Idaho State Department of Agriculture

2017

END OF YEAR REPORT

HYDRILLA MANAGEMENT

STRATEGIES AND TECHNIQUES AIMED AT ERADICATION IN IDAHO POPULATIONS

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INTRODUCTION

Hydrilla (*Hydrilla verticillata*), also known as water thyme, is an aquatic herbaceous perennial and one of the most aggressive and environmentally disruptive freshwater plants in the world (Haller 1975, Swarbrick et al. 1981, Murphy 1988, Mullin, et al. 2000, Hershner and Havens 2008, Bianchini, et al. 2010). It is highly adaptable and forms dense monocultures that restrict water flow, degrade water quality, impede recreation, and outcompete native species (Haller and Sutton 1975). This plant has been referred to as "the perfect aquatic weed" because of its ability to dominate aquatic systems through superior propagation and colonization (Langeland 1996). Hydrilla reproduces primarily through vegetative fragmentation and the production of overwintering structures called turions and tubers (Van & Steward 1990). Tuber dormancy is of particular concern in the reproductive success of this plant based on its potential to remain viable in sediment for up to 10 years (Kay 1992). Rapid growth rates also allow hydrilla to grow extremely fast at up to one inch per day. As the hydrilla nears the surface, branching of the stem is initiated and will develop into thick surface mats that effectively intercept sunlight and block penetration to plants in lower profiles (Haller and Sutton 1975). Because hydrilla can grow under very low light conditions, it has a competitive advantage over other aquatic plants (Van, et al 1976). This thick surface mat can also alter water chemistry, deplete dissolved oxygen levels, and has been linked to avian vacuolar myelinopathy (AVM) in herbivorous waterfowl and their avian predators (Wilde, et al. 2005), along with fish kill events. Due to the

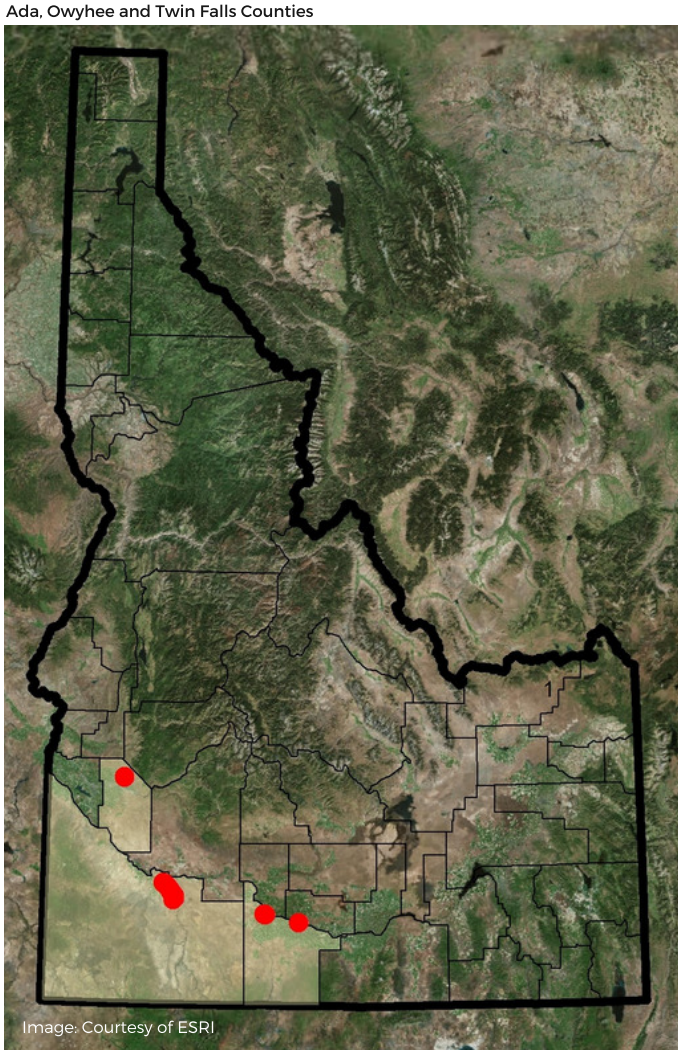
Hydrilla infested settling pond in Twin Falls County.

extremely aggressive and adaptable nature of this plant, hydrilla was added to the Idaho State Noxious Weed list in the early detection, rapid response (EDRR) category. This category requires that management action be initiated immediately upon discovery in the hopes of eradicating small infestations before populations can become widespread and hard to contain or control. The 2007 identification of hydrilla in Owyhee County raised local and regional concerns due to the foreseeable impacts to local irrigation systems, and the potential for spread

downstream into the Snake River. In response this threat, the Idaho State Department of Agriculture (ISDA) began an aggressive survey and removal program on identified populations with the intent of eradication.

Hydrilla has now been identified in four locations within three southwestern Idaho counties (Owyhee, Ada, and Twin Falls). The first population was identified in the Bruneau River near Bruneau, ID in December 2007 with a second population discovered shortly after in a North Boise neighborhood in 2008. Routine surveys in Twin Falls County led to the discovery of a third population in 2015, followed by additional locations within the same county in 2016 and 2017 (Map 1). All infested areas are located within surface waters that have geothermal influence. The area of mixing created at these ambient water/geothermal water interfaces creates habitats with suitable temperature ranges for hydrilla growth and establishment. Temperatures required for optimal growth of dioecious hydrilla range between 20°C (68°F) and 27°C (81°F) (Barko and Smart 1981, Kasselmann 1995) and are temperatures observed year-round in several of these sites.

Map 1. Regional map indicating the location of hydrilla infestations in Idaho for Ada, Owyhee and Twin Falls Counties



