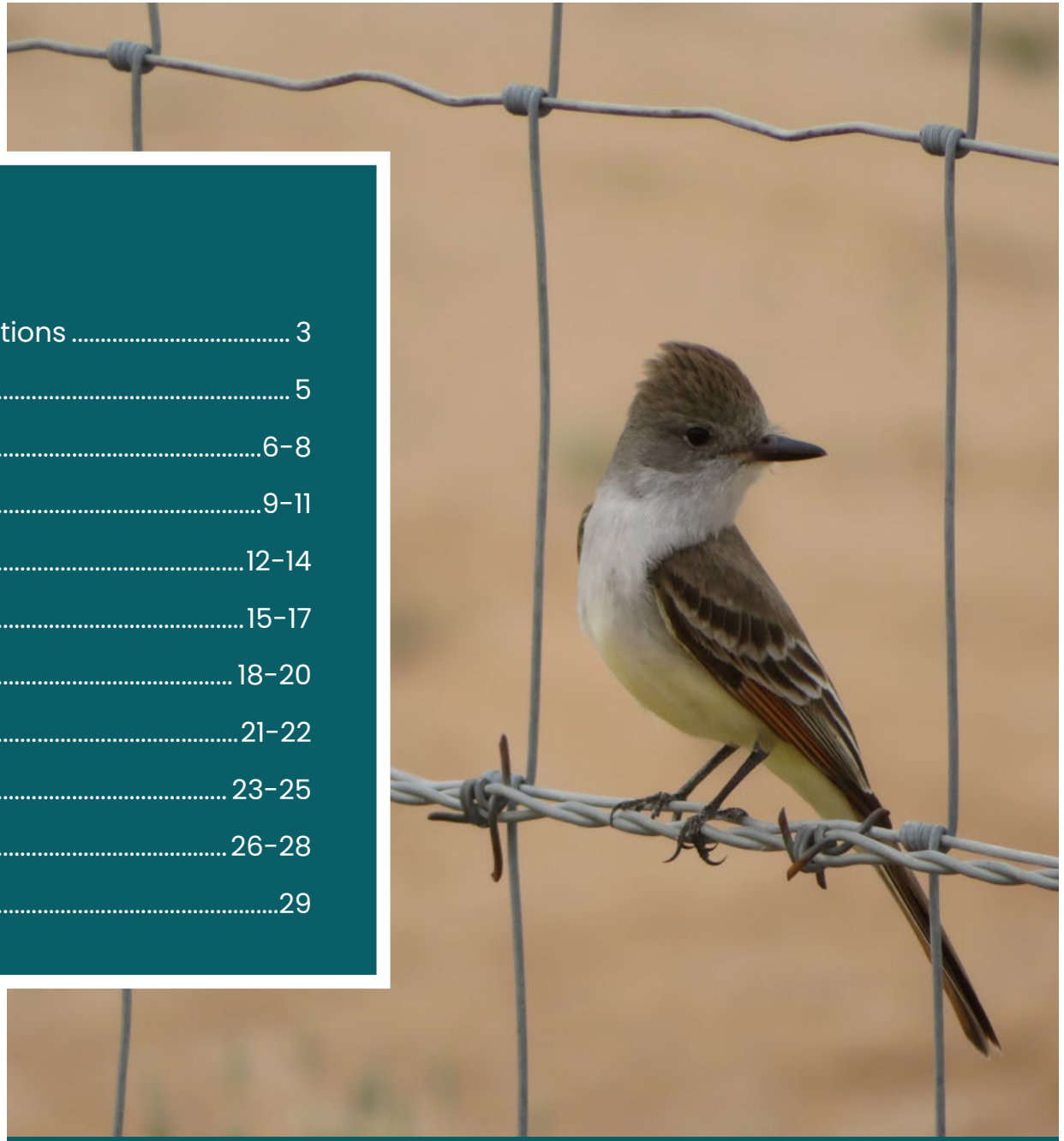
