



Native Fish and Fishing Management Strategy - Pecos National Historical Park



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Executive Summary

The Pecos National Historical Park (PECO) Native Fish and Fishing Management Strategy (Strategy), describes the management goals and objectives, and the management strategies and actions that will ensure the long term conservation and restoration of the native fish community, including an at-risk population of Rio Grande chub (*Gila Pandora*) in the Pecos River within Pecos National Historical Park, New Mexico, U.S.A.

In 1990, the historic Fork Lightning Ranch (FLR) was acquired by the National Park Service (NPS) and became the federal agency responsible for managing the ~ 3 miles of the lower Pecos River and the lower portion of Glorieta Creek. Upon acquisition of the FLR, there was immediate interest from local fishing groups to fish the non-native, brown trout fishery that had developed under private ownership. Accordingly, in 2008, PECO implemented a pilot, limited access, permitted, catch and release fishing program, and promulgated temporary fishing regulations under the authority of the Superintendents Compendium (36 CFR 1.5) to regulate its use.

However, the NPS has the obligation and responsibility to manage aquatic resources, including native fish communities, and regulate fishing in a manner that is consistent with the statutory mandates of the National Park Service Organic Act (1916; 54 USC 100101(a) et seq.; Organic Act), and NPS Management Policies (2006). Those mandates require PECO to conserve the natural resources of the park unimpaired, and to prioritize conservation of native resources over other recreational uses. Specifically, it requires PECO to preserve and restore the natural abundance, diversity, dynamics, distribution, habitats, genetics and behaviors of the native fish community; minimize human impacts on native fish populations; prevent the displacement of native fish by introduced exotic species, and; to control and/or eradicate non-natives to the extent prudent and feasible. Accordingly, management to maintain a trophy, non-native, predatory brown trout fishery for recreational purposes, to the detriment of the extant population of native Rio Grande chubs, is not consistent with the NPS mission and policy mandates.

The goal of the Native Fish and Fishing Management Strategy is to align future management at PECO with NPS Management Policies (NPS 2006), and management goals of PECO. The Strategy is intended to identify a programmatic framework that would direct future long-term management for fish populations, and recreational fishing within the park. The Strategy identifies opportunities for PECO to preserve and restore native fishes; control and/or eradicate non-native predatory trout; and identifies appropriate recreational fishing opportunities and regulations consistent with the intent of NPS management policies, so the Park may meet its obligation to conserve and protect native species, including the at-risk Rio Grande chub.

Accordingly, PECO recommends the implementation of a recreational fishing program that will realign the fishing program goals with the NPS Mission and policy mandates, with the following elements:

- Modification of the current non-native, catch and release, trout fishing program, and implementation of a fishing program with the goals of diversifying fishing opportunities, and encouraging the harvest of non-native trout;

- Modification of fishing regulations adopted under the authority of the Superintendents Compendium (36CFR1.5) that allow the take of non-native fish consistent with NM state regulations;
- Implementation of an annual fish community monitoring program.
- Implementation of an adaptive management program that would inform management actions to reduce brown trout abundance if the recreational fishing program alone is not sufficient to meet the management standards and thresholds thought necessary to protect native fish consistent with NPS native fish management and policy goals.
- Establishment of a managed, catch and release, native, Pecos-strain Rio Grande cutthroat trout fishery that will restore the native trout to the Pecos River fish community within PECO, mitigate for the loss of the catch and release brown trout fishery, and provide an opportunity for education and outreach about native fish within PECO
- Reestablishment of a population of native flathead chubs within PECO

I. BACKGROUND INFORMATION

Legislative History of PECO

Pecos National Monument was established on June 28, 1965. The establishment of the monument was intended to preserve 342 acres of land having exceptional historic and archeological importance including the remains and artifacts of the seventeenth century Spanish missions and ancient Indian pueblo (PL 89-54, June 28, 1965; 79 Stat. 195). The monument was expanded by an Act of Congress on June 27, 1990 to become Pecos National Historical Park, composed of Pecos National Monument and the Forked Lightning Ranch. The Act recognizes the "...multi-theme history, including the cultural interaction among diverse groups of people of the Pecos area and its gateway role between the Great Plains and the Rio Grande valley ... and to provide for the preservation and interpretation of the cultural and national resources of the Forked Lightning Ranch" (PL 101-313, June 27, 1990; 104 Stat. 279).

