

**Aquatic Invasive Species Program
Utah Division of Wildlife Resources**

Statewide Summary
(January 1 thru December 31, 2012)

**Utah's Attack against the Invasion of
Quagga & Zebra Mussels
And other
Aquatic Invasive Species**

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General

Utah Division of Wildlife Resources' (UDWR) Aquatic Invasive Species (AIS) Program made a significant step forward in 2012, bringing the Utah Division of State Parks and Recreation (SP&R) onboard via a contract for implementation of the Utah Aquatic Invasive Species Plan (Plan) at the State's 22 water-based state parks. SP&R had always participated in the overall annual planning for implementation of the AIS project, but now their personnel are implementing the Plan in each of their parks. The contract is a "value added" agreement, since SP&R actually interdicts boaters throughout the entire window of time each park operates, rather than the typical 40-hour work week previously covered by UDWR's AIS staff. In general the number of boaters contacted in each park increased in 2012, and the rate of compliance with the required Decontamination Certification Form also increased dramatically.

Note: Key SP&R personnel at each park were trained by the Pacific States Marine Fisheries Commission's AIS trainers and certified as Level I Watercraft Inspection and Decontamination (WIT I) trainers. The SP&R personnel in turn trained their own parks' staff in WIT I protocols. And UDWR's WIT II trainers followed up periodically to reinforce the training.

Significant outreach statewide by UDWR, SP&R and our partners occurred to boaters and anglers as follows:

- a. Large (3'x5') metal Decontamination Certification advisory signs were maintained at all primary boat launch sites within the State of Utah.
- b. Utah's required "Decontamination Certification Forms" were provided and/or made available to each boater at water body gate entrances and boat launches for their completion and display prior to launch.
- c. "No mussels!" brochures as reminders about the "Clean, Drain & Dry" self-decontamination method and the "Professional" decontamination method were made available to each boater.
 - i. The Clean, Drain & Dry self-decontamination method is as follows:

1. Clean: Remove all plants, fish, mussels and debris from the boat's exterior and interior.
2. Drain: Remove all water from bilge, live wells, ballasts and motors (lower the foot on the outdrive or outboard motor for a few minutes).
3. Dry: Dry out all wetted areas to kill invasive mussels via desiccation.
 - a. 7 days in summer—June July & August;
 - b. 18 days in spring—March, April & May;
 - c. 18 days in fall—September, October & November; and
 - d. 30 days in winter—December, January & February.

Note: An alternative in winter is 72 hours of perpetual freezing.

ii. The Professional decontamination method is as follows:

1. A certified Water Craft Inspection & Decontamination professional, using high (3,000 psi) and low pressure scalding water (>140⁰F) washes the boat inside and outside, then flushes its raw-water circulation systems with the scalding water.

- d. During each individual boat inspection process boaters and those who accompanied them were appraised about the need for vigilance due to risks from quagga and zebra mussels, including how to perform the Clean, Drain & Dry self-decontamination.
- e. Boats were Professionally decontaminated as needed.
- f. Enforcement of the AIS Rule R657-60 occurred as needed.

Note: Enforcement contacts are mainly conducted as an outreach contact, explaining the law and why it is important for boaters to comply. However, in a few cases a written citation was needed.

Statewide Operations

Budget, Personnel & Equipment for UDWR's AIS Program

- **FY13 Utah General Funds used for UDWR's AIS Program: \$1,350,000**

- **Partner Funds Used by UDWR's FY13 AIS Program: \$325,256**

U.S. Bureau of Reclamation (\$12,500), U.S. Forest Service (\$42,856), Bureau of Land Management (\$20,000), U.S. Fish & Wildlife Service (\$63,610), Central Utah Water Conservancy District (\$100,000), Emery Water Conservancy District (\$10,724), Uintah Water Conservancy District (\$12,500), Weber Basin Water Conservancy District (\$10,244), Provo River Watershed Council (\$42,000), PacifiCorp (\$10,827)

- The National Park Service at Lake Powell during the boating season spent over \$1,000,000 on an outstanding quagga & zebra mussel prevention program. This eliminated a need for UDWR to conduct its earlier \$193,000 AIS program at Lake Powell, which allowed a re-direction of those funds to other parts of the State. UDWR does provide a \$22,000 AIS grant each year to NPS. They have been able to double and triple

UDWR's grant funds by using them as match for other AIS grants they have secured. NPS assigns multiple Rangers and Technicians and multiple decontamination units to Lake Powell.