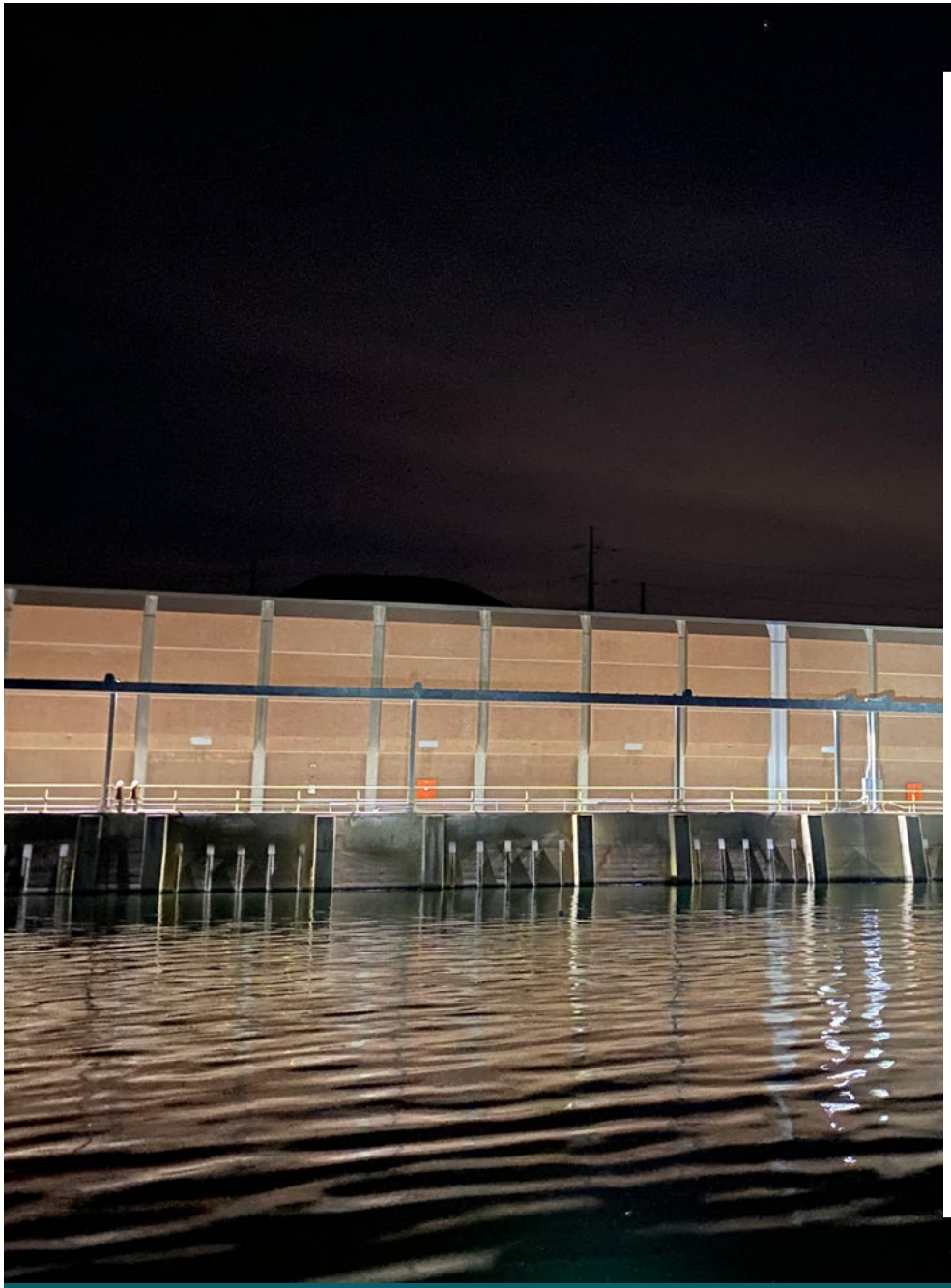