Description of Park and Setting

Pecos National Historical Park is 28 miles southeast of Santa Fe, New Mexico. Most of the park lies in the upper Pecos River Valley. This narrow valley is bordered by the 13,000-foot Sangre de Cristo Mountains to the north, the rugged hills of the Tecolote Range to the east, and the steep Glorieta Mesa to the west. The 8,200-foot Glorieta Mesa escarpment is the most prominent geographic feature in the area, rising abruptly above the 7,000-foot valley floor. The upper Pecos River Basin is part of a broad pass through the Sangre de Cristo Mountains. This passageway skirts the south end of the Tecolote Range and extends up the Pecos Valley before traversing the gentle slopes of Glorieta Pass west to the Apache Canyon area and the Rio Grande Valley.

In 1990, upon acquiring the Fork Lightning Ranch (FLR) at PECO, the NPS became the manager of ~ 3 miles of the lower Pecos River and the lower portion of Glorieta Creek. The Pecos River flows south from the Pecos Wilderness in the southern Sangre de Cristo Mountains of northern New Mexico, bisecting the park. Glorieta Creek enters the park from the northwest to join the Pecos River within PECO boundaries (Figure 1). The Pecos River is characterized as medium to low gradient stream with a pool-riffle structure formed within a largely alluvial valley typical of a lower elevation, transition zone stream, though areas of exposed bedrock laterally constrain the river in some places. The river substrate is primarily cobble and gravel. The vegetation of the surrounding watershed is dominated by one-seed juniper (*Juniperus monosperma*) and piñon (*Pinus edulis*). Broadleaf cottonwoods (*Populus deltoides*) and willows (*Salix* spp.) are the dominant vegetation comprising the bank-side riparian vegetation (Gage and Cooper 2011).

Since acquisition of FLR, the river reach has been managed to promote natural resource values consistent with a wild, natural, and largely pristine river system. Other than a reduction in summer streamflow due to upstream water diversions, and changes in the fish community composition as a consequence of trout stocking associated with recreational fishing (introduction of non-native brown trout and rainbow trout, and loss of native Rio Grande cutthroat trout (*Oncorhynchus clarki virginialis*) and flathead chub (*Platogobia gracilis*)), this reach of the Pecos River within PECO is perhaps the best example in northern New Mexico of a stream reach representative how it would have appeared before European settlement.