INITIAL POPULATIONS

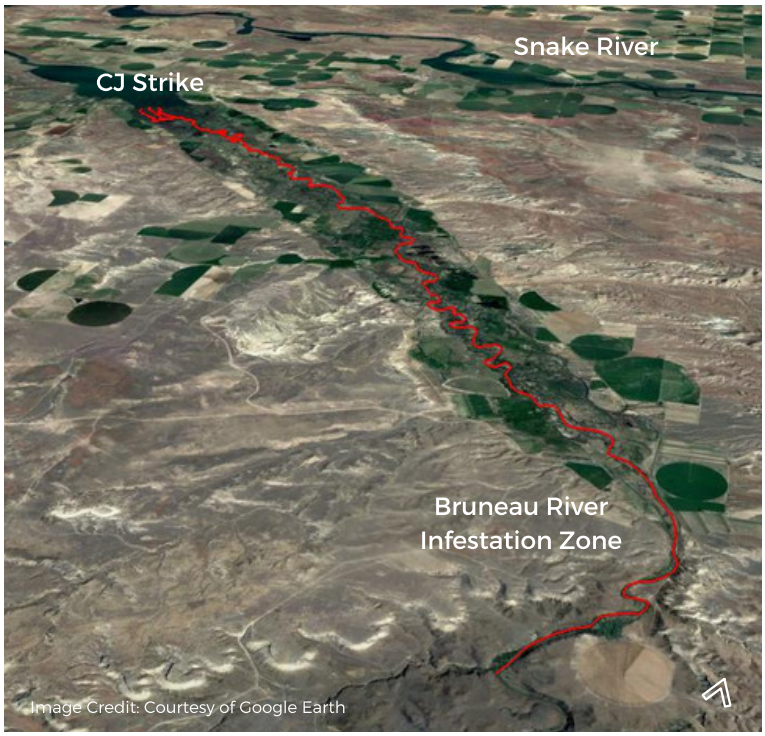
Owyhee and Ada Counties

Owyhee County: Bruneau River

The Bruneau River population covers a twelve-mile stretch from Hot Creek downstream toward CJ Strike Reservoir (Map 2). Historically, dense beds of plants were found throughout this region, but were primarily located in areas with geothermal influence. Hydrilla was also found in the lower reaches of the infestation zone (outside of identified geothermal areas); however, plants in these areas were typically scattered and occurred in low densities. Repeated surveys since initial discovery have found no hydrilla to occur downstream in CJ Strike reservoir or the Snake River.

Using DNA analysis, the US Geological Survey determined that the hydrilla in the Bruneau River is of dioecious biotype. Dioecious hydrilla is typically found in southern US states, whereas the monoecious biotype has been found in colder climates, such as Washington, Maine, New York and Wisconsin. The lower temperature limit of the dioecious biotype is not well established in the scientific literature; however, its distribution appears to be limited in the US by cold temperatures. The distribution of dense hydrilla in the Bruneau system displays a similar temperature limitation and appears to be constrained to geothermally influenced waters, which are found in the first seven miles of river extending below Hot Creek. Primarily, hydrilla found outside of geothermally influenced areas occur in low densities and are believed to have been deposited as tubers/turions that were moved downstream during high spring flows. However, late season hydrilla growth in Idaho populations have consistently been recorded at temperatures down to 10°C (50°F), which shows that the plant is capable of growing outside of optimal conditions.

Map 2. Hydrilla infestation area in the Bruenau river extending from Hot Creek to the delta at CJ Strike Reservoir.



Suction removal system.

Image Credit: Bethany Muffley - ISDA

Owyhee County: Bruneau River Treatment History

Scientists and experts from around the nation were consulted following the 2007 identification of hydrilla in the Bruneau River. Treatment options were identified and stakeholders from around the region were brought together to develop an eradication plan. ISDA in cooperation with Idaho Fish and Game (IFG), Idaho Department of Environmental Quality (IDEQ), Idaho Office of Species Conservation (IOSC), US Fish and Wildlife Service (USFWS), US Bureau of Land Management (BLM), United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) and landowners from throughout the Bruneau Valley all came together to execute the agreed plan As a result, an aggressive eradication program utilizing diver-removal, hand-removal and herbicide treatment was implemented in early February 2008. Initial treatments consisted of two eight-hour diquat injections into the river, three diquat backpack applications, ten days of diver-harvesting removal, and five days of hand removal. Efforts in 2008 resulted in an estimated 50% reduction in biomass for the following year. Coordination with the Hot Springs and Buckaroo Canal Companies also focused treatments to remove hydrilla biomass from the upper parts of the canal systems.

Treatment in subsequent years further reduced hydrilla biomass and distribution throughout the infested area. Herbicide use decreased as hydrilla densities were reduced into levels where hand removal became more effective. Grant funding in 2010 from USDA, APHIS, and BLM permitted the hiring of seasonal staff dedicated to the project area, which allowed for a more comprehensive and sustained mapping, survey and removal program. In 2011, this funding also allowed for the purchase of a suction removal system (modified dredge) to help facilitate the removal of hydrilla biomass, including tubers.

From 2010 to 2012, all hydrilla-infested areas identified in the Bruneau River were surveyed repeatedly during each growing season (typically June-October). When hydrilla plants were found, a GPS location was acquired and a range for the number of plants and area of coverage was recorded. In areas of low plant density, plant materials were carefully removed by hand and often included tubers. In areas of higher plant density, suction removal proved more efficient and effective and allowed the removal of large quantities of biomass along with a majority of tubers anchored in the sediment in areas worked. The collection of data in this manner allowed for hydrilla occurrence and density (plants per m^2) to be recorded and monitored over time throughout the river system.

In an attempt to increase the sensitivity of the analysis and to more clearly illustrate changes of the hydrilla population over time, the actual number of hydrilla plants removed was investigated. Prior to 2013, higher plant densities prohibited a year-to-year comparison of individual plant numbers. Due to substantial reductions in plant densities; however, crews were able to record accurate counts of individual plants throughout the infestation zone. This information provides a metric to track changes over time and quantifies actual hydrilla plant growth rather than just focusing on the locations of occurrence. Between 2013 and 2016, data collected in the Bruneau River found individual plant numbers decreased by 95.3% in the entire infestation zone and 95.7% in high density areas.


Hand removal in Section 4.

Image Credit: Bethany Muffley - ISDA

Owyhee County: Bruneau River 2017 Field Season

The 2017 field season was the eighth year of the hydrilla eradication project where intensive survey data were collected, and a focused season-long removal effort implemented. Decreased plant numbers and a shortened growing season caused by extreme climatic conditions allowed for a reduction in staff and man hours needed to accomplish management objectives. Hand pulling and suction removal continued as the primary treatment option against hydrilla in the Bruneau River system and significant percentage decreases continue to be observed using these techniques.

The entire area of known hydrilla infestation was surveyed in 2017 and plants were removed whenever encountered. The survey area is divided into ten operational zones based on river access locations (Map 3). These locations were identified in previous years to help drive management decisions and focus efforts on areas with higher plant densities and occurrence. Higher density areas have historically been found in upper sections 1-5 which contain several geothermal springs and a few densely infested backwater areas that had been acting as point-source locations for the

transport of hydrilla vegetative materials back into the main river stem. Since 2013, management efforts have heavily focused on sections 1–5 to prevent the possibility of new growth that could result in tubers and turions being carried downstream during high seasonal flow events. Since hydrilla tubers can remain viable for several years and break dormancy at any time over that period (Netherland 1999), it is extremely important to focus efforts in high-density areas and remove all reproductive materials to decrease the deposition of hydrilla in subsequent years. During the growing season, hydrilla mainly spreads through fragmentation and is the reason why focus must be placed on upper river sections to stop the infestation at its source. Using this management strategy, survey and removal efforts for 2017 recorded a 99.3% reduction in high-density areas when compared to 2013 findings. This reduction is also seen throughout the entire infestation zone at a decrease of 99.1% in overall hydrilla population (Figure 1 and Map 5).

Map 3. River sections for hydrilla survey and removal. Bruneau River, Idaho.

