

HACCP Step 1 – Activity Description

Activity Description	
Facility: BIO-WEST, Inc.	Site: Reaches 5 and 6 of Lower Colorado River Multi-Species Conservation Plan planning area (Imperial NWR downstream to Mexico border).
Project Coordinator: Mike Robertson	Activity/Management Objective: Survey and evaluation of potential restoration habitats in the Lower Colorado River for refuge populations of razorback sucker and bonytail.
Site Manager: Mike Robertson	
Address: 1063 West 1400 North Logan, UT 84341	
Phone: 435-752-4202	
Project Description	
(i.e., Who, What, Where, When, How, Why)	
<p><u>Who:</u> BIO-WEST personnel</p> <p><u>What:</u> We wish to prevent transfer of non-target organisms between Lake Mead and downstream locations (and among downstream locations) in the Lower Colorado River during water quality and fisheries surveys in potential restoration sites.</p> <p><u>Where:</u> Equipment used on Lake Mead during seasonal monitoring of its razorback sucker population will also be used to sample 25 backwaters downstream of Imperial NWR (over approximately 25 river miles) for fish and water quality samples.</p> <p><u>When:</u> Surveys are to be conducted between June 15, 2007, and August 31, 2007; monitoring efforts on Lake Mead will be complete during early May.</p> <p><u>How:</u> The boat used to conduct monitoring efforts on Lake Mead may be trailered and launched in the Colorado River near Imperial Dam to access some survey sites from the river. In addition, some equipment used in Lake Mead (e.g., trammel nets) may also be used in sampling the potential survey sites. Risk of transporting non-target species will be reduced or eliminated from the surveys by a couple of means: First, the boat and any equipment used in Lake Mead monitoring will be treated according to the recommended approach (Attachments A and B); second, bodies of water in the Lower Colorado River will be sampled so that the locations with the least probability of holding nuisance species are surveyed first, while those with greatest probability are surveyed last. Any areas that have, or may have giant salvinia will be surveyed last. Third, when the boat is removed and moved to new launch site the boat and trailer will be pressured washed at a cleaning station when available.</p>	

Project Description (Continued)

(i.e., Who, What, Where, When, How, Why)

How (cont'd): Specific actions to be taken to treat the boat will include dry storage of the boat for as long as possible in the heat of Boulder City in May-June prior to sampling. We will also power wash the boat and trailer, and visually inspect each (especially the carpeted rails) and scrape off any mussels or aquatic vegetation between boat launch locations. The live well will be emptied of all water and live material when moving between boat launch locations and allowed to air dry completely. The bilge will be drained after each survey on the inclined ramp at the survey location. Sampling gear, including nets, measuring boards, scales, etc., which have been used in Lake Mead and will be used in the Lower Colorado River will be soaked in a solution of 5-12% chlorine bleach for at least 30-60 minutes.

Why: To complete contact obligation for BOR contract to conduct LCR MSCP Backwater Inventory Site Visits in Reaches 5 & 6.

