Categorical Exclusion Form

Project: Restoring Natural Conditions to Kelly Warm Spring
PEPC Project Number: 59971
Description of Action (Project Description):

The National Park Service proposes to restore native fish to Kelly Warm Spring (KWS). KWS has been a target of aquarium dumping for decades, which has created aquatic assemblages dominated by invasive species. KWS has been studied intensively since 2009, and data indicate that introduced fishes, amphibians, and pathogens are a clear threat to the native fauna in the warm spring and adjoining waterways (Harper and Farag 2017, see attached supplemental information). The park would cooperate with the Wyoming Game and Fish Department (WGFD; NPS Management Policy 2006: 4.1.4,; see Jurisdictional Inventory) to remove non-native fish and amphibians by applying an EPA-approved piscicide (rotenone; fishes) and/or direct removal (amphibians) then restocking with native fish species.

The KWS treatment was designed to minimize both the amount of rotenone needed and the size of the treatment area. See the attached summary for more detail. It provides information about the problem of aquarium dumping; introduced invasive species and unique pathogens documented in KWS; alternatives considered; rotenone properties and environmental impacts; and planned procedures.

The KWS system includes the spring (0.48 acre in size), and its outflow - Savage Ditch and Ditch Creek. The project area includes the spring, 11.5 km of ditch exiting the spring and 2.5-3 km of Ditch Creek (see Final KWS Project Area Map). Rotenone would be applied for approx. 8 hours in the treatment area, which includes the thermal feature and 6 km of Savage Ditch, which exits the spring. An additional 5.5 km of the Savage Ditch system would be temporarily dewatered using tarps and/or sand bags during the treatment and for approx. 1-3 days afterwards. The KWS treatment would likely occur during the latter half of August 2018. This time was chosen because high ambient temperatures speed the breakdown of rotenone, and because Ditch Creek typically lacks connectivity to the Snake River at this time of year, reducing any potential connection to the river and contact with the chemical. Press releases would be issued prior to the treatment and areas would be recommended to the Superintendent for temporary closure and, if approved, appropriately signed before, during, and for 72 hours after treatment.

Briefly, the project will be implemented under the Incident Command Structure and follow the Communications Plan. In particular, all press contacts will be directed through the Public Affairs Office. Project implementation will include the following: - pre- and post-treatment monitoring; - calculating the minimum, effective amount of rotenone; - using sandbags and/or tarps to dewater 5.5 km of the Savage Ditch system, and removing them post treatment; - cutting aquatic vegetation in the spring and ditch as necessary to better achieve desired rotenone concentrations; - distributing rotenone via booster drip stations and a rotenone/sand mixture to maintain even rotenone concentrations; - using sentinel fish to assess rotenone concentrations in the water; - applying oxidant to the treatment areas at a predetermined rate, if needed, to neutralize residual rotenone; - removing and disposing of recoverable fish carcasses; - restocking native fish species on one or more occasions once the spring is clear of non-native fish; - continuing to inform the public about the prohibition on aquarium dumping and its harmful effects on park resources; and - retreating the spring and outflow later in year or in subsequent seasons as needed if invasive fishes are not successfully removed or are re-introduced.

Note: The proposed project would occur only within Kelly Warm Spring, a portion of the Savage Ditch system, and a segment of Ditch Creek (see attached map). Restoration activities would not occur at the Abercombie Warm Spring or the unnamed warm spring adjacent to the Gros Ventre River.

Project Locations:

Location			
County:	Teton	**State:**	WY

Mitigation(s):