ASH-THROATED FLYCATCHER NEAR KLECK ROAD



HASSAYAMPA PUMPING PLANT AT NIGHT

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

"WILD" HORSES NEAR THE DRINKER AT SALT RIVER SIPHON

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 responsible management recommendations based on sound techniques and robust data.

Many of the same challenges from 2020 carried over to 2021, as the world-wide pandemic (COVID-19) continued to impact our daily lives. CAP employees were able to return to a relatively normal work schedule in early-August, but through it all, reliable deliveries of Colorado River water continued.

Despite various challenges, the long-term monitoring program implemented by the Biology Program, as well as special projects, continued throughout 2021. Aquatic vegetation, quagga mussels, caddisflies, and Cymbella (rock snot) kept us busy, while fish stocking, sediment mapping, and bio-box monitoring proceeded as normal.

The following annual report is a summary of the work completed in 2021, including approaches and significant findings, as well as strategies for monitoring and research in 2022. Each section also includes a brief introduction to the issue being addressed, which is carried over from previous annual reports. Strategies for 2022 are based on historical data and lessons learned from sampling efforts in previous years.

CHUCKWALLA NEAR LAKE PLEASANT

QUAGGA MUSSELS ATTACH TO A ROPE AT MWP

QUAGGA MUSSELS

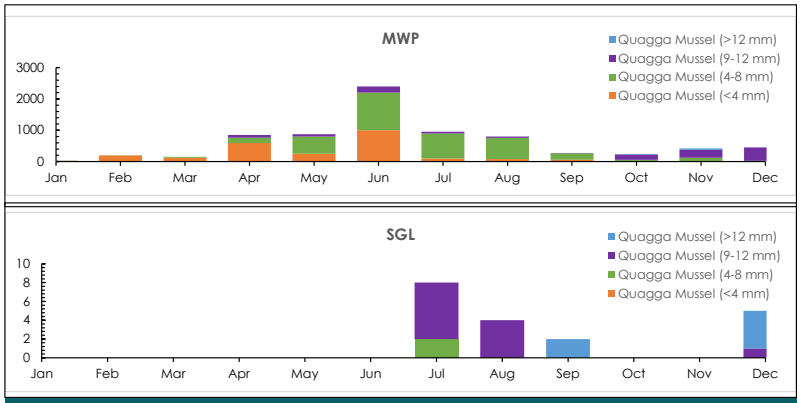
BACKGROUND

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 monitored with monthly bio-box checks and annual trash rack inspections. Additionally, plant and aqueduct personnel report irregular findings related to quagga mussels as conditions dictate. In 2021, installation of a chemical injection system at MWP was completed. This injection system will address infestations of quagga and other organics in the cooling water systems.



MONTHLY QUAGGA INFESTATION AT MWP AND SGL, THE ONLY TWO PUMPING PLANTS WITH MORE THAN TWO INDIVIDUAL QUAGGA MUSSELS FOUND IN 2021.

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. THIS TANK ACTS AS THE CENTRAL RESERVOIR AND THE MOLLUSCICIDE IS DELIVERED TO EACH UNIT THROUGH A DISTRIBUTION SYSTEM.

FINDINGS

Quagga mussels were only prevalent at MWP in 2021, with the typical high numbers peaking during summer months, but persisting throughout the year. Less than ten large quagga were observed in the SGL bio-box during June through August, but those mussels eventually died and fell to the bottom of the tank. The only other locations where quagga were observed were at BRW in May (two small individuals), and BRD and BLK in December (two large individuals each). These mussels were likely trans-locators and not the result of any significant reproductive event. Quagga mussels had been found in the bio-box at BSH in 2019 and 2020, but not in 2021. However, plant personnel indicated that HVAC infrastructure was infested with quagga and had become clogged. This may indicate that quagga are persisting in piping and infrastructure at BSH.

The chemical treatment system at MWP became operational in September 2021. Prior to starting the system, each cooling unit was inspected using a videoscope to determine baseline infestation. Although there were varying degrees of fouling, all units showed a high potential for clogging from quagga mussels, colonial hydroids, and other organic debris. Follow-up inspections are scheduled for January 2022 to evaluate the effectiveness of the treatment and adjust application rates as necessary.

Trash rack inspections showed only light fouling at most plants. Quagga mussel density on racks was light to non-existent. Although colonial hydroid infestation was evident at all plants, there were no levels that require attention. The heaviest organic presence was at WAD, where quagga, hydroid, and algae were all observed on the racks. At MWP racks at Units 1 and 6 were most heavily infested, but that is likely a result of the rake system being removed from those units. Units with the rake system had virtually no biological attachment.

STRATEGIES FOR 2022

In 2022, CAP will continue to monitor quagga mussels in bio-boxes, trash racks, and various locations throughout the canal system. We will continue to count on maintenance personnel to alert us of any issues and address those problems as they arise. Issues at BSH will be investigated and a strategy to mitigate the fouling will be determined. The chemical injection system at MWP is fully operational, so monitoring of the effectiveness of the system will occur throughout the year, and adjustments will be made as necessary to improve the efficiency of the system.

QUAGGA MUSSELS IN GLENDALE TURNOUT
Photo by Jim Geisbush

AQUATIC VEGETATION - MWP

BACKGROUND

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, 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. CAP continues to monitor growth, collect vegetation with a weed harvesting boat and treat vegetation with a aquatic herbicide as needed.