HACCP Step 2 – Identify Potential Hazards

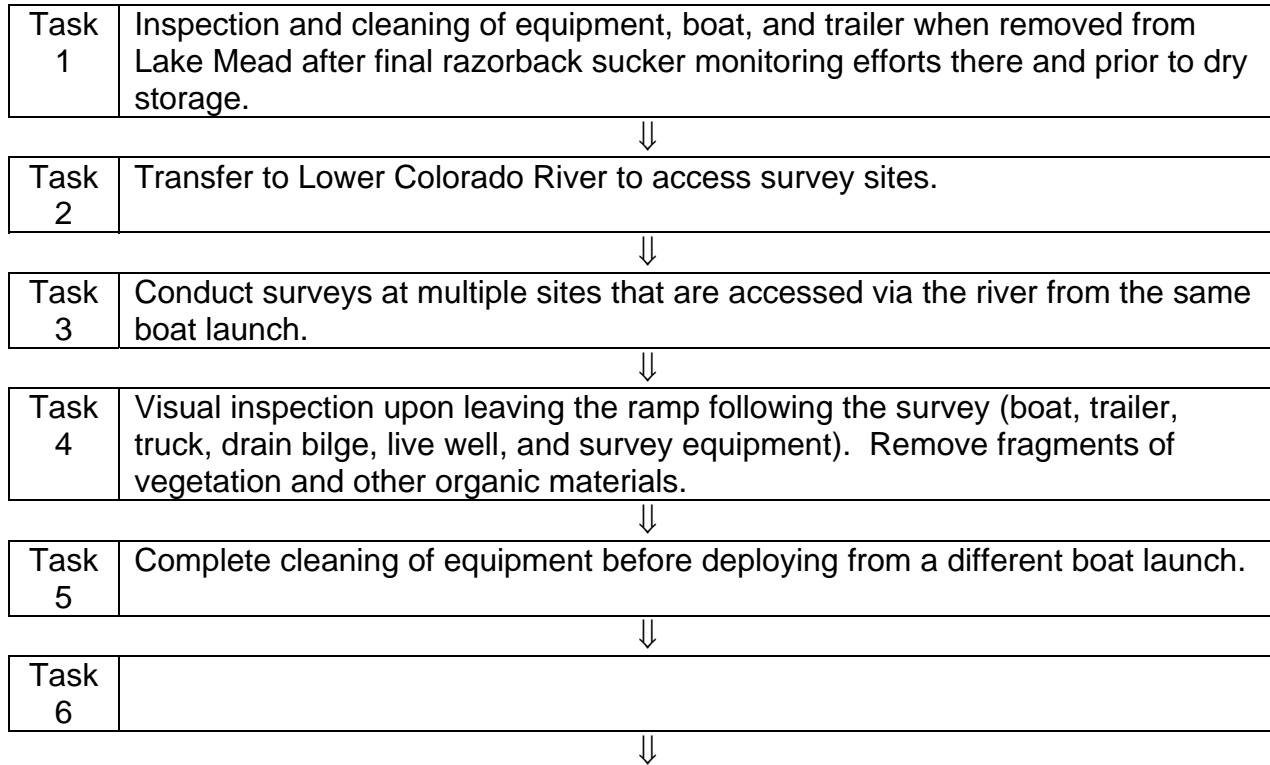
(to be transferred to column 2 of HACCP Step 4 – Hazard Analysis Worksheet)

Hazards: Species or Contaminants That May Potentially Be Moved/Introduced
Vertebrates: Fish
Invertebrates: Aquatic invertebrates and zooplankton (such as quagga mussels, New Zealand mudsnails, apple snails, crayfish, and undesirable zooplankton)
Plants: Aquatic macrophytes (such as giant salvinia, Hydrilla, watermilfoils [Eurasian and Parrot feather], pondweeds, naiads, coontail) and phytoplankton (such as golden algae, filamentous and blue-green algae)
Other Biologics (e.g., genetics, disease, pathogen, parasite, or non-pathogens):

Fish parasites (e.g., Eurasian tapeworm, leeches and flukes, anchorworms)
Others (non-biological contaminants [e.g., pesticide residue, oil products, and harborage via packing or construction materials]):
Gas, oil

HACCP Step 3 – Flow Diagram

Flow Diagram Outlining Sequential Tasks to Complete Activity/Project
 Described in HACCP Step 1 – Activity Description
 (to be transferred to column 1 of the HACCP Step 4 – Hazard Analysis Worksheet)



HACCP Step 4 - Hazard Analysis Worksheet

1 Tasks (from HACCP Step 3 - Flow Diagram)	2 Potential hazards identified in HACCP Step 2	3 Are any potential hazards significant	4 Justify evaluation for column 3	5 What control measures can be applied to prevent undesirable results?	6 Is this task a critical control point?
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Task 1 Inspection and cleaning of equipment, boat, and trailer when removed from Lake Mead after final razorback sucker monitoring efforts there and prior to dry storage.	Vertebrates Fish	No	Desiccation, heat, and removal of all standing water eliminate likelihood of survival; large organisms are easy to detect and remove.		N/A
	Invertebrates Aquatic invertebrates (quagga mussels, New Zealand mudsnails, apple snails, crayfish) and zooplankton	Yes	Mollusks and zooplankton cysts may survive periods of desiccation.	Visually inspect for organisms and remove, ensure equipment is dry.	Yes
	Plants Aquatic macrophytes (giant salvinia, Hydrilla, watermilfoils (Eurasian and parrot feather), pondweeds, naiads, coontail, algae and phytoplankton (golden algae, filamentous and blue-green algae)	Yes	Plant materials, seeds, and spores may survive periods of desiccation.	Visually inspect for organisms and remove, ensure equipment is dry.	Yes
	Others Biologics Aquatic parasites (Eurasian tapeworm, leeches and flukes, anchorworms)	No	Desiccation, heat, and removal of all standing water and obligate hosts eliminate likelihood of survival.		N/A
	Others Gas, oil	No	Equipment is well maintained and cleaned.		N/A