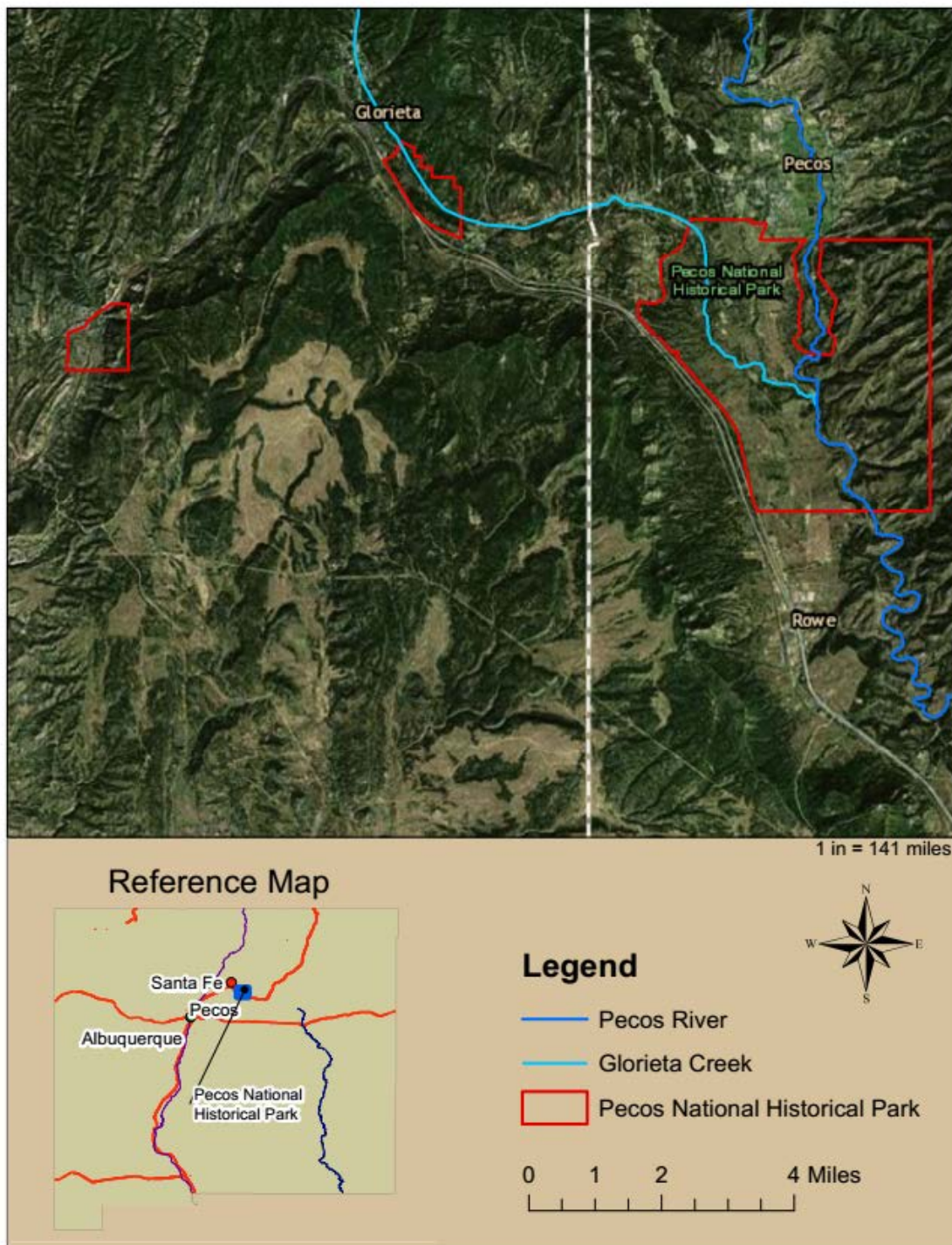


Figure 1: Map of Pecos National Historical Park, Santa Fe and San Miguel Counties, New Mexico

NPS Mission and Management Policies

NPS Mission

“The National Park Service preserves unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world”

Natural Resource Management Mission (Chapter 4, NPS Management Policies 2006): Preserving park natural resources is one of the core responsibilities of NPS managers. The NPS has distilled this responsibility into a separate natural resources mission statement: “The National Park Service will preserve and protect the natural resources, processes, systems, and values of units of the national park system in an unimpaired condition to perpetuate their inherent integrity and to provide present and future generations with the opportunity to enjoy them.”

NPS Management of Fish Resources

The fundamental purpose of the national park system, established by the National Park Service Organic Act (1916) and reaffirmed by the General Authorities Act (1970 as amended), begins with a mandate to conserve park resources and values for the benefit and inspiration of all people of the United States, and to regulate their use accordingly.

Native fish have biological, recreational and cultural heritage values and play critical roles in maintaining the ecological health of NPS area ecosystems. Fish are unique in the NPS; they are the only animal that may be caught and harvested in parks by general regulation (36CFR2.3). Fishing, and the management of fish resources (including non-native fish) to provide fishing opportunities, is an activity that has the potential to alter the abundance, size and age structure, and behavior of native fish populations with consequences for ecosystem function. The National Park Service allows fishing as a means of providing for public enjoyment and customary and traditional use, but must ensure that it is managed, and regulated in a manner that avoids unacceptable impacts and impairment of park resources.