- The Arizona Game and Fish Department assigns two technicians to work at Lake Powell in cooperation with the National Park Service in the conduct of its AIS program.
 - The Idaho Department of Agriculture contracts the Idaho State Parks at Bear Lake to conduct an AIS program very much like UDWR's program on the other half of the lake. Idaho assigns one technician and one decontamination unit to Bear Lake. They also enforce purchase/display of Idaho's AIS boat sticker, which funds their AIS Program.
 - The Wyoming Game and Fish Department conducts an AIS program at Flaming Gorge Reservoir very much like UDWR's program on the other half of the reservoir. Wyoming assigns three technicians and one decontamination unit to the reservoir. They also enforce purchase/display of Wyoming's AIS boat sticker, which in part funds their AIS Program.
 - The Ute Tribe conducts an AIS program on tribal lands very much like UDWR's program. They assign necessary personnel and one decontamination unit to protect their multiple waters.
 - Many other agencies and organizations located in Utah conduct activities in support of the attack against aquatic invasive species. For example the U.S. Fish and Wildlife Service, U.S. Forest Service, Bureau of Land Management, Bureau of Reclamation and National Park Service direct program activities within their respective agencies toward the effort. Multiple water conservancy districts do the same. And, non-governmental organizations (e.g., PacifiCorp, Trout Unlimited, BASS, etc.) also participate in the fight.
 - Not to forget that approximately 75,000 individual citizen boaters also helped by appropriately decontaminating their boats.
- **FY13 AIS Personnel (73) & Decontamination Units (41) Assigned to UDWR's AIS Program**
- UDWR Aquatic Section Program
 - 1 Statewide AIS Coordinator (1.0 FTE)
 - 5 Region AIS Biologists (5.0 FTE)
 - 25 AIS Technicians (I & II)—On-ramp Educators & Boat Inspection/Decontamination operations (8.31 FTE)
 - 34 Lead Ranger Aides employed by Utah State Parks and Recreation via a UDWR contract — On-ramp Educators & Boat Inspection/Decontamination operations (approximately 3 months each @ 8.5 FTE)
 - UDWR Native Species Aquatic Program
 - 1 Native Aquatic Biologist—mollusk identification (0.05 FTE)
 - UDWR Conservation Outreach Program
 - 1 Technical Writer (1.0 FTE)
 - UDWR Law Enforcement Program

- 1 Criminal Information Technician (0.50 FTE)
- 5 Region Conservation Officers (2.51 FTE)
- Boat Decontamination Units
 - 41 Watercraft Decontamination Units purchased with UDWR General Funds and partner funds between FY07 and FY11 (none purchased in FY12 or 13); assigned as follows:
 - Note:** Boat decontamination units previously owned by UDWR and assigned to the multiple State Parks were permanently transferred to SP&R for exclusive use in their implementation of the Plan.

Northern Region (8 Decontamination Units): Bear Lake¹, East Canyon, Echo, Hyrum, Pineview (2), Rockport and Willard.

¹**Bear Lake (Idaho)**—Idaho Department of Agriculture has one additional decontamination unit sited at the Idaho Bear Lake State Park.

Central Region (7 Decontamination Units): Deer Creek, Jordanelle, Strawberry (2), Utah Lake (2) and Yuba.

²**Southern Region (11 Decontamination Units):** Fish Lake, Gunlock (shared with St George POE), New Castle, Otter Creek, Panguitch, Piute, roving unit (Kolob, Minersville, Pine Valley, Sand Cove), Sand Hollow (3) and Quail Creek.

²**National Park Service, Lake Powell (Utah/Arizona):** National Park Service, using their funds since FY07, placed five additional decontamination units around Lake Powell as follows:

- (a) Wahweap (double-sided semi-permanent reclaim unit);
- (b) Bullfrog (single-sided semi-permanent reclaim unit);
- (c) Antelope Point (trailer-mounted reclaim unit);
- (d) Hall's Crossing (trailer-mounted reclaim unit); and
- (e) Hite (trailer-mounted reclaim unit).

³**U.S. Fish and Wildlife Service (Vernal Fisheries Office)**—USFWS provided an additional decontamination unit for statewide operations at Ports of Entry and other Administrative Checkpoints, so UDWR would not have to pull a unit off line during those operations (see Table 4 for location of operations).

Northeast Region (7 Decontamination Units): Flaming Gorge⁴ (3), Pelican, Red Fleet, Starvation and Steinaker.

⁴**Flaming Gorge (Wyoming)**—Wyoming Game & Fish placed an additional decontamination unit, sited in the Buckboard Marina area.

Southeastern Region (8 Decontamination Units): roving unit (Manti lakes), Electric Lake, Huntington North, Joe's Valley, Millsite, Scofield (2), and Ken's Lake-Recapture-Blanding Reservoirs area.