Task 2 Transfer to Lower Colorado River to access survey sites.	Vertebrates Fish	No	Likelihood of re-infection during transit is remote.		N/A
	Invertebrates Aquatic invertebrates (quagga mussels, New Zealand mudsnails, apple snails, crayfish) and zooplankton	No	Likelihood of re-infection during transit is remote.		N/A
	Plants Aquatic macrophytes (giant salvinia, Hydrilla, watermilfoils (Eurasian and parrot feather), pondweeds, naiads, coontail, algae and phytoplankton (golden algae, filamentous and blue-green algae)	No	Likelihood of re-infection during transit is remote.		N/A
	Others Biologics Aquatic parasites (Eurasian tapeworm, leeches and flukes, anchorworms)	No	Likelihood of re-infection during transit is remote.		N/A
	Others Gas, oil	No	Likelihood of re-infection during transit is remote.		N/A

HACCP Step 4 - Hazard Analysis Worksheet (continued)

1 Tasks (from HACCP Step 3 - Flow Diagram)	2 Potential hazards identified in HACCP Step 2	3 Are any potential hazards significant	4 Justify evaluation for column 3	5 What control measures can be applied to prevent undesirable results?	6 Is this task a critical control point?
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Task 3 Conduct surveys at multiple sites that are accessed via the river from the same boat launch.	Vertebrates Fish	Yes	Boat, live well, nets, and equipment may harbor nuisance species as a result of the survey.	Conduct "field" cleaning: Visually inspect boat and equipment, remove detected materials, drain live well	No
	Invertebrates Aquatic invertebrates (quagga mussels, New Zealand mudsnails, apple snails, crayfish) and zooplankton	Yes	Boat, live well, nets, and equipment may harbor nuisance species as a result of the survey.	Conduct "field" cleaning: Visually inspect boat and equipment, remove detected materials, drain live well	No
	Plants Aquatic macrophytes (giant salvinia, Hydrilla, watermilfoils (Eurasian and parrot feather), pondweeds, naiads, coontail, algae and phytoplankton (golden algae, filamentous and blue-green algae)	Yes	Boat, live well, nets, and equipment may harbor nuisance species as a result of the survey.	Conduct "field" cleaning: Visually inspect boat and equipment, remove detected materials, drain live well. Identify sites in advance that may contain Giant salvinia and conduct sampling among sites in a manner to reduce likelihood of inadvertent transport between sites.	No
	Others Biologics Aquatic parasites (Eurasian tapeworm, leeches and flukes, anchorworms)	Yes	Boat, live well, nets, and equipment may harbor nuisance species as a result of the survey.	Conduct "field" cleaning: Visually inspect boat and equipment, remove detected materials, drain live well	No
	Others Gas, oil	No	Equipment well maintained		N/A