Where fishing is allowed it is recognized that there will be impacts to park resources. However, park Superintendents are responsible for ensuring that the impacts associated with fishing are not in conflict with the fundamental purpose of conserving native species and functioning ecosystems. As NPS Management Policies make clear, parks must determine when and where fishing is an appropriate use, determine the nature of that use, and develop monitoring and assessment tools, standards, indicators to determine if fishing is causing impacts that may lead to impairment. It is the responsibility of parks to establish the level at which the impacts resulting from fishing become unacceptable, and if evidence indicates that such impacts are occurring, to take all measures within NPS authority to ensure that the threshold is not reached.

Any apparent conflict is resolved by adherence to the underlying principles that guide the development of all NPS management policies. In cases of uncertainty as to the impacts of activities on park natural resources, park managers must ensure that conservation will be

predominant when there is a potential conflict between the protection of resources and their use. In doing so, a park must “employ a tone that leaves no room for misunderstanding the National Park Service’s commitment to the public’s appropriate use and enjoyment, including education and interpretation, of park resources, while preventing unacceptable impacts.”

Important Note: Fishing management in this context is concerned not only with the direct impacts of fishing on native fish populations, but also the impacts of past management activities on native species (e.g., stocking of non-native sports fish and the subsequent impacts to native fish).

NPS Natural Resource Management Policies

To achieve the NPS mission, the NPS creates laws to regulate the management and use of park resources, including fish and fishing. However, it is the NPS management policies that provide guidance on the appropriate standards and thresholds for protection. Such policies form the basis of park regulations that protect resources consistent with the NPS mission, and ensure that all parks are managed and regulated in a consistent and proper manner in pursuit of NPS goals. Adherence to policy is mandatory for all NPS employees, unless specifically waived or modified by the Secretary, the Assistant Secretary [of Department of Interior], or the Director [of the NPS].

NPS policies that pertain to fishing are located throughout the current version of NPS Management Policies (Appendix 1). Superintendents have the primary responsibility to ensure that fishing in parks is managed consistent with management policies and to direct their staffs to enforce federal fishing regulations, including adopted state regulations, and to review and amend regulations as necessary to fulfill the NPS mission and comply with the Organic Act.

The following is an abridged summary of the important management policies relevant to the management and regulation of fish and fishing in parks, including PECO. Apart from a few words used to preserve the context, the text is quoted directly from the NPS Management Policies. The most recent, complete service-wide policies may be found at:

<http://www.nps.gov/policy/mp/policies.html>

The Laws Generally Governing Park Management: (M.P. 1.4.1) The most important statutory directive for the National Park Service is provided by interrelated provisions of the [NPS Organic Act of 1916](#) and the [NPS General Authorities Act of 1970](#), including amendments to the latter law enacted in 1978

The key management-related provision of the Organic Act is as follows:

[The National Park Service] shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified ... by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations. ([16 USC 1](#))

The NPS Obligation to Conserve and Provide for Enjoyment of Park Resources and Values: (M.P. 1.4.3). The fundamental purpose of all parks also includes providing for the enjoyment of park resources and values by the people of the United States. Congress, recognizing that the enjoyment by future generations of the national parks can be ensured only if the superb quality of park resources and values is left unimpaired, has provided that when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant.

What Constitutes Impairment of Park Resources and Values: (M.P. 1.4.5). The impairment that is prohibited by the [Organic Act](#) and the [General Authorities Act](#) is an impact that, in the professional judgment of the responsible

NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values

Unacceptable Impacts: The impact threshold at which impairment occurs is not always readily apparent. Therefore, the Service will apply a standard that offers greater assurance that impairment will not occur. The Service will do this by avoiding impacts that it determines to be unacceptable. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment. (M.P. 1.4.7.1)

Management of Native Animals (Fish): The NPS will maintain as parts of the natural ecosystems of parks, all fishes and other aquatic species native to park ecosystems by (1) preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats and behaviors of native fish populations and the communities and ecosystems where they occur; and (2) minimizing human impacts on native fish populations, communities and ecosystems, and the processes that sustain them (NPS MP 4.4.1.).