- The spread of non-native, invasive plant species in the park is a serious concern. Thus, no equipment will be allowed to offload or remain within the park if dirt or other contaminants with the potential to harbor seeds or other plant material is apparent. The Operations Chief will ensure that all cooperator vehicles and equipment shall arrive at the restoration site in a condition free of mud, dirt, and plant material.
- Limit the removal of aquatic vegetation to the minimum necessary to achieve a successful piscicide treatment.
- Coordinate temporary public use closures with the Public Affairs Officer (307-739-3393) and Chief Ranger (307-739-3472) and recommend appropriate closures to the Superintendent one to three weeks before treatments are scheduled to occur. Ensure the communications plan is followed and implemented and that all communications contacts are coordinated and directed through the Public Affairs Office.
- Follow all relevant requirements provided in the Grand Teton National Park and John D. Rockefeller, Jr. Memorial Parkway Standard Mitigations and Stipulations which is available on the GRTE P drive at P:\Planning Office\Environmental Compliance SOP_PIF\Standard Stipulations & Mitigation Measures.
- If any cultural materials are discovered during project implementation, work in the area shall halt immediately. The Park Archeologist will be contacted and evaluate the materials. The park Cultural Resource Division will inform the SHPO of any unanticipated finds.

CE Citation: E.2 Restoration of noncontroversial native species into suitable habitats within their historic range and elimination of exotic species.

CE Justification:

After completing public scoping and considering comments and environmental effects, the park has completed a categorical exclusion for the control action. Of the 42 public comments received during the initial scoping process, 12 supported the use of rotenone treatment (preferred alternative), 15 were against the use of rotenone, but supported alternative methods of removing exotic species, 8 were against any type of removal action, 2 requested further information and analysis before NPS moves forward with the project, and 5 had no direct opinion or were unclear in their comments. The attached "Kelly Warm Spring Native Fish Restoration Plan" provides details on rotenone chemistry and toxicology related to these concerns. The use of required personal protective equipment (PPE) virtually eliminates exposure for applicators and excluding the general public from treatment areas is an effective means of minimizing potential exposure to unsafe levels of rotenone. Therefore, the park has determined that the use of rotenone would have no significant impacts on public health and safety.

Decision: I find that the action fits within the categorical exclusion above. Therefore, I am categorically excluding the described project from further NEPA analysis. No extraordinary circumstances apply.

Signature

Superintendent ______________________ Date: 9/25/18

David Vela 9/25/2018

Extraordinary Circumstances:

If implemented, would the proposal...	Yes/No	Notes
A. Have significant impacts on public health or safety?	No	
B. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands; wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (Executive Order 11990); floodplains (Executive Order 11988); national monuments; migratory birds; and other ecologically significant or critical areas?	No	
C. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources (NEPA section 102(2)(E))?	No	
D. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?	No	
E. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?	No	
F. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?	No	
G. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office?	No	
H. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species?	No	
I. Violate a federal, state, local or tribal law or requirement imposed for the protection of the environment?	No	
J. Have a disproportionately high and adverse effect on low income or minority populations (EO 12898)?	No	
K. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or adversely affect the physical integrity of such sacred sites (EO 130007)?	No	
L. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area or actions that may promote the introduction, growth, or expansion of the range of such species (Federal Noxious Weed Control Act and Executive Order 13112)?	No	

Kelly Warm Spring (KWS) Native Fish Restoration Supplemental Information

Prepared by C. Whaley, Grand Teton National Park Fisheries Biologist and Aquatic Invasive Species Coordinator, 3/8/2018

Problem

Warm springs in the southern portion of Grand Teton National Park have been a target for aquarium dumping for several decades and this has resulted in aquatic assemblages dominated by non-native species. Kelly Warm Spring (KWS) in particular has been subjected to introductions of more non-natives. Consequently, this system has been examined intensively since 2009, and the information gathered indicates that introduced species (fishes, amphibians, and pathogens) are a clear threat to the native fisheries in the warm spring and adjoining waterways (Harper 2017). Furthermore, the potential link between proliferation of aquatic invasive species and shifts in climatic regimes (Rahel and Olden 2008) amplifies the importance of restoring native assemblages to these thermal features and fortifying the health of the area's native fishery.

High Threat Non-native species present

Non-native fish have displaced native species in 3 warm springs in the southern portion of Grand Teton National Park: an unnamed warm spring in the Gros Ventre River bottom, Abercombie Warm Spring, and Kelly Warm Spring. The former two features have populations of warm water obligate species that are unlikely to infiltrate adjacent waterways in the near term; however, Kelly Warm Spring hosts a greater range of invasive species with wider thermal tolerances. Some of these species, such as the tadpole madtom (*Noturus gyrinus*), American bullfrogs (*Lithobates catesbeianus*) and goldfish (*Carassius auratus*, have been found in adjacent systems.