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Task 4 Visual inspection upon leaving the ramp following the survey (boat, trailer, truck; drain bilge and live well, and inspect survey equipment). Remove fragments of vegetation and other organic materials.	Vertebrates Fish	Yes	Boat, trailer, truck, live well, nets, and equipment may harbor nuisance species as a result of the survey.	Conduct "field" cleaning: visually inspect boat, trailer, truck and survey equipment; remove detected materials; drain bilge and live well; rinse and dry equipment.	No
	Invertebrates Aquatic invertebrates (quagga mussels, New Zealand mudsnails, apple snails, crayfish) and zooplankton	Yes	Boat, trailer, truck, live well, nets, and equipment may harbor nuisance species as a result of the survey.	Conduct "field" cleaning: visually inspect boat, trailer, truck and survey equipment; remove detected materials; drain bilge and live well; rinse and dry equipment. Power wash boat and trailer between boat launches.	Yes
	Plants Aquatic macrophytes (giant salvinia, Hydrilla, watermilfoils (Eurasian and parrot feather), pondweeds, naiads, coontail, algae and phytoplankton (golden algae, filamentous and blue-green algae)	Yes	Boat, trailer, truck, live well, nets, and equipment may harbor nuisance species as a result of the survey.	Conduct "field" cleaning: visually inspect boat, trailer, truck and survey equipment; remove detected materials; drain bilge and live well; rinse and dry equipment. Power wash boat and trailer between boat launches.	Yes
	Others Biologics Aquatic parasites (Eurasian tapeworm, leeches and flukes, anchorworms)	Yes	Boat, trailer, truck, live well, nets, and equipment may harbor nuisance species as a result of the survey.	Conduct "field" cleaning: visually inspect boat, trailer, truck and survey equipment; remove detected materials; drain bilge and live well; rinse and dry equipment. Power wash boat and trailer between boat launches.	Yes
	Others Gas, oil	No	Equipment well maintained		N/A

1 Tasks (from HACCP Step 3 - Flow Diagram)	2 Potential hazards identified in HACCP Step 2	3 Are any potential hazards significant	4 Justify evaluation for column 3	5 What control measures can be applied to prevent undesirable results?	6 Is this task a critical control point?
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Task 5 Storage of boat, trailer, and equipment between sample trips.	Vertebrates Fish	No	Desiccation, heat, and removal of all standing water eliminate likelihood of survival; large organisms are easy to detect and remove.		N/A
	Invertebrates Aquatic invertebrates (quagga mussels, New Zealand mudsnails, apple snails, crayfish) and zooplankton	Yes	Mollusks and zooplankton cysts may survive periods of desiccation.	Visually inspect for organisms and remove, ensure equipment is dry, use power washer.	Yes
	Plants Aquatic macrophytes (giant salvinia, Hydrilla, watermilfoils (Eurasian and parrot feather), pondweeds, naiads, coontail, algae and phytoplankton (golden algae, filamentous and blue-green algae)	Yes	Plant materials, seeds, and spores may survive periods of desiccation.	Visually inspect for organisms and remove, ensure equipment is dry, use power washer.	Yes
	Others Biologics Aquatic parasites (Eurasian tapeworm, leeches and flukes, anchorworms)	No	Desiccation, heat, and removal of all standing water eliminate likelihood of survival.		N/A
	Others Gas, oil	No	Equipment is well maintained and cleaned.		N/A

Attachment A: Field Equipment Treatment for Quagga Mussels

Quagga mussels (an invasive species) were identified as being present in Lake Mead on January 6, 2007. Subsequent surveys have been identified Quagga mussels as far south as the Central Arizona Project and Metropolitan Water District withdrawal intake structures in Lake Havasu. At this time the Department is considering all of the Colorado River and Colorado River lakes downstream of Lake Mead as being positive for the mussels. The spread of Quagga mussels is due to their naturally high fecundity and dispersal capacity by a microscopic larval stage called a veliger. The Department will immediately begin treating all of its field equipment that has contact with the Colorado River and river lakes for Quagga mussel control using the following procedures when moving to non-infected areas.

There are numerous recommendations from various Agencies on how to treat equipment and boats reducing the risk of facilitating the spread of zebra or Quagga mussels. Some of the recommended processes are lacking scientific data supporting the action. All of the recommendations are considered to be better than no action. First and foremost take advantage and incorporate ambient environmental conditions (heat, dryness, freezing) with recommended protocols. The immature stage (veligers) is particularly sensitive to heat or dryness.

This approach is multi phased with general recommendations for equipment and boat storage between uses, treatment recommendations for low risk situations, and treatment recommendations for higher risk situations.

If the equipment has been in dry storage for 30 days or more prior to movement to waters considered non-infected then consider the risk transfer minimal.