Management of Threatened or Endangered Plants and Animals (M.P. 4.4.2.3): The Service will undertake active management programs to inventory, monitor, restore, and maintain listed species' habitats; control detrimental nonnative species; manage detrimental visitor access; and reestablish extirpated populations as necessary to maintain the species and the habitats upon which they depend;

The National Park Service will inventory, monitor, and manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible. In addition, the Service will inventory other native species that are of special management concern to parks (such as rare, declining, sensitive, or unique species and their habitats) and will manage them to maintain their natural distribution and abundance.

Harvest of Plants and Animals by the Public (M.P. 4.4.3). Habitat manipulation for harvested species..... will not include the artificial manipulation of habitat to increase the numbers of a harvested species above its natural range in population levels.

Management of Non-Native (Exotic) Species: (M.P. 4.4.4). Exotic [fish] species will not be allowed to displace native [fish] or other aquatic native species, if displacement can be prevented. All exotic fish species that are not maintained to meet an identified park purpose will be managed – up to and including eradication- if control is prudent and feasible (M.P. 4.4.4.2).

The NPS will manage exotic (nonnative or invasive) species by eradicating their populations if 1) control is prudent and feasible, and 2) the exotic species interferes with natural processes and the perpetuation of natural features, native species, or natural habitats (M.P. 4.4.4.2).

The NPS will manage fishing activities (see MP 8.2.2.5) and may encourage the intensive harvesting of exotic fish species in certain situations when needed to meet park management objectives (NPS MP 4.4.3).

Watershed and Stream Processes: (M.P. 4.6.6) The NPS will also manage watersheds as complete hydrologic systems and minimize human-caused disturbances..... The NPS will protect watersheds and stream features primarily by avoiding impacts on watershed and riparian vegetation and by allowing natural fluvial processes to proceed unimpeded (NPS 2006).

Chapter 8: Use of the Parks

The Service will focus special attention on visitor enjoyment of the parks while recognizing that the NPS mission is to conserve unimpaired each park's natural and cultural resources and values for the enjoyment, education, and inspiration of present and future generations.

Fishing (M.P. 8.2.2.5)

Recreational fishing will be allowed in parks when it is authorized or not specifically prohibited by federal law provided that it has been determined to be an appropriate use per section 8.1 of these policies. When fishing is allowed, it will be conducted in accordance with applicable federal laws and treaty rights, and non-conflicting state laws and regulations. The Service will manage fishing activities to achieve management objectives. Before the Service issues regulations or other restrictions, representatives of appropriate tribes and state and federal agencies will be consulted to ensure that all available scientific data are considered in the decision-making process. Any such

regulations or other restrictions will be developed with public involvement and in consultation with fish and wildlife management agencies as appropriate, consistent with departmental policy at 43 CFR Part 24, and as described in section 4.4.3

PECO Natural Resource Planning Priorities

The PECO Foundation Document provides a foundation for future planning and management decisions, and is the park's most important planning document. The core components include a description of the park's purpose, significance, fundamental resources and values, other important resources and values, and interpretive themes. The foundation document also includes special mandates and administrative commitments, an assessment of planning and data needs identifies planning issues, planning products to be developed, and the associated studies and data required for park planning.

The "Natural Resources of the Upper Pecos Watershed" have been identified as a "fundamental" natural resource within PECO. Fundamental resources and values (FRVs) are those features that are truly significant about a park and have been determined to warrant primary consideration during planning and management. They are considered a resource of such importance that if they are allowed to deteriorate, the park purpose and/or significance could be jeopardized. Through this process, the following management and planning opportunities and needs have been identified, all of which are consistent with and will be addressed through implementation of the actions proposed in the plan.

Specifically, the PECO Foundation Plan has identified the wild life (including native fish) of the park as a fundamental value; "Wildlife: Glorieta Creek and Pecos River riparian areas contain the highest biodiversity found in the park and serve as vital corridors for species migration and dispersal. Native cutthroat trout have not been in the system for decades; other aquatic species are slowly recovering from recent flood (2013)".