Tadpole madtoms were first documented in the Kelly Warm Spring in 1998 (Kiefling unpublished data). Madtoms are a cold-tolerant species and their native range includes the upper Midwest and eastern United States, and the Canadian provinces of Ontario, Manitoba, and Saskatchewan.

American bullfrogs are one of the most successful aquatic invaders in the world due to their ability to disperse, high reproductive rates, and willingness to feed on a diversity of fauna. They are believed to have been introduced to Kelly Warm Spring in the 1950s where they have completely displaced native amphibians. The frogs are native to the southern and eastern portions of North America including Nova Scotia, Quebec, throughout the eastern U.S. and most of the Mississippi River drainage.

Goldfish were first recorded in the spring in 2009 (C. Whaley, unpublished data), have self-sustaining populations in every U.S. state outside of Alaska, which includes a robust population in Lake Tahoe. Goldfish can reach a length of 590 millimeters, weigh 3 kilograms, and tolerate temperatures of 0.3° Celsius (Ford and Beitinger 2005), approximately 32° Fahrenheit.

No established populations of these invaders have been documented outside of Kelly Warm Spring or its effluent, but the potential exists that they could establish themselves in other areas which would negatively impact native ecosystems and complicate resource managers' ability to control or eliminate these species.

Pathogens
Necropsies performed by the Wyoming Game and Fish Department (Wildlife Forensics and Fish Health Lab Laramie, WY) on fish taken from Kelly Warm Spring found pathogens that are not typically found in Wyoming's waters. The most concerning pathogens detected in non-native fish included a tape worm *(Diphyllobothrium dendriticum),* and *Salmonella* species. The tapeworm is typically hosted by salmonids, has the ability to infect new species, and has only been found once before in Wyoming (Lake Alice, Lincoln County, 2006). *Salmonella* is considered an aquarium and aquaculture pathogen that is not generally found in wild populations. A large burden of *Salmonella* is required for the bacteria to persist beyond a few days following exposure of fish to contaminated feed (Nesse et al. 2005). *Salmonella* was documented in several specimens from Kelly Warm Spring, which indicates high densities of this uncommon pathogen. Similar to the tapeworm, this bacterium possesses the ability to spread to other species.

Yellow grub (*Clintostomum marginatum*), a parasitic worm not often found in wild fish in Wyoming, was detected in native fish in the warm spring. Fish can typically tolerate high loads of this parasite, however, in the presence of the other, previously described pathogens, which are not well tolerated, it's uncertain how cumulative effects from these pathogens could impact native fish. Temporarily removing fish from the system and preventing future aquarium dumping will curtail the risk associated with the proliferation of these and other virulent pathogens that could adversely impact the area's fishery.

Alternatives considered
Eliminating non-native species found in Grand Teton National Park's thermal features would protect and promote the ecological, recreational, and economic values associated with a healthy fishery. Alternatives considered included no action, mechanical removal, draining the thermal features, and treating the water with a piscicide. Considered but dismissed approaches for fish removal included no action, mechanical removal, and draining the springs.

No action would fail to address the risks listed above and may facilitate the proliferation of non-native species and pathogens and lead to the degradation of the ecological, recreational, and economic values.

Mechanical removal was dismissed as a viable option for fish removal as it would fail to adequately remove non-natives at an exorbitant cost. In 2015 a team of resource managers conducted intensive fish collection efforts in Kelly Warm Spring and its outflow, investing over 150 personnel hours over the course of 3 days. Less than 8% of the core infested portion of the system was sampled. Habitat complexity precluded total elimination of non-native fishes through mechanical removal, thus it was clear that a substantial, and likely ineffective annual effort would be needed in perpetuity to possibly contain but not eliminate the non-native threats found in the spring.