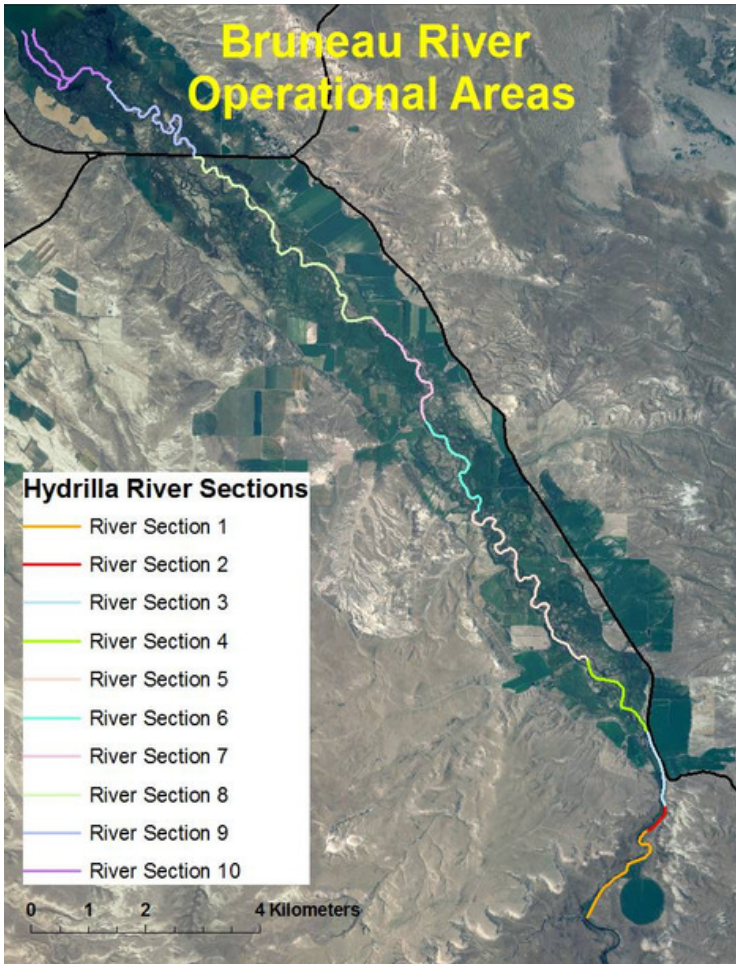
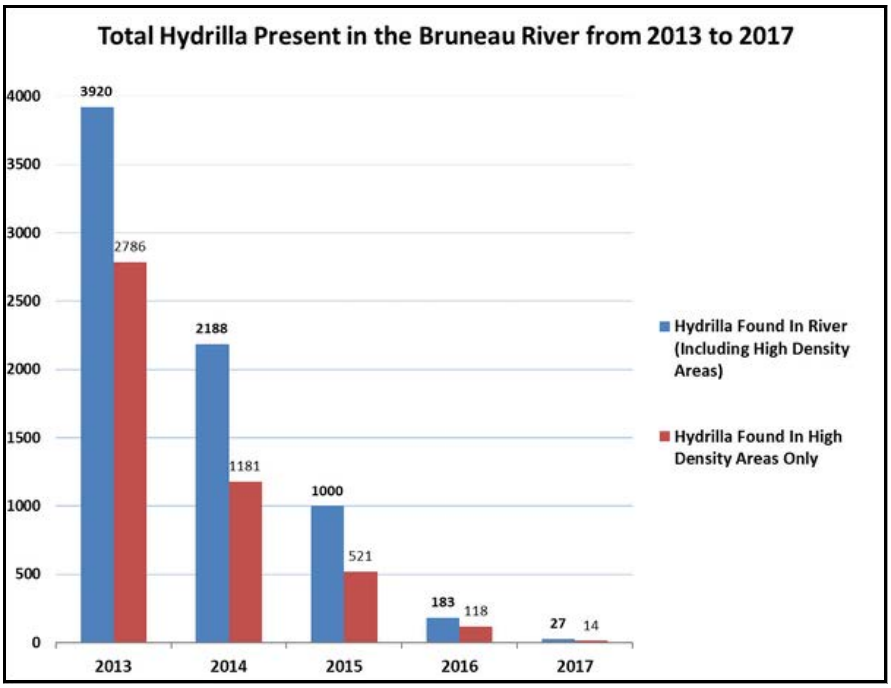


Figure 1. Hydrilla plants found and removed from the Bruneau River between 2013 to 2017.



Dividing the river into ten operational areas (Map 3) also allows for a further investigation of the number of plants removed and illustrates localized treatment progress for each river section by year. The below table shows the actual plant numbers recorded per river section for each year from 2013 to 2017 (Table 1).

Table 1. Hydrilla plants found and removed per river section between 2013 to 2017.

River Section	2013	2014	2015	2016	2017
1	493	259	73	25	3
2	487	412	307	65	4
3	122	60	62	4	9
4	2483	991	216	58	9
5	316	441	323	22	2
6	12	11	16	4	0
7	0	6	1	4	0
8	5	0	2	1	0
9	2	8	0	0	0
10	0	0	0	0	0

Significant decreases in plant occurrence were observed in 2016 and 2017. River Section 3 records the only increase in plant occurrence for 2017 and was a direct result of an identified breach in the Hot Springs Canal which runs parallel to it (Image 1). Plants with well developed tubers were found directly below the breach location suggesting that materials were deposited into the river directly from the canal way. In 2014, a dense population of hydrilla was observed in the Hot Spring Canal with a scattered presence in the Buckaroo Canal located on the other side of the river (Map 4). Survey focus was immediately shifted to river sections 1 and 2 in an attempt to stop fragments from entering both canal systems, and intensive dredging activities preformed on a weekly and biweekly basis were initiated to prevent deposition of newly grown plant materials back into the main river stem. Between 2014 and 2017, approximately 1,700 hydrilla plants and over 690 tubers have been removed from the upper sections of the two canal systems. Continued decreases in plant occurrence within the river suggest that removal efforts undertaken in these connected canal systems are proving successful against the deposition of reproductive materials back into the main river stem (Map 5 and 6).

Above average temperatures and snowpack in southern Idaho for 2017 led excessive runoff into surface waters. This excess water caused extensive flooding in areas around the state as water from swollen reservoirs was released to make room for more. The Bruneau River also experienced above average flow. During surveys, it was evident that a large volume of water had scoured out river sections, and had even carved out new sections of river in some places. The scouring of the river could have lifted and carried plant materials downstream to unidentified locations. Tubers and turions could have also been buried under large amounts of sediment allowing

Map 4: Hydrilla infestation areas in canal systems paralleling the river. Bruneau, Idaho.