NPS Regulation of Fishing

Fishing is allowed in all parks as a traditional activity unless specifically prohibited. Unless otherwise provided in law, fishing in national parks is managed and regulated by the National Park Service under the authority provided in the NPS Organic Act. Regulations within NPS units strive to permit reasonable use and enjoyment of fish resources without compromising the health and biological diversity of native species and aquatic ecosystems. Areas inside park boundaries may be closed to fishing to protect spawning and nursery areas, threatened and endangered fish species or other resources that are at risk due to habitat loss or over-fishing.

What is regulated?

By regulation (36CFR1), fish are defined as "any member of the subclasses Agnatha, Chondrichthyes, or Osteichthyes, or any mollusk or crustacean in salt water". Therefore, fishing regulations cover all fin-fish in both fresh and salt water. Other taxa (e.g. horseshoe crabs), and freshwater mollusks and crustaceans (freshwater crayfish) are considered "wildlife", and cannot be fished for, or harvested unless specifically allowed by regulations addressing wildlife.

Fishing Regulations

Fishing in national parks is conducted in accordance with the **NPS Service-wide general fishing regulations**, published in the Code of Federal Regulations at 36 CFR §2.3. The NPS has determined that these regulations are widely applicable and provide for the proper use of fisheries resources in all NPS units. Unless otherwise provided for in statute (e.g. law that created the park), or subsequently modified by the park, the general fishing regulations apply in all park waters, at all times, unless modified by special park regulations.

State regulations are adopted as federal regulations under 36 CFR § 2.3(a) to the extent that they do not conflict with the NPS general regulations. Where there is a conflict between an adopted state regulation and the general federal regulations, the federal regulation applies. In order to reduce the opportunity for conflicts between federal and state regulations, NPS policy encourages NPS units to adopt fishing regulations that are at least, or more restrictive than state regulations.

For many parks, the federally adopted state regulations are the only ones that an angler needs to be aware of. However, 36 C.F.R. §§ 1.2, and 1.5 provides the authority for parks to further modify the general fishing regulations to meet park specific management goals or when the NPS general fishing regulations and state regulations, by themselves, are inadequate to protect park fish resources consistent with the NPS conservation mission. Permanent “**Special Park Regulations**” can be found in the Code of Federal Regulations at 36 CFR §7 and 36 CFR §13 (Alaska).

Sometimes, in order to protect important resources, it is necessary for a park to adopt temporary or emergency fishing regulations. These are published in the **Superintendents Compendium**; the annual compilation of designations, closures, permit requirements, and other restrictions made by the Superintendent, in addition to what is contained in the NPS General Fishing Regulations (36CFR§2.3) and Park Special Regulations (36 CFR §7 and §13). Regulations that may be changed from year to year to better protect fish resources, may also be published here.

Anglers should be aware that when parks state that “state regulations apply”, it is important to remember that the state regulations are adopted as federal regulations, and only apply to the extent that they do not conflict with the NPS Service-wide General Fishing Regulations, or are amended by Park Special Regulations or the Superintendents Compendium.

Cooperation with States and Others

Sport-fishing regulations in NPS units are generally established in consultation with (but not deference to) the state(s) within which a park occurs. Although park managers are ultimately responsible for managing fish and aquatic ecosystems, and regulating their use within their boundaries, Department of the Interior regulations (43 CFR § 24) encourage the development of cooperative agreements with states and requires the preparation of fish and wildlife management plans in cooperation with state fish and wildlife agencies and other Federal agencies when appropriate. (43 CFR § 24.4). Memoranda of Understanding (MOU) and joint fishery management plans are encouraged for parks with fishery resources that are in common or continuous with those managed by states or other entities. These documents should be used to articulate goals and objectives and define management and regulatory responsibilities.

Park staff are encouraged to work with local communities and other user groups in the management of fisheries through cooperative conservation principles found in NPS Management Policies (2006). Such coordination is identified as a best practice in Director's Order #75A: Civic Engagement and Public Involvement (See Management Policies § 1.6-1.8) and may be required as part of the public participation process involved in compliance with NEPA.

