Freshwater Mussels (various species from Unionidae family) HACCP Plan
(Hazard Analysis Critical Control Point)

1. **Activity Description**
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3. **Flow Diagram**
4. **Hard Analysis Worksheet**
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1) Activity Description

Facility: Warm Springs National Fish Hatchery	**Site:** Warm Springs National Fish Hatchery
Project Coordinator: Carlos Echevarria	**Activity:** Freshwater mussel propagation, restoration, refugia, augmentation and reintroduction throughout the Apalachicola, Chattahoochee, Flint River Basin
Site Manager: Carlos Echevarria	
Address: 5308 Spring Street Warm Springs, GA 31830	
Phone: (706) 655-3382	

Project Description i.e. Who; What; Where; How; Why
Freshwater mussels will be collected by hand (grubbing) between the months of May and August for freshwater mussel propagation, restoration, refugia, life history studies, host fish identification, augmentation and reintroduction throughout the Apalachicola, Chattahoochee, Flint River Basin.

2) Identify Potential Hazards

Hazards: Species which may potentially be moved/introduced
Vertebrates: None
Invertebrates: zebra mussels, asian clams
Plants: None
Other Biologics: bacteria, parasites, protozoans, fungus
Others: None

3) Flow Diagram

Step 1		Freshwater mussels are collected by hand (grubbing) and stored in submerged mesh bags
Step 2		Transport: in burlap sacks on ice in coolers
Step 3		Scrubbing mussels with a hand brush and a clean water source to remove external ANS
Step 4		Equipment disinfection: wetsuits, meshbags, coolers, truck
Step 5		Quarantine: mussels held in recirculating tanks and aquariums for 21-30 days
Step 6		Quarantine effluent treatment
Step 7		Pathogen and disease monitoring
Step 8		Mussels tagged to identify the population and date and location of collection
Step 9		Isolation: mussels are held in isolation for the duration of their stay at WSNFH
Step 10		Quarantine mussel holding tanks, aquariums, and equipment disinfected with 300 ppm chlorine for 1 hour
Step 11		Study and evaluation period: mussels are utilized for various studies such as captive refugia, propagation and life history studies
Step 12		Prior to repatriation mussels quarantined for 30 days to insure they naturally purge any pathogens obtained from hatchery water
Step 13		Repatriation
Step 14		Isolation and quarantine holding tanks and aquariums disinfected with 300ppm chlorine for 1 hour

4) Hazard Analysis Worksheet

(1) Harvest or Aquaculture Step	(2) Identify potential ANS hazards introduced or controlled at this step (1)	(3) Are any potential ANS hazards significant? (Yes/No)	(4) Justify your decisions for column 3	(5) What control measures can be applied to prevent the significant hazards	(6) Is this step a critical control point? (Yes/No)
(1) Freshwater mussels are collected by hand (grubbing)	Fish/other vert: none	No	Fish and other vertebrates not collected	NA	No
	Invertebrates: zebra mussels, asian clams	Yes	Zebra mussels are not always visible and asian clams accidentally collected	Scrub mussels to remove external ANS	No
	Plants: none	No	Any plant material is removed from mussels at collection site	NA	No
	Other biologics: bacteria, parasites, protozoans	Yes	Mussels internally harbor other biologics	Control measures best applied in later step	No
(2) Transport mussels to WSNFH in burlap sacks on ice	Fish/other vert: none	No	Fish and other vertebrates not collected	NA	No
	Invertebrates: : zebra mussels, asian clams	Yes	Zebra mussels are not always visible and asian clams accidentally collected	Transport a minimal amount of water in coolers	No
	Plants: none	No	Any plant material is removed from mussels at collection site	NA	No
	Other biologics: bacteria, parasites, protozoans	Yes	Other biologics transported in water and in mussels	Transport a minimal amount of water	No
(3) Scrub mussels with a clean water source to remove external ANS	Fish/other vert: none	No	Fish and other vertebrates not collected	NA	No
	Invertebrates: : zebra mussels, asian clams, bacteria, parasites, protozoans	Yes	Zebra mussels are not always visible	Disinfect cleansing water with 300ppm chlorine	No
	Plants: none	No	Any plant material is removed from mussels at collection site	NA	No
	Other biologics: bacteria, parasites, protozoans	Yes	Mussels may harbor other biologics internally and externally	Disinfect cleansing water with 300ppm chlorine	No
(4) Collection equipment disinfected	Fish/other vert: none	No	No vertebrates in contact with equipment	NA	No
	Invertebrates: : zebra mussels, asian clams, bacteria, parasites, protozoans	Yes	Zebra mussels not always visible	Disinfect equipment with 300ppm chlorine for 1 hour	No
	Plants: none	No	Plant material removed at collection site	NA	No
	Other biologics: bacteria, parasites, protozoans	Yes	Other biologics not visible	Disinfect cleansing water with 300ppm chlorine	No
(5) Quarantine mussels held in recirculating tanks and aquariums for a minimum of 30 days	Fish/other vert: none	No	No vertebrates in quarantine system	NA	No
	Invertebrates: : zebra mussels, asian clams,	Yes	Juvenile zebra mussels missed during scrubbing may develop in 30 day quarantine period	Re-inspect mussels for zebra mussels and re-scrub if necessary	Yes
	Plants: none	No	No plants in quarantine system	NA	No
	Other biologics: bacteria, parasites, protozoans	Yes	Mussels must be allowed to naturally purge biologics	Diagnostic evaluation	Yes