Outreach

- Public presentations about AIS were made in many places across Utah, including for multiple Chambers of Commerce and other civic groups, Utah Boat Show, International Sportsman Exposition, Vernal's Western Park Facility, Rocky Mountain Anglers Association, Utah Water Users Association, Utah Lake Festival, Provo River Watershed Festival, Friends of Strawberry Valley, June Sucker Recovery Program, public and private secondary school classes across the state, Utah Nonpoint Source Water Quality Conference, NRCS Earth Day program, multiple university ecology classes, and the Utah Farm Bureau's Nature High Summer Camp.
- UDWR's AIS program is recognized as one of the best in the United States. So, AIS presentations were made to numerous natural resource management agencies across Utah. Multiple consultations about AIS were provided to international governments, US federal government agencies, and for other states' AIS programs. AIS consultations were also provided to multiple national and local organizations with angling or boating interests.
- Multiple media releases statewide occurred on the radio, television and in local area or statewide newspapers. All of these media releases were promoted as news, and were without cost to UDWR. Regarding just the aforementioned television news releases, they were viewed by approximately 2.1 million folks and had a publicity value of nearly \$60,000.
- 5,602 different viewers assessed UDWR's mussel Web site (www.wildlife.utah.gov/mussels), visiting an average of 3.24 pages per visit to learn about AIS issues and watercraft decontamination procedures. An additional 4,656 folks went directly to the Mussel-Aware Boater online orientation course to earn a Decontamination Certification Form valid for the entire year.
 - A Decontamination Certification Form is required to be displayed in the launch vehicle with every boat launch in Utah (<http://wildlife.utah.gov/dwr/invasive-mussels/454-formoptions.html>).
 - Approximately 60,000 unique registered boaters exist in Utah, owning 70,321 registered boats (2010 data provided by Utah State Parks and Recreation). Ninety-two percent of the unique registered boaters use a single-launch Decontamination Certification Form, which is available either online as a self-print-download or available at most boat launch facilities. The other 8% (4,656) have become certified as "Mussel-Aware Boaters" by taking a 45 minute online certification course, which provides them with a multi-launch Decontamination Certification Form valid for the entire boating season.

- Approximately 80 fishing contests with several thousand participants occurred. Participants were all required to become Mussel-Aware Boaters by participating in an online course that earned them a Decontamination Certification Form valid for the entire year. The contestants could represent a very high risk, since their boats frequently visit water bodies affected by invasive quagga, zebra and false dark mussels.
- Volunteers worked 2,019 hours or 0.97 FTE under authority of UDWR's Volunteer Program. They targeted watercraft interdiction to inspect for AIS and to educate boaters about quagga & zebra mussel risks and how to decontaminate their boats as follows: Salt Lake City office 134 hours; Northern Region 32 hours; Central Region 621 hours; Southern Region 857 hours; Northeastern Region 121 hours; Southeastern Region 254 hours.
- A large number of boats (241,915) were interdicted statewide and either inspected as a low risk or a high risk boat, based upon its prior 30-day use history. If a boat was not used on a known Dreissena mussel affected water body, it received a low risk inspection. However, if the boat had been used on a Dreissena mussel affected water body, it received a high risk inspection (Table 1).

Table 1. Number of Boats Interdicted, Inspected and Decontaminated; and Boaters Educated in Utah by UDWR, SP&R or Their Partners Relative to Risk from Dreissena Mussels and Protocols for Boat Decontamination—2012.

Region or Inter-state Water Body	Northern Region	Bear Lake (ID side) ^a	Central Region	Southern Region	Lake Powell (UT & AZ)	Northeastern Region	Flaming Gorge Reservoir (WY side) ^a	Southeastern Region	Total
Boats Interdicted & Inspected	58,351	1,327	40,183	20,876	100,000 (NPS estimate)	15,748	3,201	2,229	241,915
Boat Occupants Educated about AIS	130,706	2,972	90,010	57,560	224,000	26,944	7,170	4,993	544,358
	estimated ^b	estimated ^b	estimated ^b	actual count ^b	estimated ^b	actual count ^b	estimated ^b	estimated ^b	
High Risk Boats Professionally Decontaminated ^c	28	1	46	1,602	4,000	164	9	245	6,095

NOTES:

^aContacts at inter-state water bodies by Idaho or Wyoming AIS personnel are primarily made for enforcement of the respective States' AIS Sticker.

^bBoater contacts in the Southern Region (20,876) and Northeastern Region (15,748) also documented the number of folks who accompanied a boat (57,560 in the Southern Region and 26,944 in Northeastern Region) and who were also educated about AIS risks and boat decontamination protocols, particularly the Clean, Drain & Dry method. So, this data shows 1.71 (Northeastern Region) to 2.76 folks per boat (Southern Region) via actual count were educated. Thus, on average 2.24 folks per boat ($N = 84,504$) are anticipated to be educated during a boater contact.