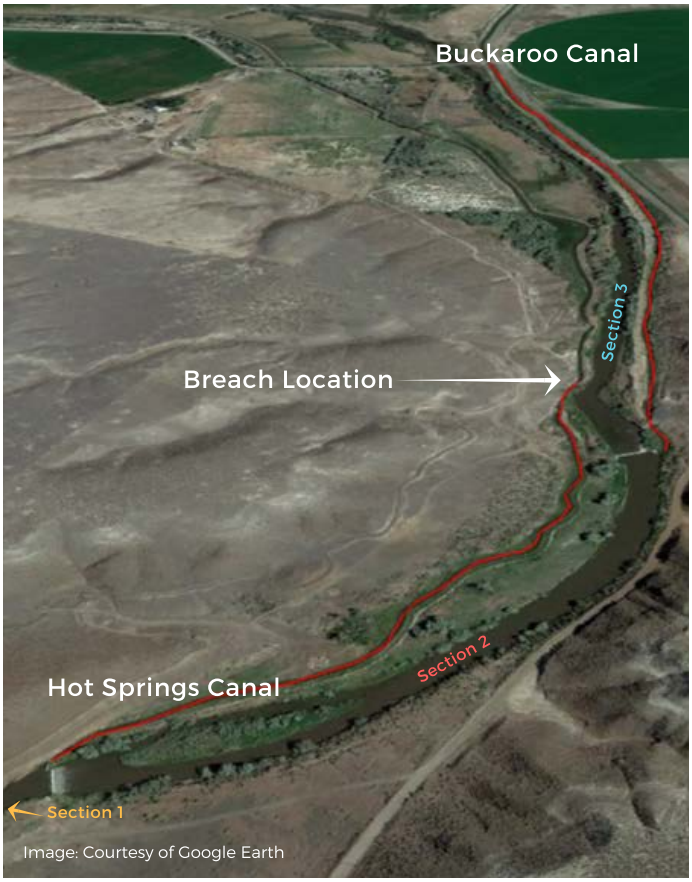
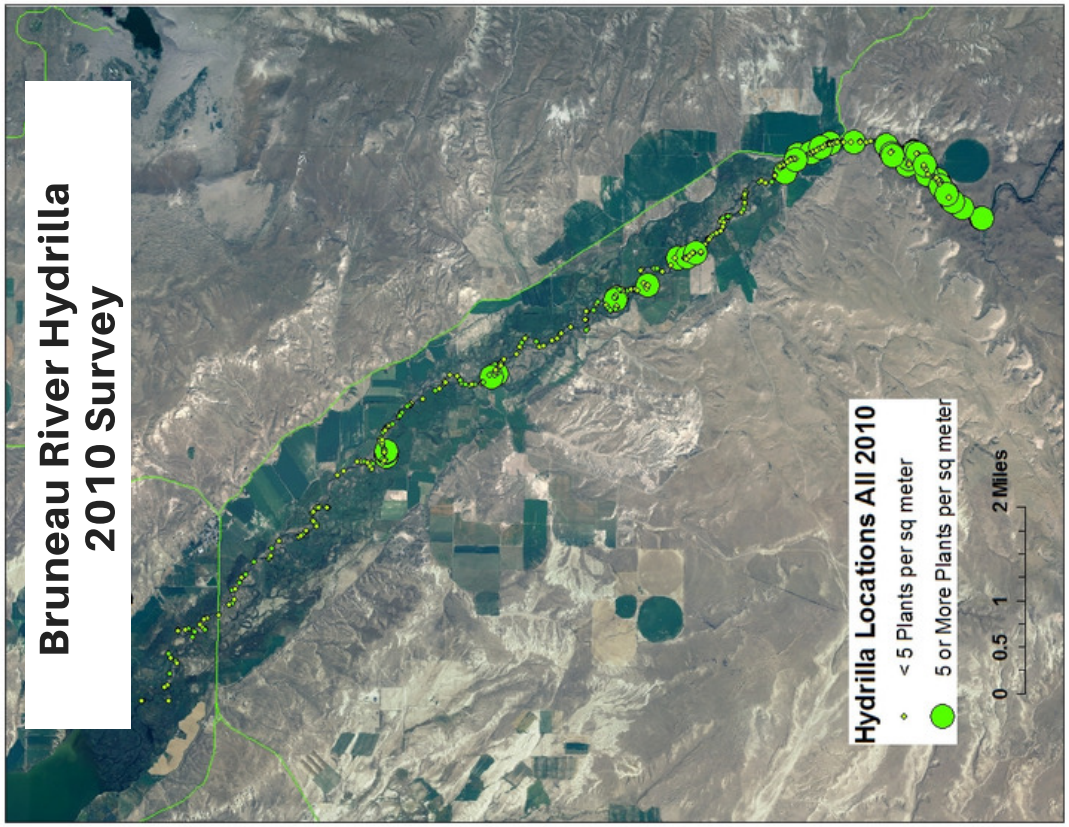
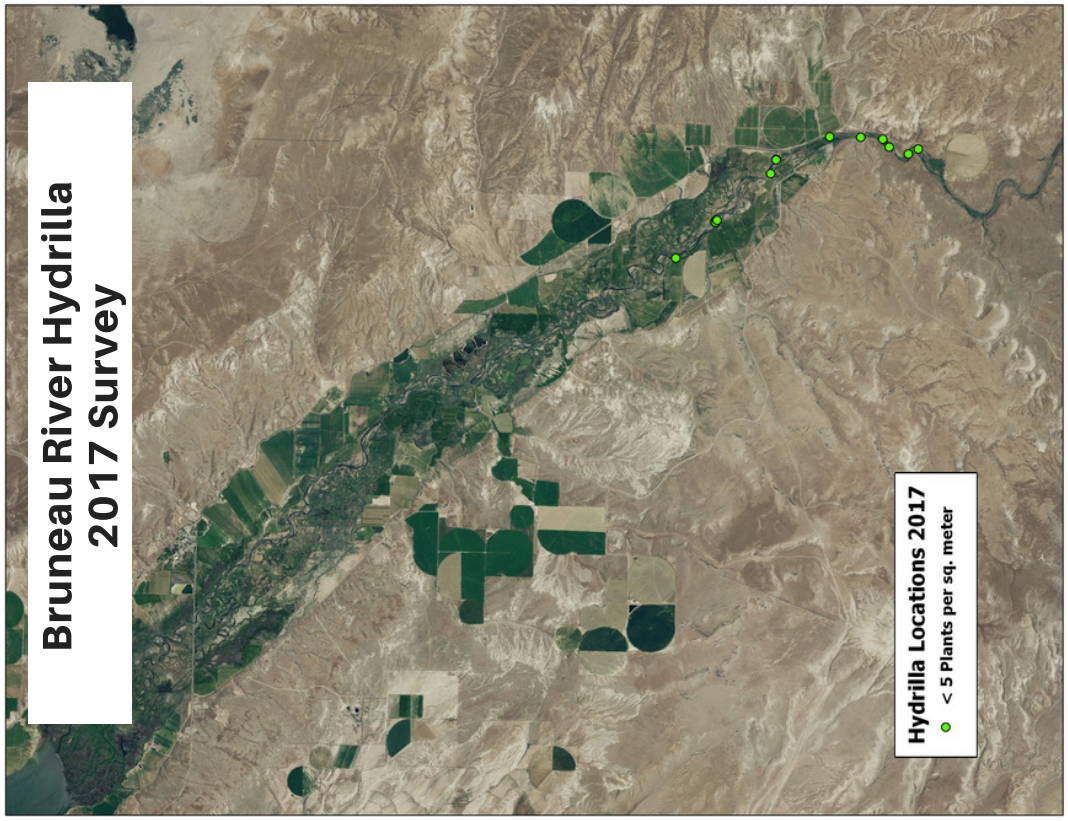


Image 1. Water discharge in Section 3 from breach location in Hot Springs Canal.