CAP WEED HARVESTING BOAT ON LAKE HAVASU

TRASH RAKES AT MWP COLLECT AQUATIC WEEDS, BUT DUE TO THE COMPOSITION OF THE WEEDS, THE RAKE SYSTEM HAS BEEN INEFFECTIVE.

THE VEGETATION TREATMENT IN 2021 WAS SUCCESSFUL IN CONTROLLING PONDWEED SPECIES IN SHALLOW AREAS OF THE INTAKE CHANNEL.

APPROACH

Aquatic vegetation growth was monitored from April through September within the 65-acre CAP intake channel using downscan sonar and StructureScan (Lowrance HDS Live 9). Data was uploaded to BioBase® to create bathymetric maps and vegetation heat maps. In July, an aquatic herbicide (Cascade®) was applied to approximately 25 surface acres within the CAP intake channel. The effectiveness of the treatment was measured through vegetation mapping and random sampling. During the "weed season" (July through September), CAP weed harvesting crews actively collected floating vegetation mats using the weed harvesting boat. Aerial drone surveys were completed in July and August to evaluate growth of vegetation in both the CAP intake channel and the Bill Williams National Wildlife Refuge.

FINDINGS

Mapping of vegetation within the intake channel showed that vegetation growth was heavier and more widespread than in previous years.

The weed treatment in 2021 was determined to be partially successful. Pondweed species that grow in more shallow water (near shore) were severely impacted by the treatment. However, a majority of the weed growth in the deeper water of the intake channel consists of southern and spiny naiad. These species were not affected by the treatment, even though the maximum label application rate was achieved. Reasons for lack of effectiveness on the naiad species is not fully understood, but may simply be a function of the depth and volume of water causing too much dilution. The full report of findings and recommendations is available upon request.

Even though the treatment had only marginal success, just 430 cubic yards of weed material was collected in 2021 by the weed harvesting boat. Over 80% of the total volume was collected during a single week (Aug 9-14) when monsoon storms were particularly severe. This continues the pattern of relatively low weed collection totals during the past three years, and coincides with the lack of significant monsoon storms.

STRATEGIES FOR 2022

In 2022, CAP will focus the weed treatment on the shallow areas where pondweed is most prevalent. This will help to control the large weed mats that form in mid-July, while the naiad mats that form later in the summer will be collected with the weed harvesting boat. Vegetation coverage and plant height will be mapped bi-weekly to evaluate the effectiveness of the treatments and monitor overall vegetation growth. 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 AUGUST 2021.
Photo by Michael Rogers

VEGETATION GROWTH IN THE WAD FOREBAY DURING APRIL 2021.

AQUATIC VEGETATION - AQUEDUCT

BACKGROUND

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 DURING SPRING TO CONTROL AQUATIC VEGETATION IN THE CAP.

FILAMENTOUS ALGAE OFTEN GROWS IN THE WADDELL CANAL IN MID-SUMMER.

MANUALLY SCRAPING TRASH RACKS MAY BE REQUIRED TO REMOVE ALGAE AND OTHER DEBRIS.

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

An "island" of rooted vegetation was found growing in WAD forebay during spring and early summer. The vegetation was growing on a large mound of sediment that periodically forms in the forebay. Typically grass carp will control this vegetation, and an increase in stocking rates may be required in 2022 to ensure that it doesn't grow out of control. Filamentous algae was once again evident throughout Waddell Canal during summer months, but was somewhat lighter growth than observed in previous years. CAP maintenance crews scraped municipal turnouts on just a few occasions, but no problems were reported. 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. They have deployed sensors that detect biological growth throughout the canal system, and as they refine processes, will be able to provide CAP and its stakeholders with indicators of the potential for algal blooms. The study will conclude at the end of 2023.

Grass carp were stocked throughout the canal in early March to maintain population levels for effective control of aquatic vegetation. The grass carp have provided effective control since 1996, and stocking will continue as a primary control mechanism.

STRATEGIES FOR 2022

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.

THE CAP FISH HOLDING TANKS ALLOW FOR SMALLER NUMBERS OF FISH TO BE STOCKED IN SPECIFIC LOCATIONS ALONG THE ENTIRE CANAL.

CADDISFLIES

BACKGROUND

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 neighborhoods were not yet constructed 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 channel catfish in the canal since 2011 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 2021

APPROACH

Channel catfish are stocked annually during late February/early March. In 2021, approximately 6,500 catfish were stocked into Pool 20, These fish averaged 8-12 inches and weighed approximately one-half pound each.