^cBoats were decontaminated if they had been used in a Dreissena mussel affected water body within the previous 30-days.

^{NOTE}Dreissena mussel veligers were detected in Lake Powell during late fall 2012, when the boating season was essentially over; so, the number of boats decontaminated across the state were not influenced by Lake Powell. In 2013 the workload for boat decontamination may dramatically increase if the Dreissena detection at Lake Powell continues.

- High risk boats are required to decontaminate before launching into a Utah water body.
 - UDWR’s five regional aquatic invasive species biologists and several personnel from each of Utah State Parks & Recreation’s parks; Idaho State Parks personnel at Bear Lake; National Park Service and concessionaire personnel, including Arizona Game & Fish personnel at Lake Powell; as well as Wyoming Game and Fish personnel at Flaming Gorge are certified as either Level I or Level II “Water Craft Inspection & Decontamination Trainers.” This is a certified training program provided by the Pacific States Marine Fisheries Commission to specifically target boats encrusted with quagga, zebra and false dark mussels. These trainers have conducted multiple Watercraft Inspection & Decontamination Training classes in association with management of Utah water bodies statewide.
 - 6,095 Professional decontaminations were conducted by certified Water Craft Inspection & Decontamination professionals (Table 1).
- In general, the boat inspection process allowed for everyone in the boater’s group to be educated about the risks and impacts from quagga and zebra mussels, including decontamination protocols, especially the Clean, Drain & Dry self-decontamination method.
 - 544,358 folks at boat launch sites were educated about AIS (Table 1).
- 49 Dreissenidae (quagga, zebra or false dark mussel) mussel encrusted boats were discovered in Utah through UDWR’s and its partners’ boat interdiction, inspection and decontamination processes. An encrusted boat is defined as having one or more invasive mussels attached or contained within the boat (Table 2).
 - In a couple of cases live mussels were found.
 - All encrusted boats were decontaminated, quarantined and eventually allowed to launch or proceed to their destination.

Table 2. Boats Discovered by UDWR, SP&R, NPS or Their Partners to be Encrusted or to Contain one or more Dreissena Mussels--2012.

Discovery as a Pre-launch Boat (destination if different)	Number of Boats	Boats Hauled by Commercial Transporters or Owners	Dreissena Species & Condition		Origination Water Body
			Quagga Mussel (QM) Zebra Mussel (ZM) False Dark Mussel (FDM)	Live or Dead	
East Canyon Reservoir, UT	1	Owner	QM	dead	Rye Patch Reservoir, NV
Notes:	Boat owner claimed that the boat's last use was at Rye Patch Reservoir in NV, and that a singular quagga mussel valve and quagga shell pieces, plus an Asian Clam valve, were picked-up by his grandchildren and thrown onto the boat's floor, ultimately washing into the bilge area.				
Pineview Reservoir, UT	1	Owner	QM	dead	Lake Mead, NV/AZ
Flaming Gorge Reservoir on the WY side	1	Owner	QM	dead	Lake Havasu, CA
US Highway 6 near Price, UT (en route to Seattle WA, Puget Sound)	1	Commercial	FDM	live	Clear Lake, TX
Notes:	False Dark Mussels were discovered on the 53-foot Annie M. The mussels are a native marine mollusk, inhabiting brackish and marine waters along the Gulf Coast and along the Atlantic Coast northward to Maine. Clear Lake is brackish, with direct connectivity to Galveston Bay. Although this species is unlawful to possess in UT, it is not unlawful to possess in TX. The species could survive in the brackish inlet bays (Farmington Bay, Ogden Bay and Bear River Bay) to the Great Salt Lake. The discovery resulted from a tip by a concerned motorist/boater. It was held for 9 days in quarantine while the mussels were killed by dessication and the boat professionally decontaminated.				
I-15 at St. George Port of Entry, UT (en route to Sand Hollow Reservoir, UT)	2	Owner	QM	dead	Lake Mead, NV/AZ
Notes:	These encrusted boats were discovered during operations of three different Administrative Checkpoints conducted for 5 hours each on separate dates at the St. George POE.				
Sand Hollow Reservoir, UT	1	Owner	QM	dead	Lake Mead, NV/AZ
Panguitch Lake, UT	1	Owner	QM	dead	Lake Mead, NV/AZ
US Highway 89 near the UT-AZ border just north of Page AZ (en route to Saskatoon, Saskatchewan, Canada)	1	Commercial	QM	live	Colorado River, Laughlin NV
Notes:	Quagga Mussels were discovered on the 100-foot Fiesta Queen. The discovery resulted from notices from AZ and NV about a potentially encrusted boat leaving a water body in the lower Colorado River drainage. Idaho, Utah & Arizona and the NPS collaborated to locate the boat. It was held for 29 days in quarantine while the mussels were killed by dessication and the boat professionally decontaminated.				
UDWR's Southern Region Office in Cedar City, UT (en route to storage at boater's nearby home)	1	Owner	QM	dead	Lake Mead, NV/AZ
Sub-Total	10				