4) Hazard Analysis Worksheet cont'd

(6) Quarantine effluent treatment	Fish/other vert: none	No	No vertebrates in effluent	NA	No
	Invertebrates: zebra mussels, asian clams	Yes	Mussels will naturally purge internal organisms, zebra mussels may become visible	Disinfect effluent with 300 ppm chlorine for 1 hour	Yes
	Plants: none	No	No plants in effluent	NA	No
	Other biologics: bacteria, parasites, protozoans	Yes	Biologics purged by mussels and not visible	Disinfect cleansing water with 300ppm chlorine	Yes
(7) Pathogen and disease monitoring	Fish/other vert: none	No	No vertebrates in system	NA	No
	Invertebrates: zebra mussels, asian clams, bacteria, parasites, protozoans	Yes	Mussels potentially harbor other organisms	Mussels will be examined to detect any "reportable" pathogens or organisms	Yes
	Plants: none	No	No plants in system	NA	No
	Other biologics: bacteria, parasites, protozoans	Yes	Mussels potentially harbor pathogens and other organsims	Fish health diagnostic evaluation	Yes
8) Mussels tagged to identify the population, date and collection location	Fish/other vert: none	No	No ANS vertebrates introduced in tagging process	NA	No
	Invertebrates: none	No	No ANS invertebrates introduced in tagging process	NA	No
	Plants: none	No	No ANS plants introduced in tagging process	NA	No
	Other biologics: bacteria, protozoans, parasites	No	No ANS plants introduced in tagging process	NA	No
(9) Isolation: mussels are held in an isolation facility for the duration of their stay at WSNFH	Fish/other vert: none	No	No ANS vertebrates in water source	NA	No
	Invertebrates: none	No	No ANS invertebrates in water source	NA	No
	Plants: none	No	No ANS plants in water source	NA	No
	Other biologics: bacteria, protozoans, parasites	No	No ANS biologics in water source	NA	No
(10) Quarantine mussel holding tanks, aquariums and equipment disinfected	Fish/other vert: none	No	No ANS vertebrates in quarantine system	NA	No
	Invertebrates: zebra mussels, asian clams	Yes	Mussels will naturally purge themselves	Disinfect quarantine building, tanks, aquariums and equipment with 300ppm chlorine for 1 hour	No
	Plants: none	No	No ANS plants in quarantine system	NA	No
	Other biologics: bacteria, protozoans, parasites	Yes	Mussels will naturally purge themselves	Disinfect quarantine building, tanks, aquariums and equipment with 300ppm chlorine for 1 hour	No