Names and addresses of residents calling with concerns about the caddisflies are recorded to determine where the caddisflies create a significant nuisance. An online form was also created for residents to notify CAP of concerns and can be found on the CAP website.

Additionally, CAP's Senior Biologist communicates regularly with the specialist from Bullhead City, as well as the biologist from Salt River Project, to share ideas about potential control efforts.

FINDINGS

Although CAP received relatively few notifications from the public (1), field crews noted typical "swarms" of caddisflies during spring and fall. Additionally, some residents approached CAP maintenance crews in the field to inquire about caddisfly control techniques.

Catfish stocking in 2021 concentrated on Pool 20, as the nuisance caddisflies appear to be most active in that area. Additionally, since stocking in this pool began just two years ago, the higher numbers were needed to boost the "resident" population. Future stockings will be spread out based on the estimated fish population in each pool.

The specialist in Bullhead City has found some success in reducing the caddisfly population below Davis Dam by "drying" this section for a period of time. As a trial, Salt River Project drained a section of canal and power-washed the concrete liner. Although this approach showed some promise in the short-term, caddisflies quickly returned to re-populate the treated area.

STRATEGIES FOR 2022

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 (one-half pound) in Pools 20-24. CAP will continue to work closely with specialists around the country, including Bullhead City and SRP, in an effort to find relief for residents adjacent to the canal.

CADDISFLIES TEND TO EMERGE AND "SWARM" AT DAWN AND DUSK.

CADDISFLIES SPEND MOST OF THEIR LIVES UNDERWATER AS LARVAE, AND BUILD CASINGS SO THAT THEY CAN ATTACH TO SUBSTRATE AND FEED ON ORGANIC MATTER.

CHANNEL CATFISH HAVE PROVEN TO PROVIDE SOME LEVEL OF CONTROL TO HELP REDUCE CADDISFLY POPULATIONS IN THE CAP.

CYMBELLA STALKS FLOAT ON THE CANAL SURFACE IN SUMMER.

CYMBELLA ("ROCK SNOT")

BACKGROUND

Since the time of their discovery in the CAP (1997), stalk-forming diatoms have occasionally become a nuisance for both CAP and its stakeholders. Cymbella (aka rock snot) 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 waters (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.

CAP field crews were asked to report any instances of rock snot observed in the canal.

FINDINGS

Within the canal, a significant amount of floating material broke off from the canal liner in the western portion of the CAP. Crews at LHQ observed a large amount of material on the surface of the forebay in March, and cooling water strainers were constantly plugged with the organic material. This "event" impacted the pumping plant through the end of June and only subsided with the summer outage. The Senior Biologist traced the problematic Cymbella and found that the bloom originated in Pool Bouse. As the material moved through the pumps at LHQ, it was broken into smaller pieces and was distributed throughout the water column. Material was observed as far south as BRD, approximately 250 miles downstream. Despite

the widespread distribution, impacts to stakeholders and downstream pumping plants were minimal, although Apache Junction reported some pump issues. The reason for the significant bloom is unknown.

In addition to the bloom in Pool Bouse, there was a small bloom in the Waddell Canal. This bloom did not appear to impact downstream municipal customers.

AzCATI researchers continued their work on Cymbella in 2021. They were able to narrow down the species of Cymbella that is found in the canal and it appears to be unique in the United States. A bulk of the AzCATI research focused on the deployment of sensors (MiProbe®) that are used to detect biological activity. Preliminary findings suggest that these sensors will be able to provide CAP and stakeholders with an alert when algal blooms are likely. This will allow for preparations to be made to effectively manage any problems that may arise as a result of the algal blooms.

The AzCATI research also identified a chemical solution that may be used to help breakdown the organic material when it clogs filters and strainers. Use of the chemical may be used when backwashing or power washing the strainers to speed the cleaning process.

STRATEGIES FOR 2022

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 work will continue until the end of 2023.

CYMBELLA THAT HAS DETACHED FROM THE CANAL LINER GETS CAUGHT IN TURNOUT GRATES AND CAN RESTRICT FLOW TO WATER TREATMENT FACILITIES.

AZCATI IS UTILIZING TECHNOLOGY TO DETECT ALGAL GROWTH IN THE CAP SYSTEM.

CYMBELLA DEBRIS CAN CLOG FILTRATION SYSTEMS AND STRAINERS IN PUMPING PLANTS.