Table 2. Continued.					
Discovery as a Pre-launch Boat (destination if different)	Number of Boats	Boats Hauled by Commercial Transporters or Owners	Dreissena Species & Condition		Origination Water Body
			Quagga Mussel (QM) Zebra Mussel (ZM) False Dark Mussel (FDM)	Live or Dead	
Lake Powell, UT & AZ	39 mussel encrusted boats discovered by National Park Service's AIS staff and their partners as follows:				
	8	Owner	QM	dead	Lake Mead, NV/AZ
	24	Owner	QM	dead	Lake Pleasant, AZ
	3	Owner	QM	dead	Lake Mohave, NV/AZ
	1	Owner	QM	dead	Lake Havasu, AZ/CA
	2	Owner	QM	dead	Unknown Water Bodies, CA
	1	Owner	QM	dead	Used Boat with an Unknown Water Body History
Notes:	Mussels were discovered in association with the anchor (anchor, anchor line or anchor chest/well) for 24 (62%) of the 39 Lake Powell boats. Day use boaters at a mussel affected water body can easily become encrusted when their anchor is dropped onto a bed of mussels, while the boater simply hangs out to recreate.				
Grand Total	49				

Public Surveys to Measure Outreach Effectiveness

- UDWR has completed several boater feedback assessments over the last several years relative to aquatic invasive species. The most recent survey, 2012 Utah Boater Aquatic Invasive Species Survey, can be perused at http://wildlife.utah.gov/mussels/PDF/2012_Boater_AIS_Survey_%28Pub.12-19%29.pdf. It is important to measure effectiveness for implementation of the Utah Aquatic Invasive Species Management Plan, which is primarily based upon application of outreach principles.
- UDWR's AIS outreach has been targeting modification in boater behavior, to encourage Utah's boaters to:
 - Properly display a required Decontamination Certification Form at every launch; and
 - Decontaminate their boats via the Clean, Drain & Dry self-decontamination method or the Professional decontamination method.
Note: Decontamination is only required if a boat has been used within the prior 30 days on a quagga or zebra mussel affected water body, but routine decontamination following any boating excursion is encouraged.
- Prior to 2008 when the Utah Aquatic Invasive Species Interdiction Act was passed, no boater in Utah had need to:
 - (1) Display a Decontamination Certification Form; or
 - (2) Decontaminate their boats.

The findings from feed-back surveys indicate that outreach about AIS and boat decontamination certification combined with limited law enforcement are mostly effective, minimizing the proportion of folks who fail to do either process. The goal is get 100% boater participation, so much work remains to be done; the public obviously expresses concern for the problem and intent to cooperate.
- Boaters are generally classified into two groups based upon their demonstrated preference for type of Decontamination Certification Form used:
 - The single-use Decontamination Certification Form, which is only valid for a single launch date; forms are available online or at boat launch sites.
 - This group makes more than four times the use (4.4:1) of their boats for fishing vs. other recreational boating activity--ski, swim, explore, etc.
 - 97% report knowledge regarding risk from invasive mussels.
 - 85% report to display the Decontamination Certification Form.
 - 83% report to routinely decontaminate their boat after an outing.
 - The multi-launch Decontamination Certification Form, which is valid for the entire year in which it is issued; forms are only available online

following successful completion of a Mussel Aware Boater orientation and exam.

- This group makes nearly equal use (1.06:1) of their boats for fishing vs. other recreational boating activity--ski, swim, explore, etc.
 - 100% report knowledge regarding risk from invasive mussels.
 - 100% report to display the Decontamination Certification Form.
 - 87% report to routinely decontaminate their boat after an outing.
- It is evident that the reported gaps relative to knowledge for risk from invasive mussels; the rate of display for the Decontamination Certification Form; and the rate of routine boat decontamination between the two groups are not substantially different. However, covert observations in 2011 of 426 boaters statewide showed that only two-thirds actually did fill out and display the Decontamination Certification Form. And only ½ initiated part of the self-decontamination process (clean & drain) immediately upon leaving the water, although it is unknown how much of the needed dry time was accomplished at home. (No doubt, some could have completed the entire process at home.)
- It is believed that additional outreach combined with targeted law enforcement may improve the situation of reported behavior vs. observed behavior being markedly different. No doubt that both groups are reactive to the invasive mussel problem.
 - The new 2012 contractual arrangement between UDWR and SP&R has resulted in an improved situation regarding proper display of the Decontamination Certification Form at state parks.
- Across both groups most (77%) said they use the Clean, Drain & Dry self-decontamination method, while 6% use the Professional decontamination method, and 16% indicate they don't routinely decontaminate. (We need to minimize the later number.)