Map 6: All hydrilla locations in 2010 in plants per m². Bruneau River, Idaho.



Map 5: All hydrilla locations in 2017 in plants per m². Bruneau River, Idaho.

them to lay dormant until conditions become more favorable. The entire river area was surveyed to ensure that any growth from transported plant materials would be identified and removed. As of October 2017, no plants were found below a known high-density area in the top of section 5. The entire infestation zone will continue to be worked to ensure that all plant material will be promptly removed upon discovery.

Figure 2. Degree day analysis for water temperatures in the Bruneau River, ID near Hot Springs. Days over 20˚C by year (USGS Gage Water Temperature Data).

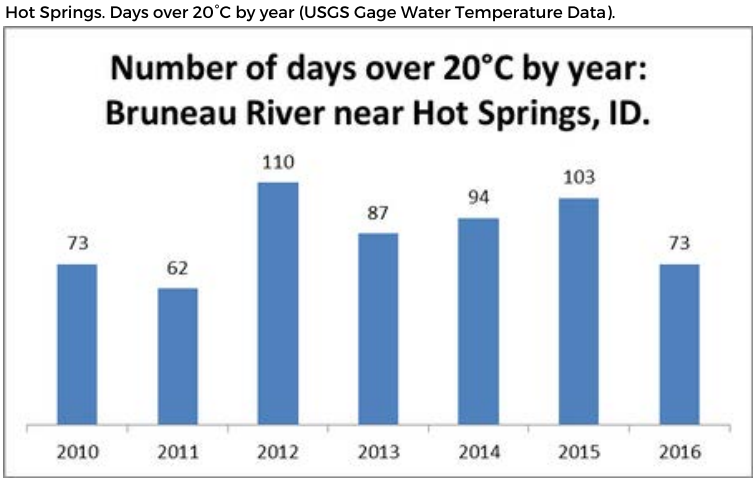
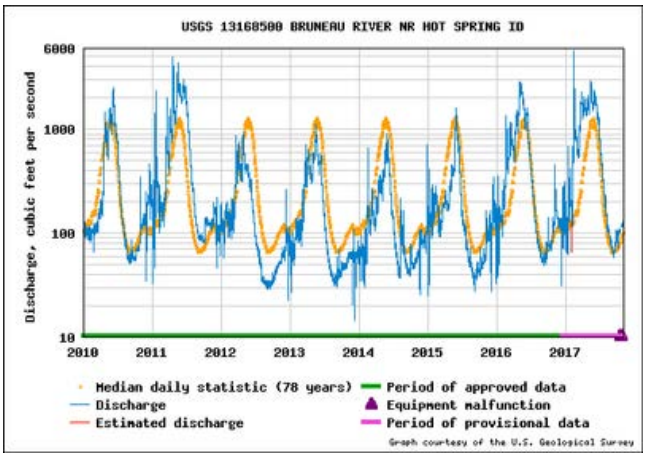


Figure 3. Discharge data for the Bruneau River near Hot Springs from 2010 to 2017. Information was accessed using USGS Water Data website @ https://waterdata.usgs.gov/id/nwis/uv?site_no=13168500



Seasonal temperature data have been collected since program initiation in 2010 . Bruneau River water temperatures between June 1 and October 31st were analyzed to determine the number of days per season that temperatures were over 20˚C (68°F) (FIgure 2). Published literature indicates the optimal temperature range for growth in dioecious hydrilla is between 20˚C (68˚F) and 27˚C (81˚F) (Barko & Smart 1981, Kasselmann 1995), so analyzing this information could help predict when tubers may emerge from dormancy. Due to extremely high seasonal runoff in 2017, access to the Bruneau River was impacted and the installation of the programs temperature probe was delayed. As a result, temperature information from 2017 was incomplete and did not permit the season's degree-day analysis. Stream flow data obtained from the USGS Water Data website (https://waterdata.usgs.gov/usa/nwis/uv?13168500) indicate that stream flow events in 2011 were similar in volume to 2017 (Figure 3). The years 2010 and 2016 also showed similar flow volumes, and both had recorded 73 days of temperatures averaging over 20°C (68°F). If a correlation exists in the Bruneau River system between stream flow volume and average temperature, then it could be interpolated that 2017 may have also experienced approximately 62 days with water temperature averages exceeding 20°C (68°F) as recorded in 2011.

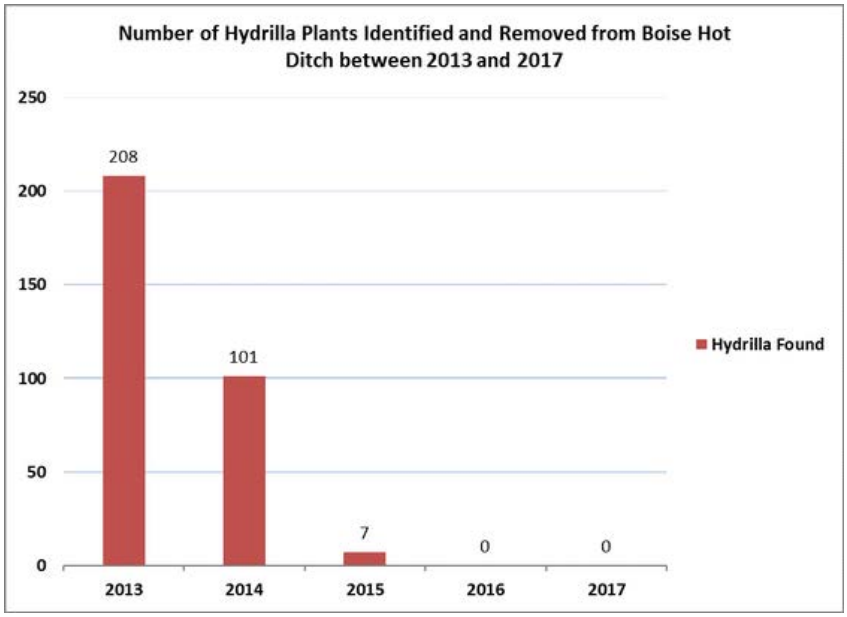
Ada County: Boise Hydrilla

A population of hydrilla was identified in a small geothermal ditch in Boise in 2008. This water system flows into the Farmers Union Canal and eventually deposits back into the Boise River. Plants were found in a 400-meter length of ditch that runs through the backyards of private homes in a North Boise neighborhood. Hydrilla was likely introduced as an escaped aquatic hitchhiker in a shipment of tilapia received by a local aquaculture hobbyist who was using the natural geothermal water for fish propagation. Tilapia occurrence is observed frequently in this area and has been associated with hydrilla populations in other Idaho locations.