A CYMBELLA BLOOM IN EARLY 2021 CREATED A LARGE AMOUNT OF FLOATING DEBRIS IN THE CAP SYSTEM THROUGHOUT MUCH OF THE SPRING AND SUMMER.

COLONIAL HYDROIDS

BACKGROUND

Hydroids are invertebrates (Hydrozoa) that look similar to a branched algae species, but feed on zooplankton and other invertebrates. The colonial hydroid, Cordylophora caspia, was first described in the Colorado River system in 1987, but was not positively identified until 2015. CAP first recorded the hydroid in bio-boxes in 2012, although it was likely in the system prior to then.

The presence of colonial hydroids can be of concern for various reasons, but for CAP, they have the potential to cause biofouling issues and they provide a substrate for quagga mussel settlement. Although not specifically monitored in the CAP system, Cordylophora presence is documented through bio-box observations and trash rack inspections. To date, the hydroid has only created issues in the MWP cooling water system, which is now treated with chemical injection.

MICROSCOPIC IMAGE OF CORDYLOPHORA CASPIA (WWW.MARINESPECIES.ORG)

COLONIAL HYDROIDS GROWING IN A BIO-BOX AT MWP

HYDROIDS CAUSE BIOFOULING ON TRASH RACKS AND IN COOLING WATER SYSTEMS.

HYDROIDS INCREASE SURFACE AREA FOR ATTACHMENT OF QUAGGA MUSSELS AND TOGETHER, CAN REDUCE THE FLOW OF COOLING WATER.

SEDIMENT

BACKGROUND

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 desilting 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 PLUMES ARE VISIBLE WHEN PUMPS ARE ACTIVATED AFTER AN OUTAGE.

APPROACH

Bathymetric mapping is conducted in each forebay and major turnout on an annual basis (since 2013) to help better understand patterns in sediment deposition. 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).

CAP Engineering initiated a short-term study to identify the most likely and significant potential sources of sediment. The contractor used various databases to determine erodibility and combined that data with topographic, precipitation, wind, and vegetation data to develop a predictive model.

FINDINGS

Sediment mapping in April 2021 showed a continued increase in sediment volume in nearly every pumping plant forebay. The SGL forebay, which was completely dredged in November 2019, had a sediment volume of over 7,700 cubic yards in 2021. This is nearly 13% of the total available forebay volume. The three largest turnouts (SROTO, CMATO, SMATO) continued to show a high level of sediment deposition, with 35-60% of the total turnout volume being occupied by sediment. BRD, PIC, and SAN have the highest percentage of sediment deposition in forebays, ranging from 31-40% of total forebay volume.

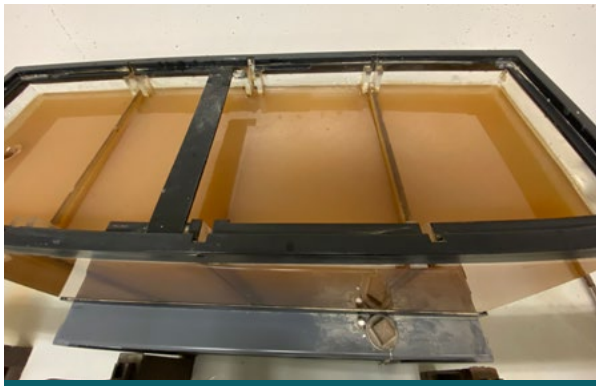
No dredging occurred in 2021; however, a storm event in late summer just upstream of RED (Pool 34) deposited a large amount of sediment in the canal and downstream turnouts. A temporary repair has been completed, with broken concrete panels being replaced by a compacted earthen liner. Erosion is expected to be minimal and future mapping will show how much sediment has entered the system with this event and subsequent repair.

A CAP Engineering sediment study concluded that precipitation and runoff were most prominent from PIC to SXV, and therefore contributed highly to the sediment deposition in that area. Drain inlets and erosion from the service road are the primary entry points for this sediment. They also found that wind erosion is significant in the southern portion of the canal and may be contributing to the sediment load.