Decontaminations of Equipment Other Than Boats

- Scuba equipment for UDOT's bridge inspection contractors has routinely been decontaminated in recent years. However, the contractors did not seem to work in Utah during 2011 & 2012.
- Construction equipment for SP&R was routinely inspected and decontaminated, since they had been working in quagga mussel affected waters at Red Fleet Reservoir's state park and Sand Hollow Reservoir's state park in the previous 30 days.

Presence/Absence of Quagga & Zebra Mussels or other AIS

- Approximately 100 selected water bodies and facilities statewide were sampled for AIS (e.g., Quagga and Zebra Mussels, New Zealand Mudsnail, Eurasian Watermilfoil, Asian Clam, etc., including other native noxious species such as Didymo and Northern Watermilfoil). The collected information allows UDWR and its partners to better educate boaters and anglers, so they don't inadvertently spread these undesirable species.

- Most sites included a plankton sample for microscopy assessment to determine the presence or absence of larval (veligers) quagga or zebra mussel. And, selected samples included PCR assessment for detection of environmental DNA (eDNA) free-floating in a water body from an AIS. The specific water bodies tested and results from 2007 to date can be viewed at <http://wildlife.utah.gov/mussels/waters.php>.

Utah's Dreissenidae Affected Water Bodies

- Utah has been successful in its battle against invasive mussels. The DWR's strategy to fight invasive quagga, zebra and false dark mussels is simple: prevent invasive mussels from entering water bodies in sufficient numbers that allow them to successfully breed. (Aquatic wildlife oft times take multiple transfers into a water body in order to establish a thriving, reproducing population.) To implement this strategy, the DWR aided by its partners have focused on boater education, early detection, pre-launch boat inspection (mostly at launch sites), boat decontamination to kill and remove mussels and enforcement. Through this widespread outreach effort, we have successfully enlisted the cooperation of boaters.
 - Most boaters routinely use the Clean, Drain & Dry self-decontamination method, which requires them to thoroughly clean, completely drain and dry their boats after every trip.
 - Other boaters have their vessels professionally decontaminated.
 - Sand Hollow Reservoir remains classified as "infested" due to the find of a single, live adult (20mm) quagga mussel on the underwater side of a boat dock in May 2010. Despite intense ongoing searches, which included substrate samplers, shoreline inspections, scuba diving and plankton tow assessment via microscopy and eDNA, no further evidence of adults or veligers has since been found. However, PCR assessment of the plankton tow samples for Dreissenids showed evidence for quagga mussel eDNA throughout most (April through November) of the 2011 boating season and for a couple of samples (May & June) in the 2012 boating season. This find does not affect the reservoir's current classification as infested, and will not result in modification to the ongoing implementation of the control plan.

Note: Reassessment of the reservoir's classification will not occur until three consecutive years for no evidence of Dreissenid mussels (visual or eDNA) occurs.

 - Quail Creek Reservoir can deliver water via a pipe to Sand Hollow Reservoir. And Sand Hollow Reservoir can pump water to a point upstream of Quail Creek Reservoir, there by swapping water between reservoirs when needed. However, an exchange of water between the reservoirs has not occurred for several years. Despite intense searches, which included substrate samplers, shoreline inspections, scuba diving and plankton tow assessment via microscopy and eDNA, no evidence of Dreissenid adults or veligers has ever been found from Quail Creek

Reservoir. Interestingly, PCR assessment of the plankton tow samples for Dreissenids showed evidence for quagga mussel eDNA during just the September/October pooled sample from the 2011 boating season. A similar positive eDNA discovery for quagga mussel occurred from the June 2012 sample. Since these finds were not supported by microscopy or additional DNA finds, it does not affect the reservoirs current classification as “not detected,” and will not result in modification to the ongoing implementation of the control plan.