Extirpating bullfrogs is difficult and is typically attempted using mechanical methods as opposed to chemical. The park will opportunistically remove nonnative bullfrogs by destroying egg masses and catching and humanely euthanizing adults in accordance with guidelines provided by the American

Veterinary Medical Association. Disposal of products of these efforts will be conducted in accordance with the park's food storage regulations.

Draining the system for an extended period of time could effectively eliminate all fish species found in the spring and its effluent, which would be similar in effectiveness to a rotenone treatment. However, the springs percolate water continuously at varying locations, which could leave small refuges for invasive species, thus likely failing to fully eliminate non-native fish species.

Employing the use of a piscicide will eliminate invasive fish species completely. This approach requires surveys to determine the minimum effective concentration and volume of toxicant necessary, as well as the procedures and timing necessary for potential neutralization of the piscicide. Post-treatment monitoring, such as eDNA, could help determine if subsequent treatments may be required to achieve a fully native fish assemblage.

Approved Piscicides

Antimycin A and rotenone are registered in the United States by the Environmental Protection Agency (EPA) for use as a piscicide. Antimycin A is only available in a liquid formulation, while rotenone is more widely used and can be purchased in both powder and liquid forms, therefore making it the preferred formulation for spring fed systems.

Rotenone is a natural product isolated from certain subtropical and tropical members of the pea family found in South America and Southeast Asia. In these areas it was historically utilized by indigenous peoples to kill fish for human consumption. It has been used as a commercial pesticide for over 160 years and as a piscicide in at least 30 countries including the United States; where it has been used to target fish since the 1930's (Ling 2003). The U.S. Fish and Wildlife Service conducted extensive testing on rotenone from 1978–1988 investing over $3 million in developing data required by the EPA as part of its evaluation process. Rotenone was found to meet all safety requirements and the EPA concluded that use of it as a fish management tool does not present a risk of unreasonable adverse effects to humans or the environment (Sousa 1991).

Rotenone chemistry and toxicology

Rotenone is highly reactive, binds to organic matter, and decomposes rapidly in the presence of light, heat, and oxygen. It is only slightly soluble in water and requires dispersant ingredients for piscicidal applications. The proposed formulations of rotenone (Prenfish, CFT Legumine FishToxicant, and Rotenone Fish Toxicant Powder; EPA Registration Numbers 89459-85, 89459-48 and 89459-32) have short half-lives, do not leave behind harmful residues, and would result in short term impacts to water quality. While it depends on the target species, structure of the water body, and its water inflows and outflows, piscicidal treatments require the application of 0.5−4.0 parts per million (ppm) of a 5% rotenone formulation that typically results in 0.025−0.20 ppm of rotenone in the water after application.

As stated by EPA and independent studies, these concentrations of rotenone do not pose health risks to mammals, birds, reptiles, or terrestrial invertebrates. Research on toxic loads of rotenone in mammals and birds demonstrate that animals would need to consume impossibly high amounts of rotenone-treated water or rotenone-killed animals to obtain a lethal dose. For example, a 22-pound dog would have to drink nearly 8,000 gallons of treated water within 24 hours or eat 660,000 pounds of rotenone-killed fish within a day to receive a lethal dose (CDFG 1994). Additionally, a half-pound mammal would need to consume 12.5 mg of pure rotenone or drink 66 gallons of treated water for a lethal dose (Bradbury 1986). In comparison, the effective concentration of rotenone to kill fish is 0.025−0.20 ppm, which is several orders of magnitude lower than concentrations resulting in acute toxicity to mammals.

Evaluation of the risks to scavenging birds in an EPA study were based on estimated daily dose and body size and indicated no risk of acute toxicity from eating rotenone-killed fish. The EPA study showed whole body residues of common carp, a fish species with a similar tolerance to rotenone as gold fish, killed with rotenone to retain 1.08 µg/g of the toxicant. For an 88 g carp this represents 95 µg of rotenone per fish. Based on estimates of avian dietary thresholds for toxicity, a 1000 g bird (slightly smaller than a raven) would need to consume 43,000 carp to receive a lethal dose of rotenone (EPA 2007).