Precautionary Mussels Avoidance Procedures

There are numerous procedures used and recommended by various agencies that are reflective of each other and those recommend in this document. There is a general lack of scientific data actually supporting efficacy with the compounds, contact times, and processes. It is essential that additional precautions be instituted to increase the likelihood that a toxic environment is created for the mussels. These are simple procedural matters.

- Never transfer water between sites. Insure that equipment have been dried or treated prior to movement.
- Store equipment dry whenever possible. Flush motor lower end with fresh water before storage.
- Pressure wash equipment at coin operated washer after use in infected waters
- Inspect equipment immediately upon leaving the water. Scrape off any mussels or aquatic vegetation found.
- Ensure that the requisite materials and supplies for treatment are available when activity at the water is completed.
- Plan work activities so that the gradation of work sites is from least infected to most infected areas.

Mussel Decontamination Procedures

This is to be used every time equipment is exposed to water body that is confirmed or suspect (not detected yet) to have invasive mussels. Even short duration exposures can create a pathway for movement.

Field Equipment

Plan work activities to accommodate a gradation ranging no exposure (clean) to areas of greater exposure (positive).

- Inspect all field equipment before and after use to remove all visible mussels.
- All field equipment must be cleaned using appropriate methods with disinfectant materials.
- Care should be taken to match disinfectant technique with equipment and material type.
- Consideration of having equipment designated for sensitive areas (contaminated waters or water considered critical for sensitive species) area should be considered.
- Equipment should be marked as to be used in specific areas and tagged to indicate that it has been cleaned and ready for new use.

Long term exposure in contaminated waters

It is preferable not to have equipment and materials stored in waters that are known to be positive for invasive mussels. As exposure time increases the probability of mussels attaching to or veligers surviving in the wet areas increases. The decontamination procedures are the same with increased sensitivity to completing the process correctly and follow up inspections.

When possible, field equipment dedicated for use in infested waters should be considered. Typically these items may not be durable and are susceptible to accelerated degradation from recommended chemical decontaminates. Items should be cleaned and stored in marked containers designating areas of use.

- Field equipment should be washed in disinfectant solution from recommended list. Hard surfaces should be scrubbed.
- After disinfecting the items should be stored dry for not less than 7 days if temperatures of 91° F or freezing can not be attained for 2 days.

Recommended Disinfectants

Chemicals and procedures are intended to create a toxic environment for the mussels various life stages which can also deteriorate components of boats, trailers, motors, and field equipment. This impact should be considered when developing individual decontamination protocols. It is recommended to take advantage of environmental conditions (heat and dryness) as a process tool.

Chemical and Procedure Treatments

Chemical	Concentration	Contact Time
Chlorine Bleach	5% to 12 %	30 to 60 minutes
Potassium Chloride	750 ppm	60 minutes
Vinegar (5% acetic acid)	As sold	20 minutes
(ROCCAL™)	250 ppm	15 minutes
Procedure		Contact Time
Desiccation (general)	> 91° F	48 hours
Desiccation (general)	< 91° F	5 to 30 days
Power washing	2000 to 3000 psi	<1 minute
Hot Water	140 ° F	23 minutes

Temperature and Humidity Chart

Relative % Humidity	Days to 100 % Mortality at Air Temperature		
	5° C, 41° F	15° C, 59° F	25° C, 77° F
95	26.6	11.7	5.2
50	16.9	7.5	3.3
5	10.8	4.8	2.1
Zebra Mussel research Program, US Army Engineer Waterways Experiment Station, Technical Note ZMR-2-10, 1992			

Attachment B: Boat Treatment for Quagga Mussels

Quagga Mussels (an invasive species) were identified as being present in Lake Mead on January 6, 2007. Subsequent surveys have identified Quagga mussels as far south as the Central Arizona Project and Metropolitan Water District withdrawal intake structures in Lake Havasu. At this time the Department is considering all of the Colorado River and Colorado River Lakes downstream of Lake Mead as being positive for the mussels. The spread of Quagga mussels is due to their naturally high fecundity and dispersal capacity by a microscopic larval stage called a veliger. The Department will immediately begin treating all of our watercraft that have contact with the Colorado River and river Lakes for adult Quagga mussel and veliger control using the following procedures when moving to non-infected areas.