- Red Fleet Reservoir and Electric Lake, both evidenced Dreissenid veligers in 2008, a finding supported by microscopy & PCR, detecting quagga mussel and zebra mussel DNA, respectively, which resulted in "detected" classifications. Despite monthly plankton microscopy and PCR assessments for eDNA during the boating seasons of the intervening years (2009-2012), no other Dreissena evidence has been found. Thus, both waters were declassified from "detected" to "inconclusive." They will remain in the lower classification for the next couple of years (2012 & 2013), and if no other discovery for Dreissenid evidence occurs, the water bodies may likely be reclassified as "not detected."
- Huntington North Reservoir, Joe's Valley Reservoir, Midview Reservoir (Ute Tribe) and Pelican Lake each were classified as "inconclusive" in 2008 relative to Dreissena mussel veligers due to positive microscopy followed by negative PCR. Despite monthly plankton microscopy and PCR assessments for eDNA during the boating seasons of the intervening years (2009-2011), no other Dreissena evidence has been found. Thus, all four waters were declassified from "inconclusive" to "not detected."
- Lake Powell was classified as "inconclusive" in 2007 relative to Dreissena mussel veligers due to conflicting microscopy and PCR results. Despite monthly plankton microscopy and PCR assessments for eDNA during the boating seasons of the intervening years (2008-2010), no other Dreissena evidence was found. Thus, Lake Powell was declassified in late 2010 from "inconclusive" to "not detected."
 - No microscopy or PCR evidence of eDNA for Dreissenids occurred in 2011 following more than 160 lake wide samples.
- Lake Powell was classified as "detected" in early fall 2012 relative to Dreissena mussels. Quagga mussel veligers, observed microscopically and supported by PCR detections for eDNA and DNA sequencing were verified. To date only 6 veligers and 8 additional eDNA detections have occurred; all in the lake's lower six mile length between Antelope Point Marina and the Glen Canyon Dam (Lake Powell is approximately 200 miles long.). The National Park Service at the Glen Canyon National Recreation Area continues to lead assessment of this unfolding situation, working toward development of a Utah required Control Plan in cooperation with UDWR, the Arizona Game and Fish Department and the ad hoc Lake Powell Zebra Mussel Prevention Group. Ongoing prevention management

may prevent the entry of additional mussel larvae. If there aren't enough mussels to begin breeding, the population may fail.

- No other detections for *Dreissena* mussels were made in Utah during 2012.
- **Research**
 - UDWR continues to conduct research in association with universities and other research institutions in order to improve early detection methods for AIS and to better assess control methods.
- **Law Enforcement**
 - 118,845 contacts were made statewide by natural resource law enforcement officers for AIS purposes specifically targeting compliance with aquatic invasive species regulations (Table 3).

Table 3. Law Enforcement Contacts for AIS Management in Utah--2012

NOTE: Contacts are typically outreach oriented, helping folks understand and comply with Rule R657-60, but on occasion a citation was issued.

Agency	Number of Contacts	Written Notice of Non-compliance for display of Decontamination Certification Form (UT waters only)	Written Warning or Notice to Appear Citation
UDWR^a (statewide)	15,180	1,407	104
SP&R^a (Utah's 22 water-based State Parks)	381	1,504	7
Idaho State Parks^c (Bear Lake State Park)	1,327	NA	0
WYGF^d (WY side of Flaming Gorge Reservoir)	1,957	NA	103 ^b
NPS (Lake Powell)	100,000	NA	480
TOTAL	118,845	2,911	591

Notes:

^aUDWR and SP&R data includes Administrative Checkpoints as well as random statewide and in-park law enforcement contacts for AIS management. Approximately 1/3 of the Written Warning or Notice to Appear Citations involved "Failure to Stop at an Administrative Checkpoint."

^bWritten Warning or Notice to Appear Citations in WY span an administrative area larger than the Wyoming side of Flaming Gorge Reservoir. Most citations involved non-compliance with their AIS sticker.

^cThe Idaho Department of Agriculture contracted Idaho State Parks at Bear Lake to interdict, inspect and decontaminate boats when necessary. They also enforced Idaho's AIS Sticker law.

^dNPS at Lake Powell contacts all most all arriving boats and issues a "Mussel Free" certificate for display in their launch vehicle, once it has been determined that their boat has not been used at an invasive mussel affected water body within the previous 30 days, and that their boats are "Clean, Drain & Dry" compliant. Also, a self-certification process occurs at backcountry launches. These processes meet the standard for compliance with Utah's law regarding a Decontamination Certification Form.

- Many verbal warnings were made by natural resource law enforcement officers for minor non-compliance issues regarding aquatic invasive species regulations.
 - 2,911 printed non-compliance notices were placed on boat launch vehicles that failed to display a Decontamination Certification Form: AIS staff and law enforcement personnel representing UDWR (1,407) and SP&R (1,504) placed those notices. A FatPot database tracking those notices and the verbal warnings allowed enforcement officers to identify 2nd time offenders, who typically were then issued written warning citations or Notice to Appear in Court citations.
 - 591 written citations, as either a Notice to Appear in Court or a written warning, were issued by natural resource law enforcement officers for non-compliance with aquatic invasive species regulations.
 - Common Violations types:
 - Possession of prohibited AIS
 - Failure to certify decontamination prior to launch
 - Failure to display Decontamination Certification Form
 - Failure to Stop at an Administrative Checkpoint
- Administrative Checkpoints, each approved by a local magistrate and publicized in a local news paper prior to operations, were conducted by UDWR across the State of Utah in order to contact boaters in transit with their watercraft. These checkpoints are for the purpose of enforcing Rule R657-60 Aquatic Invasive Species Interdiction, particularly the unlawful transport of quagga, zebra or false dark mussels.