The only native amphibian found in the treatment zone is the Western toad, which has largely been displaced from Kelly Warm Spring system by invasive bull frogs. Western toads are unlikely to be in a gilled stage at the time of treatment, are less vulnerable than other amphibians because they are less reliant on aquatic habitats, and are therefore not expected to be adversely affected by a rotenone treatment.

There have been numerous studies on the impact of rotenone to invertebrate communities. Rotenone is classified as practically non-toxic on an acute exposure basis to honey bees (EPA 2007). In regard to aquatic invertebrates, their varying susceptibilities, short life histories, and winged adult stage provide resilience and the ability to rapidly recover and repopulate areas affected by natural and man-caused disturbances (Montana Fish Wildlife and Parks 2015). The macroinvertebrate community in Kelly Warm Spring is dominated by non-native species and lacks the typical diversity seen in the systems examined for effects of rotenone. Surveys conducted in 2015 demonstrated that this thermal feature is dominated by red rimmed melania, a snail species native to North Africa (Harper 2017). This snail species typically outcompetes and/or displaces native gastropods, and are known vectors of trematode parasites of fish and other species (De Marco 1999, Mitchell et al. 2007). The native macroinvertebrates present (such as mayflies) have short life cycles, are winged and would be expected to recolonize the area shortly after the treatment.

Concerns that use of rotenone as a piscicide could result in the development of Parkinson’s disease (PD) in humans are unrealistic (Finlayson 2012). Studies that induce PD-like symptoms in lab animals require introducing high doses of rotenone directly into the bloodstream of the animals, often with potentially harmful solvents. These studies have been used to study the pathogenicity of PD and for the development of effective treatments for the disease. The routes of exposure in these animals are not analogous to the routes of exposure experienced during a piscicide application. The greatest risk would be to the applicators but if they follow the mandates on the label, dermal, oral, or inhalation exposure is highly unlikely. Ingestion of treated water or dead fish by humans or animals could deliver small doses of rotenone through the gut; but the fragile nature of rotenone would be exploited through enzymatic, bacterial, and hydrolytic reactions rendering it into non-toxic forms. Rotenone does not easily pass through the skin of humans or animals.

Kelly Warm Spring Treatment Plan

The state of Wyoming regulates aquatic environment pesticide applicator licenses in the state and several certified WGFD personnel would be present to apply rotenone treatments in close coordination with NPS staff. All legal and safety standards would be adhered to and only trained and properly equipped personnel would assist in applying the treatment.

The KWS system is comprised of a thermally influenced pond fed by several ground water inflows and an effluent that populates a portion of the Savage Ditch system. This system has a relatively simple matrix of irrigation ditches in the Mormon Row area of Grand Teton National Park. The methods for this non-native removal treatment and native restoration effort minimize the extent of the treatment area (where application of toxicant is expected to produce a complete kill of target organisms), the project area (any area affected by rotenone application and deactivation), and the amount of rotenone necessary to effectively remove non-natives. Using only the amount of toxicant needed to accomplish the objective and confining its effects to where it is needed are important park goals for this effort.

The project area includes the spring, 11.5 km of ditch exiting the spring and 2.5–3 km of Ditch Creek (see KWS Project Area Map). The spring itself is slightly less than one half acre in surface area (~0.48 acre) and holds ~0.69 acre feet of water, though there is some variation depending on time of year, precipitation, and percolation rates. The treatment area includes the thermal feature and 2.25 km of ditch exiting the spring. Approximately 9.25 km of the Savage Ditch system would be de-watered using tarps and/or sand bags to block the incoming flow effectively decreasing the overall size of the treatment area. Once rotenone concentrations drop to levels that support native fishes (approx. 1−3 days post treatment), blockages would be removed to allow water to return to these ditches.

Press releases would be issued 1–3 weeks prior to the treatment. Placards would be posted at access points along the project area indicating that the water is closed to human recreation for 72 hours after the completion of the treatment and that consuming fish from the project area is prohibited.

