

Expanded Non-Native Aquatic Species Management Plan—Control Actions Considered for Use under Each Alternatives
December 19, 2017

Specific Actions	Alternative A No Action	Alternative B Most Expanded Control Methods	Alternative C Moderately Expanded Control Methods	Alternative D Least Expanded Control Methods
Mechanical Controls: Physical removal of non-native aquatic species from habitats. <i>Mechanical treatments would not be applied in Ribbon Falls Creek or Deer Creek. Would not include mechanical removal of rainbow trout in the Glen Canyon Reach where NPS is managing for a recreational rainbow trout fishery</i>				
Long-term intensive and repeated electrofishing and trapping of all age-classes of harmful non-natives. Includes site-specific use in Glen Canyon reach to target brown trout and green sunfish.	Allowed under CFMP for rapid response targeting all non-natives and locations, and for comprehensive brown trout control in GCNP. Allowed under the LTEMP as a long-term response for trout control in the Little Colorado River reach	Yes	Similar to Alternative B, but has more restrictive use of long-term mechanical removal of brown trout in Lees Ferry, focusing only in spawning areas to limit incidental take of rainbow trout	Same as Alternative A
Mechanical disruption of spawning areas or other early life stage habitats using dredges, suction devices, power washers, electrical grid panels, covering materials (such as rubber mats or material placed on river bottoms), or similar technologies	No	Yes	Yes	No
Sonic, detonation cord, and other mechanical concussive devices in small backwater areas	No	Yes	No	No
Dredging or mechanical harvesting of non-native aquatic plants such as didymo	No	Yes	Yes	Yes
Physical Controls: Habitat modification or exclusion of specific side channel areas less than 5 acres that are identified as source areas for harmful non-natives				
Long-term fish barriers such as weirs, exclusion screens, and net that inhibit passage into small backwater areas and limited tributary areas	No	Yes	Yes	Yes
Use of pumps and above-ground piping to alter backwater temperatures and reduce non-native spawning	No	Yes	Yes	Yes
Use of black plastic, rubber mats, or other covering to treat non-natives (by raising water temperatures and lowering dissolved oxygen levels to lethal limits or by limiting sunlight) in small backwater areas (<0.5 acres)	No	Yes	Yes	Yes
Site-specific measures at RM -12 would include some combination of these measures: <ul style="list-style-type: none"> Permanent exclusion barrier between upper and lower slough when determined appropriate for a long-term response Barrier between lower slough and river Pumps and/or above ground piping to lower the water temperature in the upper slough Periodic dewatering of upper slough using channelization, water control head gates, dewatering pumps, or other devices at the outlet to lower slough Channelization or permanent underground piping to connect the upper slough to the main channel and lower water temperature in the upper slough to reduce breeding habitat for non-natives Filling in upper slough using locally available material to remove habitat Dredging to connect upper and lower slough and thereby lower temperature in upper slough 	No	All measures would be considered for use.	Similar to Alternative B. Only differs for site-specific options at RM -12 sloughs: <ul style="list-style-type: none"> Barrier between upper and lower slough Barrier between lower slough and river Pumps or above ground piping to reduce upper slough water temperature Periodic dewatering of upper slough Dredging to connect upper and lower slough 	Same as Alternative C
Biological Controls: Introduction of organisms to control populations of non-native aquatic species				
YY male brown trout or other non-native species to reduce breeding success over time by creating a skewed population sex ratio	No	Yes	Yes	No
Site-specific measures at RM -12 would include some combination of these measures: <ul style="list-style-type: none"> Move large numbers of non-native common carp collected from other parts of the Glen Canyon reach to the upper slough to overwhelm the carrying capacity (in terms of ammonia and dissolved oxygen) of this small slough and result in a die-off of the fish community in the slough Introduce humpback chub or Colorado pikeminnow to the upper slough to prey on and compete with non-natives 	No	Yes	<ul style="list-style-type: none"> Would not include the use of common carp to overwhelm non-natives in the RM -12 slough. Introduce only humpback chub (but not Colorado pikeminnow) to the upper slough. 	No
Chemical Controls: Limited application of chemicals to control populations of non-native aquatic species. <i>Chemical treatment would not occur in Ribbon Falls Creek, Deer Creek, or in the Little Colorado River reach or in close proximity to known aggregations of federally listed endangered or threatened fish species. Pheromone or other attractants that enhance removal of adult fish or harmful non-native species could be used in conjunction with trapping or other mechanical removal methods.</i>				
Rapid response for a limited period of years to address potentially harmful non-natives in backwaters, low-velocity areas, or sloughs	No	Yes	Yes	No
Fishery renovation purposes prior to native species translocations or introductions, limited to use in tributary locations that have a natural barrier, such as Bright Angel Creek above "Split Rock Falls" or Shinumo Creek	No	Yes	Yes	No
As a last resort method to address potentially harmful non-natives in backwaters, low-velocity areas, or	No	Yes	Yes	No

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sloughs, and prevent their distribution downstream after other methods have been unsuccessful. For example at RM -12 upper or lower sloughs if other methods are tried but a risk is still present in a given year.				
To control non-native fish, application of piscicides would be limited to small backwater areas or tributaries with natural barriers, and would only include use of either (1) rotenone or other registered piscicide with appropriate neutralizing agents and other best practices or (2) appropriate experimental chemicals allowed under federal and state regulations (such as ammonia)	No	Yes	Yes	No
To control non-native aquatic plants, application of herbicides or non-toxic dyes (used to block sunlight) that are permitted under federal and state regulations in backwaters, low-velocity areas or sloughs	No	Yes	Yes	No
To control mollusks, application of molluscicides that are permitted under federal and state regulations in backwaters, low-velocity areas or sloughs	No	Yes	Yes	No
Fishing or Take Changes: Changing harvest rates to increase removal of non-native aquatic species				
Bounty system for specific non-natives and specific age/size classes, tournaments with prizes or other award programs that provide incentives to anglers to catch and keep specific non-natives.	No	Yes	Yes	Yes
Coordination between federal and state agencies to explore education and/or regulation changes that implement catch-and-keep regulations for specific harmful non-native species (such as brown trout).	No	Yes	Yes	Yes