Table 4. Administrative Checkpoints Conducted by UDWR within Utah and Total Hours Worked to Enforce Rule R657-60 for Dreissena Mussel Management--2012.						
Location	Date	Hours Operated	Boats Interdicted & Inspected	Boats Decontaminated	Boats Encrusted With Invasive Mussels	AIS Citations Issued ^a
HEADQUARTERS Total hours worked on AIS enforcement, including Administrative Checkpoints: 56; budgeted FTE 0.5 or 1,040 hr						
NORTHERN REGION Total hours worked on AIS enforcement, including Administrative Checkpoints: 915; budgeted FTE 0.6 or 1,248 hr						
Rockport State Park	Saturday, July 14, 2012	5	22	1	0	0
I-80 Echo Port of Entry	Sunday, August 05, 2012	5	131	1	0	26 ^b
CENTRAL REGION Total hours worked on AIS enforcement, including Administrative Checkpoints: 362; budgeted FTE 0.51 or 1,061 hr						
I-80 Wendover Port of Entry	Insufficient Boat Traffic on Any Day of the Week to Warrant Operations	NA	NA	NA	NA	NA
SOUTHERN REGION Total hours worked on AIS enforcement, including Administrative Checkpoints: 1,344; budgeted FTE 0.41 or 853 hr						
I-15 St. George Port of Entry	Friday, April 20, 2012 Friday, May 11, 2012 Friday, June 15, 2012	5 (each time)	69	26	3 ^c	11
NORTHEASTERN REGION Total hours worked on AIS enforcement, including Administrative Checkpoints: 634; budgeted FTE 0.29 or 603 hr						
US Highway 191 nearby to Antelope Flats, Flaming Gorge Reservoir	Monday, May 28, 2012 (Memorial Day)	5	15	0	0	20 ^b
Utah Highway 43 nearby to Manila, Flaming Gorge Reservoir	Tuesday, July 24, 2012 (Utah's Pioneer Holiday)	5	44	0	0	9 ^b
SOUTHEASTERN REGION Total hours worked on AIS enforcement, including Administrative Checkpoints: 722; budgeted FTE 0.71 or 1,478 hr						
I-70 Thompson Springs	Friday, May 11, 2012 Friday, July 20, 2012	9 (each time)	137	11	0	0
NOTES: ^a Most of the AIS citations at Administrative Checkpoints were for "failure to Stop at Checkpoint." ^b No AIS violations were discovered, however other wildlife code or traffic code violations were handled. ^c One of these boats contained an invasive Asian Clam; the other two were encrusted with quagga mussels.						

Region Summaries

Additional details for 2012 can be perused in UDWR's five Region AIS summaries, which display AIS management activity at individual water bodies or reservoir complexes managed for AIS purposes-- <http://wildlife.utah.gov/dwr/learn-invasive-mussels.html>--look under "Technical Resource." Water bodies or reservoir complexes are listed in alphabetical order per region as follows:

- **Northern Region:** Bear Lake, East Canyon Reservoir, Hyrum Reservoir, multi-reservoir complex 1 (Causey, Echo, Lost Creek and Smith & Morehouse reservoirs), multi-reservoir complex 2 (Cutler, Mantua and Newton reservoirs), Pineview Reservoir, Rockport Reservoir and Willard Bay Reservoir
- **Central Region:** Deer Creek Reservoir, Jordanelle Reservoir, Strawberry Reservoir, Utah Lake and Yuba Reservoir.
- **Southern Region:** Fish Lake, Lake Powell, multi-reservoir complex (New Castle, Enterprise, Minersville and Kolob reservoirs), Otter Creek/Piute reservoir complex (Otter Creek Reservoir and Piute Reservoir), Panguitch Lake and Sand Hollow State Park Complex (Sand Hollow, Quail Creek and Gunlock reservoirs).
- **Northeastern Region:** Big Sandwash Reservoir, Flaming Gorge Reservoir, Green River (below dam), Matt Warner Reservoir, Pelican Lake, Red Fleet/Steinaker reservoir complex (Red Fleet and Steinaker reservoirs) and Starvation Reservoir.

- Southeastern Region: Cleveland/Mammoth reservoir complex (Cleveland and Mammoth reservoirs), Electric Lake, Huntington North Reservoir, Joe's Valley Reservoir, Millsite Reservoir and Scofield Reservoir.

END