The treatment would be completed in the latter half of August when ambient temperatures are near their peaks, which will speed the breakdown of the rotenone. This timing also coincides with a period when Ditch Creek typically lacks connectivity to the Snake River; thereby reducing the need for additional neutralizing chemicals to eliminate the potential that the Snake River could be exposed to viable toxicant. Recoverable fish carcasses would be removed from the system and discarded in bear-resistant trash receptacles.

The potency of rotenone is dictated by a suite of factors that include water temperature, sunlight, alkalinity, amount of organic matter present, water volume, and mixing rates. Fish species have varying tolerances to rotenone. Bioassays would be used to determine the minimum concentration necessary to achieve the objective: this requires isolating target fish in buckets with water from the treatment area, exposing these fish to varying concentrations of toxicant, and monitoring their reaction over 8 hours. Extensive flow and volume measurements would be collected in order to determine the exact quantity of rotenone necessary to achieve the prescribed concentration throughout the treatment area.

Rotenone can adhere to organic matter and aquatic plants, which can complicate calculating the amount needed to achieve desired rotenone concentrations in the treatment area. To reduce this effect, where possible, aquatic vegetation would be removed from the treatment zone prior to piscicide application. This action does not involve uprooting plants and would be comparable to mowing the lawn. Rotenone does not adversely affect plant communities and the plants removed would return to pre-treatment levels shortly after the conclusion of the treatment.

Rotenone's instability and binding properties mean its potency is short lived after introduction to a waterway. To effectively maintain desired concentrations of rotenone for an 8-hour period in the KWS system, two application methods would be employed. In flowing water booster drip stations would be strategically placed to ensure the needed concentration is maintained for the treatment period. Target (exotic) species would be placed as sentinel fish upstream of each booster station to indicate if sufficient concentrations are being achieved. In the spring itself and areas with low mixing potential, a rotenone/sand mixture would be applied to create a graduated release of the toxicant. Water volume, flow, and fish tolerances are used to calculate the quantity of this mixture brought on site and applied during the treatment.

Desirable (native) fish species are used as sentinel fish at the terminus of the treatment area to indicate whether neutralization procedures need to be conducted. If these fish expire due to rotenone exposure, potassium permanganate, an oxidant, would be applied at a predetermined rate to neutralize the toxicant. Several environmental factors play a role in the reaction of the neutralizing agent in a given waterway; and similar to rotenone, appropriate application rates are calculated prior to treatment. Potassium permanganate is commonly used in the preparation of drinking water and quickly breaks down into non-toxic elements.

Monitoring, Restoration of Native Species, and Potential for Later Treatments

Additional monitoring, both pre- and post-treatment, would be conducted to prepare for the rotenone application and to assess its effects and efficacy. Since monitoring in Kelly Warm Spring began in 2009, repeated efforts have documented the distribution and abundance of both invasive and native species in the spring and adjoining waterways. Physical properties, such as area and flow, have been measured and would be re-measured several times before the treatment date to ensure that only the minimum required amount of toxicant would be employed.

Post-treatment monitoring would include surveys for target and non-target organisms such as fish, aquatic macroinvertebrates, and amphibians. Monitoring for fish community structure post treatment would be completed by utilizing backpack electroshocking units and eDNA sampling. Markers for the most tolerant target species would be sought in water samples after all genes of said species are expected to have cleared from the area. Upon confirmation that the spring is free from invasive fishes, the spring would be restocked with the historic native fish assemblage.

In 2012, genetic analysis of speckled dace in the warm spring determined that they were not a unique strain. Fish for re-stocking would be sourced from Ditch Creek, an adjoining waterway that has direct connectivity to Kelly Warm Spring. Fish unique to Ditch Creek, such as cutthroat trout and suckers, have been found in the Kelly Warm Spring effluent, Savage Ditch, indicating that genetic mixing between the two waterways already occurs.

If the piscicide treatment failed to fully eliminate non-native fishes, a subsequent treatment would be planned. The park will continue to provide interpretive materials to educate the public on the importance of adhering to the prohibition on aquarium dumping. If future dumping occurs and results in the re-establishment of non-native fishes, future treatments would be planned.