While 43 CFR § 24.6 encourages cooperation and communication with state agencies, "It is not intended to bind the National Park Service to the recommendations of the State or lessen the authority or responsibility of the Superintendents to ensure that management actions are consistent with public safety and enjoyment, sound resource management principles, and are compatible with the primary objectives for which the park area is established" (48 F.R. 30252). Accordingly, unless otherwise provided for in statute, the NPS always has the responsibility to ensure that park fisheries and fishing resources are managed in a manner that is consistent with the NPS mission. However, it is always desirable to work cooperatively with the State, to reach mutually agreeable solutions, consistent with NPS statutory authority, regulation and policy.

Sometimes, the mission and vision of the NPS and that of the States' are difficult to align. However, while the New Mexico has an economic and recreational interest in furthering fishing opportunities, both parties have identified the Rio Grande chub as a species of considerable conservation need. Consequently there appears to be a management direction where the NPS can partner with the state on complimentary goals that protect the native RGC while providing increased opportunities for recreational fishing within PECO.

Historic Pecos River Fish Community

There is little specific documentation of the historical Pecos River fish community within PECO. However, historical accounts, and past collections in the area suggest that it contained both cold-water, headwater species ((Rio Grande cutthroat trout (RGCT; *Oncorhynchus clarki virginalis*), longnose dace (*Rhinichthys cataractae*)), and cool/warm water, lower elevation species (dominated by minnow and sucker species including the Rio Grande chub (RGC; *Gila pandora*), white sucker (*Catostomus commersonii*), fathead minnow (*Pimephales promelas*), and flathead chub (*Platygobio gracilis*) indicative of the mid-elevation, transition zone between the headwater and plains stream environments (see Appendix II; Sublette et al., 1990).

The Pecos River fish community has been altered by the cumulative effects of water diversion; habitat fragmentation and blockage of upstream movement; river channelization, straightening and relocation; watershed degradation associated with historical logging, grazing and mining; and the hybridization, competition and predation of native species resulting from introduction of non-native species (Rees et al, 2005). While it is difficult to know for certain, it is likely that some rarer native species that may have been historically present in this reach have been extirpated and the river is now largely comprised of the few remaining common native species (RGC, longnose dace, white sucker) and non-native brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*). The non-native trout were introduced in the late 1800s to augment the dwindling native trout fishery that had been severely over-fished by commercial fishermen supporting the nearby Terrero Mine, and other recreational fishermen.

Perhaps the only species that would have been common in PECO, and has not been found in recent fish surveys would be the flathead chub. The Pecos strain of the Rio Grande cutthroat trout; the native trout of the Pecos River, has been extirpated from the mainstem of the Pecos River for many decades, and is now restricted to a few isolated tributary streams, mostly above natural barriers to non-native trout invasion, in the headwaters of the Pecos River.

Rio Grande Chub Description

The RGC is a medium sized minnow (Cyprinidae), with a maximum size of ~250 mm (10 inches). The fish inhabits pools and runs of small headwater and mid-order, cool-water, lower gradient, riffle-pool streams, typical of the transition between headwater and lowland streams. The RGC is typically counter-shaded; dark olive dorsally, light silver ventrally, with two darker lateral stripes, and may display orange/red ventral coloration during spawning. The species is a midwater carnivore, feeding on aquatic insects and juvenile fish, and so utilizes habitats and foods that are also used by native Rio Grande cutthroat trout in the lower reaches of the rivers in which they co-occur. Lotic populations of RGC spawn in early summer in riffle habitats without building nests. Juvenile chubs are thought to prefer edge habitats and cover provided by overhanging banks.



Figure 2. Photo by Jennifer Macke, 2010, Pajarito Environmental Education Center, Los Alamos, NM (PEEC).

Current status of Rio Grande chub within PECO, and relationship to brown trout

The RGC is considered native to the mainstem and all tributaries of the Rio Grande and Pecos River basins in New Mexico and Colorado, and the San Luis closed basin in southern Colorado. It is estimated that the chubs' distribution is now less than 25% of its historic range and it is uncommon or declining in much of its remaining range, although some reaches still possess healthy populations of chub. Due to declining range and threats to its habitat, the Rio Grande chub has been identified as in need of special conservation by both state and federal entities.