Ada County: Boise Hydrilla Treatment History and Results

The Boise hydrilla population has been repeatedly surveyed since discovery with plants being removed by hand when encountered. In 2015, the ditch showed considerable decreases in plant populations, and by 2016 no plants were found. Two survey events took place in 2017 with both documenting zero regrowth for the area. This is the second consecutive year where no plant regrowth has been observed (Figure 4). Literature indicates that hydrilla tubers can remain dormant in sediment for up to 10 years (Kay 1992), which is the reason why monitoring will continue in this area to ensure that any hydrilla regrowth occurring from a break in tuber dormancy will be removed before re-infesting the site.

Figure 4. Total number of hydrilla plants removed by year from geothermal ditch located in Boise, ID.



RECENT POPULATIONS

Twin Falls County

Twin Falls County: Bulh Hydrilla

On a routine survey in July of 2015, hydrilla was found and identified in the outflow of a geothermally influenced settling pond, which empties directly into the Snake River. An investigation of this initial discovery led to the identification of hydrilla populations on five separate properties (Map 5). Idaho borehole data collected by the Idaho Department of Water Resources (IDWR) and accessed through DATA.GOV (https://catalog.data.gov/dataset/idaho-borehole-temperatures) identified 15 geothermal wells that feed the area and range in temperatures from 32˚C (90˚F) to over 36˚C (43˚F) at varying discharges of 70 to 3000 cubic feet per second (CFS). Geothermal water use within properties includes fish propagation, ornamental water gardens and home heating. Specific uses within aquaculture facilities require a mixing with cooler surface water and geothermal spring water to create a temperature range suitable for year-round fish production. Preferred temperatures for tropical fish propagation average approximately 20˚C (68˚F) to 30˚C (86˚F) (Cline 2012), a temperature range that closely matches the suitability range for hydrilla establishment and growth (Barko & Smart 1981, Kasselmann 1995).

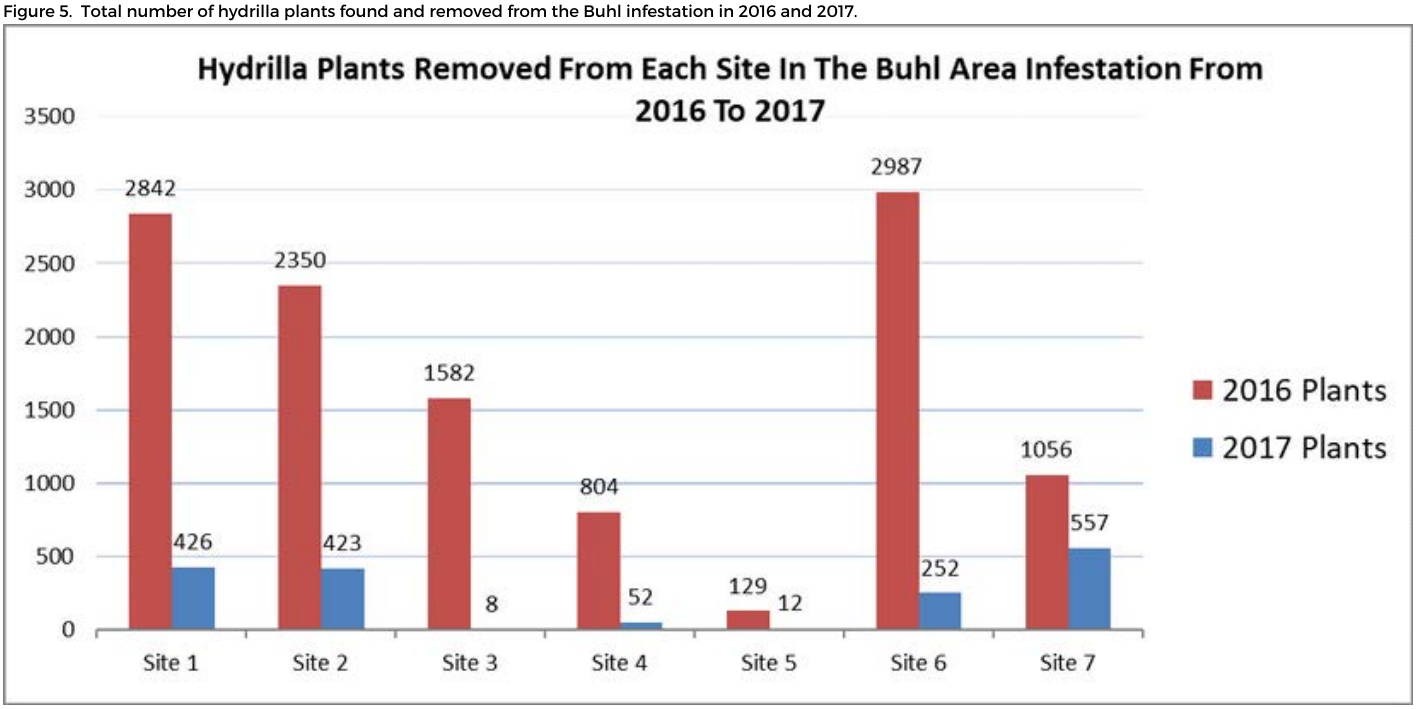
Map 7. Hydrilla infested areas near Buhl, Idaho.

Twin Falls County: Bulh Hydrilla Treatment History and Results

Site evaluations were conducted in January 2016 in Twin Falls County with the assistance of Kali Sherril with Twin Falls County Weed Control, the Aquaculture Industry Liaison for the University of Idaho Extension Gary Fornshell, and Dr. Bill Haller, Director of the University of Florida's Center for Invasive and Aquatic Plants. Treatment recommendations were provided for each site as result of this evaluation and included a combination of chemical applications, biological control, mechanical removal, benthic barriers, and hand pulling. All utilized treatments where initiated in cooperation with landowners, Twin Falls County Noxious Weed Control and ISDA.

Crews began conducting survey and removal efforts in June 2016, and followed the same techniques utilized in the Bruneau River and Boise hydrilla populations. Each site was visited once a week for the duration of the field season, and when plants were encountered, all vegetative materials including tubers were removed with the corresponding location recorded. Data collected from 2016 removal efforts were able to provide a baseline for monitoring the progress of this eradication effort. As a result, a significant decrease in plant occurrence for Buhl Sites 1–7 occurred in 2017 (Figure 5).

Figure 5. Total number of hydrilla plants found and removed from the Buhl infestation in 2016 and 2017.