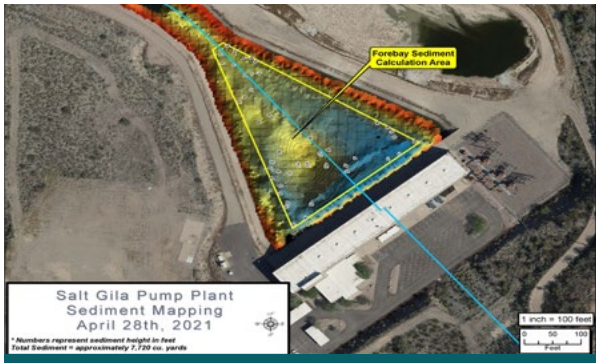
STRATEGIES FOR 2022

Sediment mapping in the pumping plant forebays will continue so that long-term trends can be evaluated. Results of the mapping will identify where sediment removal would be beneficial. Impacts of the storm event will also be evaluated from the standpoint of sediment deposition.

SEDIMENT CAN BUILD UP AT MAJOR TURNOUTS AND RESTRICT WATER FLOW.



SEDIMENT FROM THE POOL 34 LINING FAILURE WAS VISIBLE IN THE BIO-BOX AT BRW.



BATHYMETRIC MAPS ARE CREATED IN APRIL EACH YEAR TO DETERMINE THE AMOUNT OF SEDIMENT DEPOSITION IN EACH FOREBAY.

WHEN WATER LEVELS ARE DOWN, A LARGE MOUND OF SEDIMENT IS VISIBLE AT CENTRAL MAIN TURNOUT.

SMALLMOUTH BASS FROM LHQ IN JULY 2021
Photo by Kent Mosher (USBR)

FISH MONITORING

BACKGROUND

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 the sampling frequency was reduced to every 5 years because species composition had not changed over time.

RECLAMATION BIOLOGISTS IDENTIFY AND COUNT FISH COLLECTED FROM HSY DURING 5-YEAR FISH MONITORING IN JULY 2021.

APPROACH

Fish are sampled every five years at BSH, LHQ, HSY, SGL, BRD, RED, and SXV, with 2020 being the scheduled sampling year. However, because SGL was dewatered in 2019, fish removal efforts took the place of normal monitoring. BRD, RED, and SXV were all sampled in November 2020, but sites in the western canal were postponed (COVID-19). Sampling in BSH, LHQ, and HSY was completed in July 2021. Boat-mounted electrofishing, minnow traps, trammel nets, and trot-lines were used at all stations.

Sampling was coordinated with the CAP scheduled outages to take advantage of the low flow conditions, which allowed for more effective netting efforts.

Reclamation also continued its study to determine the effectiveness of eDNA sampling to determine species presence in the forebays. Water samples were collected at each sampling location for eDNA analysis. Samples were sent to the Reclamation lab in Colorado for analysis.

FINDINGS

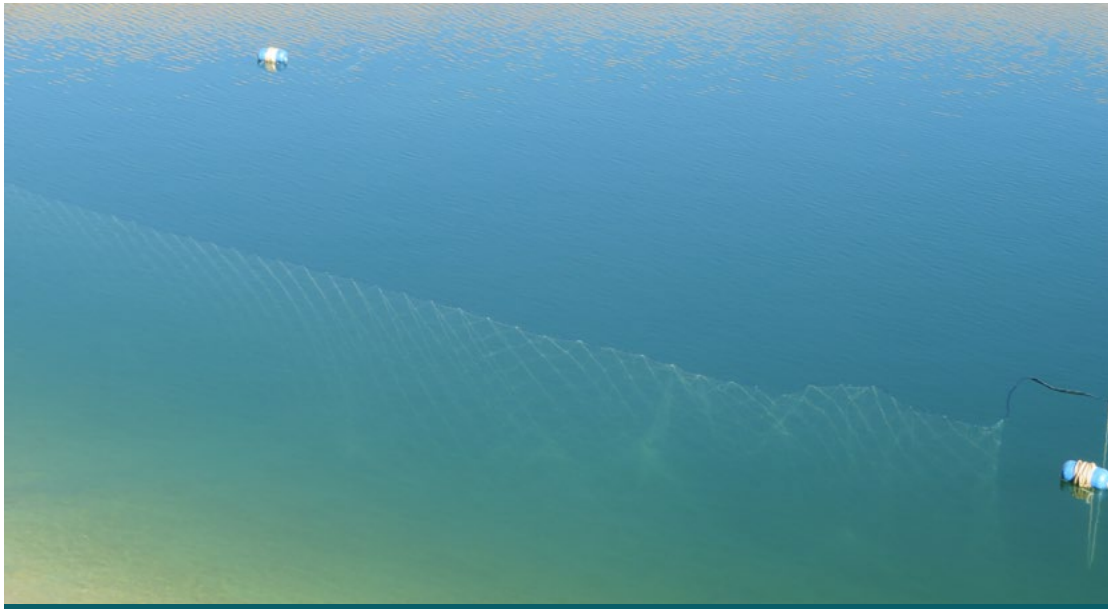
Catch rates in trammel nets and by electrofishing were relatively low, with a total of 342 fish collected. Twelve fish species were collected at sampling sites. Grass carp and common carp made up nearly 60% of the catch. No fish were captured in minnow traps or trot lines.