References:

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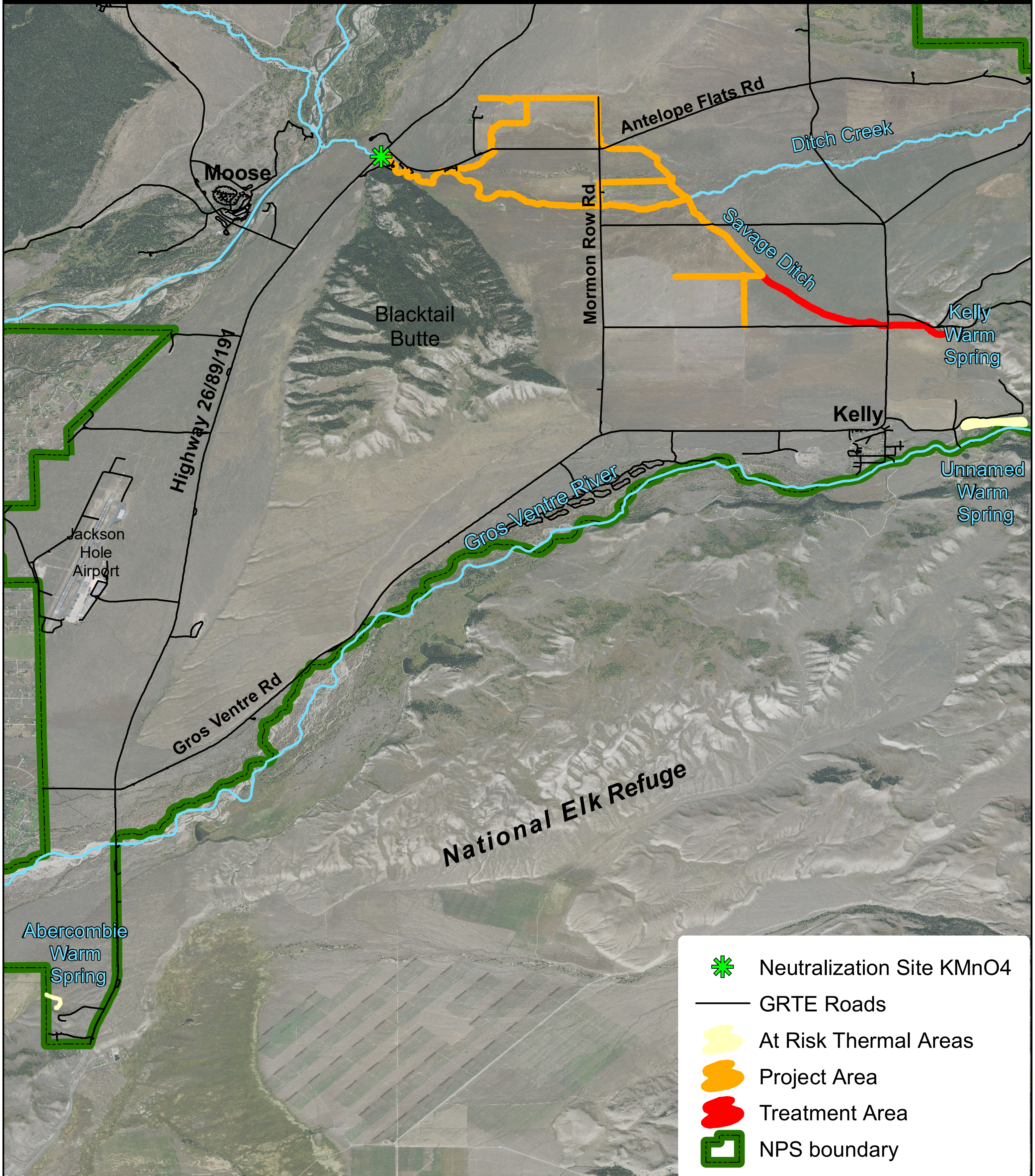
Grand Teton National Park

Kelly Warm Springs Native Species Restoration Project Area

Intermountain Region
National Park Service
U.S. Department of the Interior



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Grand Teton National Park GIS Office
July 2018
Data Sources: ESRI Basedata, NPS Park Data
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