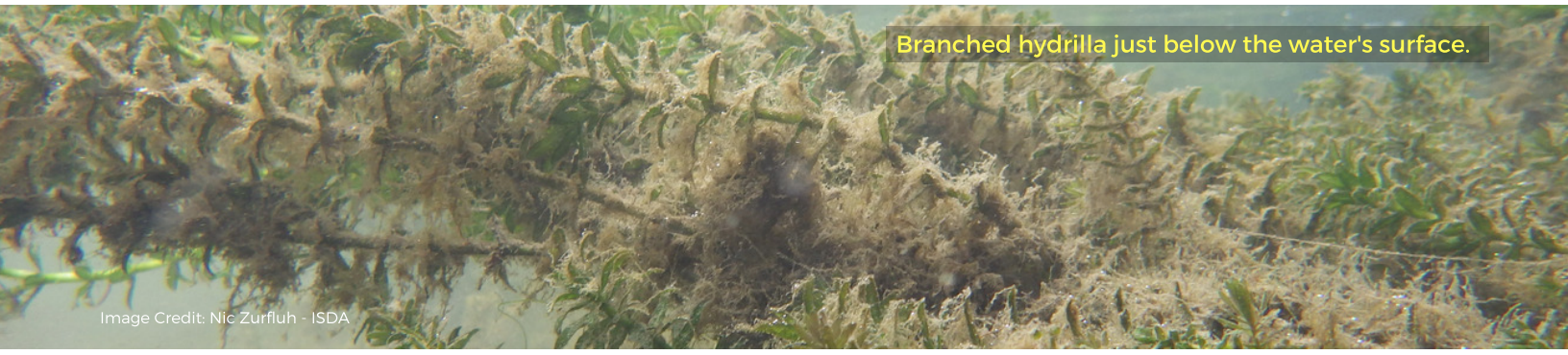

Branched hydrilla just below the water's surface.

Image Credit: Nic Zurfluh - ISDA

Twin Falls County: Bulh Hydrilla Site 1

Survey of Site 1 found hydrilla throughout the facility and infesting approximately 2 acres (0.8 hectares) of combined water-covered area. Water temperatures range from approximately 20˚C (68˚F) to 30˚C (86˚F) on an increasing trend upward from the lower reaches. The infestation appears to have originated from plant material observed in a plastic rearing tub located at the upper-most area of the facility. Fragments were carried down from this location into the rest of the system via piping that feeds into a combination of raceways, canals, ditches, channels and underground pipes. Hand removal continues as the primary treatment for this site with focus paid to the entire infestation zone and an emphasis on upper most infested areas in an attempt to stop the spread of plant materials down the line. A total of 426 plants were identified and removed from Site 1 in 2017 at a reduction of 85% from the previous year.

Image Credit: Courtesy of Google Earth


Working raceway areas in Site 1.

Image Credit: Jason Parker - Twin Falls County

Twin Falls County: Bulh Hydrilla Site 2

Hydrilla infestation area is located in a large ornamental pond which covers approximately 0.3 acres (0.14 hectares) of combined water-covered area and includes a small outflow ditch. Pond temperatures fluctuate from approximately 24˚C (75˚F) to 27˚C (81˚F) in the summer months down to around 8˚C (46˚F) in December. Most of the plants observed are located in small crevices created by rocks lining the edges of the pond, and a few are found in the outflow ditch below. Hand removal continues as the only treatment applied to the site; however, if plant numbers are not significantly decreased in the coming seasons, biological control may present a viable option. A total of 423 plants were identified and removed from Site 1 in 2017 at a reduction of 82% from the previous year.

Image Credit: Courtesy of Google Earth


Finding hydrilla in rocky areas at Site 2.

Image Credit: Michael Johnson - ISDA

Twin Falls County: Bulh Hydrilla Site 3

The facility consists of several plastic rearing tubs connected to a small concrete raceway via PVC pipe. Water temperatures on site range from 21˚C (70˚F) to 30˚C (86˚F). No hydrilla was found in rearing areas; however, a small settling area located directly below the tub discharge zone had plants identified, along with a second earthen settling pond at the base of the raceway. A limited number of plants have also been found in the outflow of this settling pond which connects to both a large ornamental pond and a small ditch that empties directly into the Snake River. Techniques utilized on this infestation have included mechanical and hand removal. The landowner removed sediment from the small settling area and dewatered the earthen pond in January 2016. This treatment was followed by suction removal in August to remove any remaining plant materials. Hand pulling has been the primary mode of plant removal in the outflow areas for 2017, and significant decreases in plant occurrence are being observed with a total of 8 plants identified this season at a decrease of 99% from last year.

Twin Falls County: Bulh Hydrilla Site 4

This infestation was identified late in the 2016 season. The landowner approached crews in July after talking to a neighbor about hydrilla occurrence on an adjacent property. Hydrilla was found in a total of three ornamental ponds surrounding the main house. Plants were deeply rooted and growing up through rocks and decomposed pond liners. Working with the landowner, crews removed rocks and pre-existing liners from two of the ponds, and then utilized the suction removal system to dislodge and remove tubers anchored deep within the sediment. Following mechanical treatments using suction removal, the landowner re-lined the front pond with a layer of carpet underneath a new benthic barrier (pond liner). Rocks were stacked on of the liner and ornamental fish were stocked for

aesthetics and also to act as biological control against potential hydrilla regrowth. Modifications on this site are an ongoing process and the landowner expects to complete pond liner replacement for his backyard ponds in 2018. No regrowth has been observed in 2017 in the finished front pond, and only a minimal amount of plants have been found and removed from the unfinished backyard ponds. A total of 52 plants were identified and removed from this site in 2017 for a decrease in occurrence of 94%.

Twin Falls County: Bulh Hydrilla Site 5

This site contains two private pond areas used for recreational purposes. There has been no hydrilla observed in the upper-most pond; however, there it contains a significant population of Eurasian watermilfoil (landowner is working with Twin Falls County Noxious Weed Control for treatment options). The lower pond (hydrilla-infested) is connected to the upper pond via an underground pipe, and then empties directly into the Snake River. Treatments on site have included mechanical suction removal and hand pulling techniques. The landowner used a backhoe to dig out the lower pond early in the season, and then crews followed up with suction removal in July. Hand pulling did not resume until November in 2016 when plants located in the upper bank area were once again submerged with rising water levels to initiate growth. Significant decreases in plant occurrence were recorded on this site in 2017 and could be the result of a high-water event experienced that spring. River levels rose rapidly and scoured out the site carrying sediment and debris downstream. This seasonal event highlights the urgency of removing plant materials quickly to decrease the chance that seasonal runoff will relocate vegetative materials downstream. A total of 12 plants were identified and removed from Site 5 in 2017, which is a reduction of 91% from the previous year.