There are numerous recommendations from various Agencies on how to treat boats, motors, and trailers reducing the risk of facilitating the spread of zebra or Quagga mussels. Some of the recommended processes are lacking scientific data supporting the action. All of the recommendations are preferred to no action. First and foremost take advantage and incorporate ambient environmental conditions (heat, dryness, freezing) with recommended protocols. The immature stage (veligers) is particularly sensitive to heat or dryness.

This approach is multi phased with general recommendations for equipment and boat storage between uses, treatment recommendations for low risk situations, and treatment recommendations for higher risk situations.

If the watercraft has been in dry storage for 30 days or more prior to movement to waters considered non-infected then consider the risk transfer minimal.

Precautionary Mussels Avoidance Procedures

There are numerous procedures used and recommended by various agencies that are reflective of each other and those recommend in this document. There is a general lack of scientific data actually supporting efficacy with the compounds, contact times, and processes. It is essential that additional precautions be instituted to increase the likelihood that a toxic environment is created for the mussels. These are simple procedural matters.

- Never transfer water between sites. Insure that boats have been dried or treated prior to movement.
- Store boat dry and drained whenever possible. Pull drain plugs to drain bilge water and live wells.
- Flush motor lower end with fresh water before storage.
- Pressure wash outside of hull and trailer at coin operated washer prior to transport or after use in infected waters
- Inspect the boat and trailer immediately upon leaving the water. Scrape off any mussels or aquatic vegetation found.
- Ensure that the requisite materials and supplies are available for treatment when activity at the lake is completed.
- Plan work activities so that the gradation of work sites is from least infected to most infected.

Mussel Decontamination Procedures

This is to be used every time a boat, motor, or trailer is exposed to water body that is confirmed or suspect (not detected yet) to have invasive mussels. Even short duration exposures can create a pathway for movement.

Boats/ motors/ trailers

- Drain the bilges, live wells, and compartments that can hold water from before leaving the water body. If possible the water is drained back into the originating water body.
- Inspect the boat, trailer, and motor removing all observed biological contaminants. Pay particular attention to trailer bunks (carpeted), hull cracks or crevices, and areas where moisture and mussels may be retained.
- Clean the boat, trailer, anchors, and compartments that held water should be pressured washed. This is easily accomplished at a self-service car wash. Pay attention while cleaning to cooling water intakes on lower units and trailer bunks.
- If bilge pumps can not be drained then re-plug the boat prior to transport and pour 2 gallons of vinegar into the bilge. Retain vinegar in the bilge for minimum of 30 minutes (transport during this phase will help wash bilge area).
- After washing is completed, including bilge wash with vinegar, pull drain plugs to dry before next usage.
- A visual inspection must be completed before and after each decontamination event.

Long term exposure in contaminated waters

It is preferable not to have equipment and materials stored in waters that are known to be positive for invasive mussels. As exposure time increases the probability of mussels attaching to or veligers surviving in the wet areas increases. The decontamination procedures are the same with increased sensitivity to completing the process correctly and follow up inspections.

If there are periods during the annual work cycle that equipment is not being used then the equipment should be removed from water for long term dry storage. Depending on environmental conditions it may require up to 30 days of storage to kill adult mussels that have become attached.

- Follow the same procedures recommended previously for decontamination.
- Incorporate a heating/drying period of not less than 7 days if temperatures of 91° F or freezing can not be attained for 2 days. These 2 temperatures are the extremes at which mussels survive in the wild and should be sufficient to kill all adults when in dry conditions. It is quite easy during most months in Arizona to attain the upper threshold temperature.

Recommended Disinfectants

Chemicals and procedures are intended to create a toxic environment for the mussels various life stages which can also deteriorate components of boats, trailers, motors, and field equipment. This impact should be considered when developing individual decontamination protocols. It is recommended to take advantage of environmental conditions (heat and dryness) as a process tool.

The following charts summarize chemicals and treatments for Quagga mussel control:

Chemical and Procedure Treatments

Chemical	Concentration	Contact Time
Chlorine Bleach	5% to 12 %	30 to 60 minutes
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Zebra Mussel research Program, U.S. Army Engineer Waterways Experiment Station, Technical Note ZMR-2-10, 1992