There were three new fish species found in the CAP during this monitoring event, all at SGL. These species included inland silverside, western mosquitofish, and Sonora sucker (stocked in 2017). All of these "new" species have been previously recorded in the Gila River Basin.

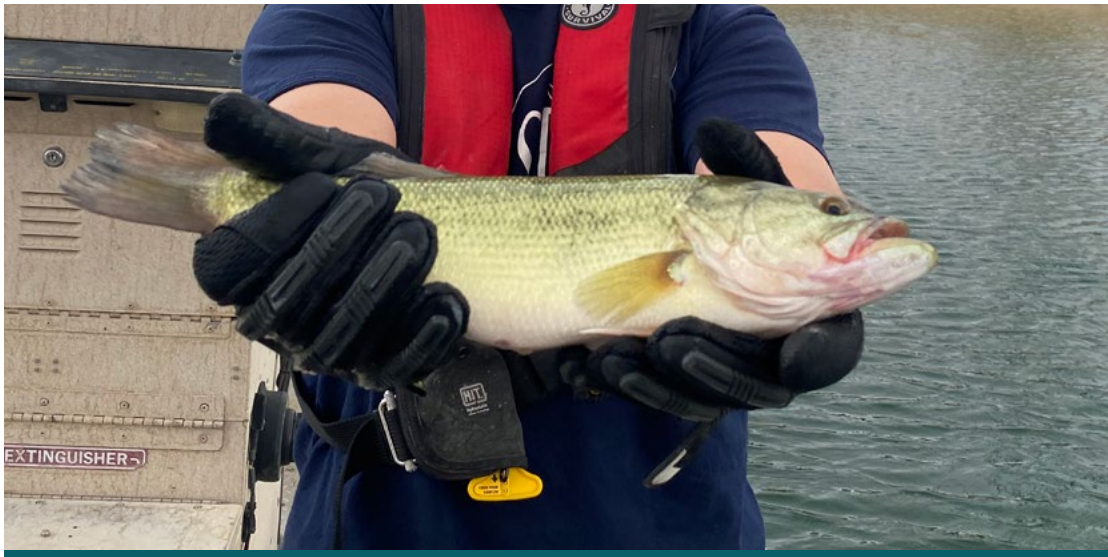
Results of the eDNA analysis are not yet available.

STRATEGIES FOR 2025

The next 5-year sampling event is scheduled for 2025. However, if eDNA results prove to be an effective method for determining species presence, regular sampling may be replaced with general water sampling for eDNA analysis.



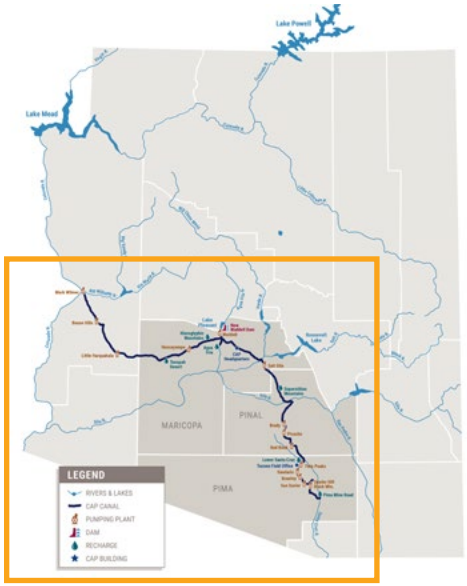
TRAMMEL NETS WERE ALSO USED FOR FISH SAMPLING DURING 5-YEAR FISH MONITORING AT BSH IN JULY 2021.



LARGEMOUTH BASS COLLECTED AT HSY DURING 5-YEAR FISH MONITORING AT HSY IN JULY 2021.

LARGEMOUTH BASS AT LHQ IN JULY 2021.

CAP SYSTEM MAP



2021 BIOLOGY ANNUAL REPORT

by Scott Bryan, Senior Biologist

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