Twin Falls County: Bulh Hydrilla Site 6

Hydrilla infests the outflow areas of two rearing facilities located on site. The outdoor facility records the highest volume of flow and continues as the focus of survey and removal efforts in 2017. The main outflow ditch flowing east empties into two large settling ponds before exiting under the road to a neighboring property. The majority of plant materials on site have been found throughout this stretch. The indoor facility's outflow to the north also contains hydrilla; however, at this time, the volume of water discharged is not enough to create a flow capable of carrying fragments downstream. This area is being watched closely and will be monitored year round to record potential seasonal flow changes. Hand removal and biological control using triploid grass carp have been the primary techniques applied to this site. In April 2016, a total of 25 fish were acquired and split between the infested ponds, and have drastically decreased hydrilla occurrence so topped-out vegetation can no longer be seen (Image 2). Hand removal in the outflow ditch is slowly decreasing the tuber bank, which is estimated to be quite substantial. The facilities manager reported that hydrilla has been a resident on site for quite some time. For 2017, biological control agents have continued to maintain plant growth in lower ponds and significant decreases were recorded in the aquaculture discharge area with a total of 252 plants were identified and removed in 2017 with a decrease of 92% from the previous year.

Image Credit: Courtesy of Google Earth

Image Credit: Jason Parker, Twin Falls County

Image 2. Photo plot comparison of hydrilla infested settling pond before and after biocontrol stocking at Site 6 in Buhl, Idaho.

Image Credit: Nic Zurfluh

Twin Falls County: Bulh Hydrilla Site 7

The infestation on this property is located in a ditch, which is fed by outflow from the aquaculture facility in Site 6. The ditch is open air for approximately 50 meters before disappearing into an underground pipe and discharging into Deep Creek. Plants are also found in a pond located in the pasture area just behind the house. The pond does not appear to have a discharge point and instead seeps into the ground. It will be monitored closely to ensure that seasonal variability does not create an active flow capable of depositing hydrilla fragments into Deep Creek. Suction and hand removal treatments have been utilized on this site and a total of 557 plants were identified and removed in 2017, which is a reduction of 47% from the previous year. Site 7 was recently sold and the new owner has been working closely with ISDA to ensure removal treatments on this property continue.

Image Credit: Courtesy of Google Earth


Late season tuber growth.
Image Credit: Jason Parker - Twin Falls County


Winter survey and removal at Site 7.
Image Credit: John Collins - Twin Falls County

Twin Falls County: Twin Falls Hydrilla

One week after the discovery of hydrilla in Buhl, an additional population was reported in Twin Falls in an irrigation/settling pond emptying into the Snake River. A second site for this area was also discovered during a routine survey in 2017 (Map 8). TF Site 1 is a settling pond fed with a constant flow of water from a combination of ambient surface water from the Perrine Coulee and the discharge of a geothermal tropical fish raceway. Temperatures produced in this area of mixing have proven ideal to support hydrilla establishment and growth and remain constant enough during winter months to prevent senesce. TF Site 2 is a slow flowing stream fed with overflow from a separate geothermal well which feeds second aquaculture operation in the area. Water at the top of this stream recorded temperatures above 38˚C (100˚F) which is higher than hydrilla optimal range of growth; however, this slow-moving stream allows water to cool off enough so that suitable temperatures are reached within the line.

Map 8. Hydrilla infestation area in Twin Falls, Idaho.

Twin Falls County: Twin Falls Site 1

The hydrilla infestation on this site occupies a large settling/irrigation pond covering approximately 0.5 acre (0.2 hectares). Water from both ambient and geothermal water sources is piped into this location creating an ideal temperature for plant establishment. There is one outlet which flows through a grate and concrete containment area before traveling through a pipe that directly discharges into the Snake River. Hydrilla plants and tubers have been removed from the confluence area at the discharge point and also from a location approximately 80 meters downstream in a second geothermal discharge point. Treatments on site have included mechanical and biological controls. The facilities manager organized dewatering in mid-January of 2016 and followed up with a backhoe to remove sediment in an attempt to decrease the tuber bank. When water was allowed to discharge back into the pond, tubers still remaining in the soil quickly reestablished and topped out at 85% coverage. In response to this bounce-back of plant biomass, 30 triploid grass carp were acquired by the landowner and stocked in the pond in October 2016. Photo plots were set-up to track the progress of released biological control agents and minimal effects were observed in the first year. Further analysis of research materials in relation to triploid grass carp as a bio-control agent indicate that significant decreases in plant occurrence may take as long as 18-24 months after stocking (Porter 1997). Survey events in November of 2017 did record a drastic decrease in the amount of topped out hydrilla coverage and suggest that the biocontrol agents successfully established themselves and are slowly achieving management objectives (Image 3). Topped out coverage appeared to have decreased from 85% to 5% by the end of 2017.

Image 3. Photo plot comparison of bio-control agent progress at TF Site 1 in Twin Falls, Idaho.

Image Credit: Hydrilla Crew - ISDA

Twin Falls County: Twin Falls Site 2

This location was identified late in the 2017 field season. The introduction of plant materials into this site is unclear; however, the land manager did indicate that soil excavated from TF Site 1 might have been transported and used in an area connected to this new population. If any of the soil transported from the initial site contained viable tubers, then introduction into this unconnected waterway is quite possible. Management strategies are currently utilizing suction and hand-removal techniques and were initiated in November 2017 in cooperation with Twin Falls County Noxious Weed Control, the area land manager, and ISDA. Large patches of hydrilla with heavy tuber production were removed from this site in the initial survey (Image 4) and 2017 removal events will provide the baseline data used in subsequent years to track progress.

Image 4. Initial removal of hydrilla at TF Site 2 in Twin Falls, Idaho.

Image Credit: Aaron Ursenbach - ISDA

FUTURE ERADICATION EFFORTS

Results from initial populations in 2017 show a continued decrease in hydrilla population size for Owyhee County, and repeated surveys have found zero plants to occur within Ada County. Twin Falls County populations also recorded significant decreases in sizes between 2016 and 2017 and did so utilizing adopted management strategies developed from initial populations. This all-around reduction in population size suggests that a sustained and persistent survey and removal program is effective in reducing plant density, occurrence, and the tuber bank. This also highlights the importance of continuing initiated efforts in all Idaho hydrilla locations, as well as early detection surveys to identify and manage new populations before the plant has a chance at widespread growth and downstream dispersal. Results in 2017 also indicate that hydrilla density will continue to decline over time as the regrowth is consistently found and removed, and lower plant densities will aid in making this process easier and more efficient. Survey and removal efforts are projected to continue into the 2018 field season following current mapping and removal methods utilized. Eradication remains the goal of the program, and through persistent and sustained effort, substantial progress will continue toward that objective.

For more information on the progress of the Hydrilla Eradication Program in Idaho, please contact Jeremey Varley, Idaho State Department of Agriculture - Noxious Weeds @ 208-332-8667.

Hydrilla removal from raceway at Site 1 in Buhl, Idaho.

Image Credit: Jason Parker - Twin Falls County

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