4) Hazard Analysis Worksheet cont'd

(11) Study and evaluation period: mussels are utilized for various studies	Fish/other vert: none	No	Mussels isolated from ANS and other vertebrates	NA	No
	Invertebrates: none	No	Mussels isolated from ANS invertebrates and other invertebrates	NA	No
	Plants: none	No	Algae not ANS and kept to an acceptable level	NA	No
	Other biologics: bacteria, protozoans, parasites	No	Biologics kept to an acceptable level with filters on water source	NA	No
(12) Prior to repatriaiton mussels are quarantined for 30 days	Fish/other vert: none	No	Mussels exposed to no known vertebrates at hatchery	NA	No
	Invertebrates: none	Yes	Mussels exposed to no known ANS invertebrates, but mussels allowed to purge regardless	30 day quarantine to ensure mussels purge any hatchery bred organisms	No
	Plants: none	No	Mussels exposed to no known ANS plants at hatchery	NA	No
	Other biologics: bacteria, protozoans, parasites	Yes	Mussels naturally purge themselves of any biologics obtained at WSNFH	NA	No
(13) Repatriation	Fish/other vert: none	No	No vertebrates with repatriated mussels, mussels transported without water	NA	No
	Invertebrates: none	No	Hazard reduced to an acceptable level in step 12	NA	No
	Plants: none	No	No plants with repatriated mussels	NA	No
	Other biologics: bacteria, protozoans, parasites	No	Hazard reduced to an acceptable level in step 12	NA	No
(14) Isolation and quarantine holding tanks and equipment disifected	Fish/other vert: none	No	Reduced to an acceptable level in steps 5 and 7	NA	No
	Invertebrates: none	No	Reduced to an acceptable level in steps 5 and 7	Tanks, aquariums and equipment disifected with 300ppm chlorine for 1 hour	No
	Plants: none	No	Reduced to an acceptable level in steps 5 and 7	NA	No
	Other biologics: bacteria, protozoans, parasites	No	Reduced to an acceptable level in steps 5 and 7	Tanks, aquariums and equipment disifected with 300ppm chlorine for 1 hour	No

5) ANS-HACCP Plan Form

(1) Critical Control Point (CCP)	(2) Significant Hazard(s)	(3) Limits for each Control Measure	Monitoring				(8) Evaluation and Corrective Actions (if needed)	(9) Supporting Documentation (if any)
			(4) What	(5) How	(6) Frequency	(7) Who		
(3) Scrub mussels with clean water source to remove external ANS	Zebra mussels	Mussels are scrubbed utilizing a "clean" underground water source. "Dirty" water is treated with 300ppm chlorine for 1 hour	Presence of zebra mussels	Visual and microscopic inspection	Each time new mussels arrive at the hatchery	Hatchery personnel	If zebra mussels appear re-quarantine and re-scrub	Record all actions in MQB daily log
(5) Quarantine: mussels held in re-circulating tanks and aquariums for 30 days	Zebra mussels, bacteria, protozoans, parasites, fungus	Mussels are held in re-circulating tanks and aquariums for a minimum of 30 days to all the mussels to naturally purge internal organisms and to all any missed zebra mussels during scrubbing to become visible	Quarantine time Presence of zebra mussels	Time Visual and diagnostic inspection	Each time new mussels put into system	Hatchery personnel, Fish Health personnel	If zebra mussels appear re-scrub and re-quarantine	Record all actions in MQB daily log
(6) Quarantine effluent treatment	Zebra mussels, bacteria, protozoans, parasites, fungus	Quarantine effluent treated with 300ppm chlorine for 1 hour	Presence of ANS	Time	Each time water is exchanged	Hatchery personnel	Increase ppm chlorine	Record all actions in MQB daily log
(7) Pathogen and disease monitoring	Zebra mussels, bacteria, protozoans, parasites, fungus	Quarantine mussels for 30 days to allow for natural purging of internal organism, mussels inspected by Fish Health prior to transfer to isolation facility	Presence of pathogens	Diagnostic tests	Once after 30 day quarantine	WSRFC Fish Health personnel	Re-quarantine if reportable pathogens or diseases found	Record all actions in MQB daily log

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Address: 5308 Spring Street Warm Springs, GA 31830	
Signature: **HACCP Plan Was Followed**	**Date:**