With the stocking of non-native brown trout in the late 1800's to supplement declining native trout populations, the native Rio Grande cutthroat trout has now been replaced with non-native brown and rainbow trout throughout much of its range, including the Pecos River within PECO. The ability of brown trout to become very large, aggressive predators, and to thrive in warmer waters of the transition zone, indicates that brown trout are a threat to chub populations that formerly thrived as the dominant mid-water fish. While the Rio Grande chub still persists within PECO, predation by non-native brown trout has been cited as one of the primary reasons for the extirpation of chub populations in many reaches of river within their historic range, and continues to be a severe threat facing the remaining populations (Rees et al, 2005).

Conservation Status of RGC

State of New Mexico: The New Mexico State Wildlife Action Plan (SWAP) identifies RGC as a Vulnerable (V), Species of Greatest Conservation Need (SGCN), and a species of Immediate Conservation Priority (I). Threats identified include; "Natural system modification, Invasive and problematic species" [including non-native, brown trout]. Factors influencing SGCN status include; "Habitat deterioration, non-native species, water diversion". Monitoring recommendations include conducting monitoring on an "opportunistic" basis.

"[The] State Wildlife Action Plan is not a policy statement of, and is not a rule or regulation adopted by the New Mexico State Game Commission and shall not be construed as such. [The] State Wildlife Action Plan is part of a grant application for federal funds and is merely an assessment prepared in that regard, conducted under the New Mexico State Game Commission's authority to conduct studies of programs for the management of endangered and nongame species of wildlife and to apply for and accept any state, federal or private funds, grants or donation from any source for game and fish programs and projects. [The] SWAP does not have the force of law, rule or regulation."

The revised and updated SWAP serves as "a guide for the Department and may help land management agencies, local governments, non-governmental organizations, private sector project proponents, and interested publics when identifying needs and opportunities to conserve New Mexico's Wildlife".

Federal

US Forest Service: The RGC is considered a sensitive species within the USDA Forest Service (USFS), Rocky Mountain Region (Region 2) and is on the R2 Regional Forester's Sensitive Species list. The Forest Service defines a "sensitive species" as one for which "population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density and habitat capability that would reduce a species' existing distribution."

Bureau of Land Management: The BLM considers the RGC to be a sensitive species in Colorado, one that has "recently undergone, is undergoing, or is predicted to undergo a downward trend such that the viability of the species or a distinct population segment of the species is at risk across all or a significant portion of the species range."

The NatureServe Global (G) and State (S) Conservation Status Rank List identifies RGC as G3; Vulnerable, at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors, and;

S3; Vulnerable, at moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

Colorado: Within its Colorado distribution, Colorado Parks and Wildlife, State Wildlife Action Plan, considers the RGC as a Tier 1, Species of Greatest Conservation Need (SGCN); "species which are truly of highest conservation priority in the state". The Colorado Natural Heritage Program had identified RGC as an S1 species; a species that is "critically imperiled" and "at very high risk of extinction or elimination due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors."

Texas: Within the State of Texas, Texas Parks and Wildlife Department considers the RGC to be threatened; "those species which the [TPWD] Commission has determined are likely to become endangered in the future." Texas has also adopted the conservation status system established by Nature Serve, which identifies the RGC as S1 in TX; "Critically Imperiled, at very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors."

Rio Grande Chub Conservation Agreement

In June 2018 a Conservation Agreement was signed to expedite implementation of conservation measures for Rio Grande Chub (*Gila pandora*; hereafter RGC) and Rio Grande Sucker (*Catostomus plebeius*; hereafter RGS) in Colorado and New Mexico (and other states or nations that may elect to participate), as a collaborative and cooperative effort among state and federal agencies, tribal entities, and other stakeholders. Implementation of this Agreement will reduce or eliminate threats that may warrant RGC and RGS being listed as special status species by state and federal agencies or listed under the Endangered Species Act (ESA) of 1973, as amended. The Agreement is designed to provide a framework for the long-term conservation of RGC and

RGS. Signatories to this agreement include several federal and state agencies and federally recognized Native American tribes in several southwestern states.

Petition to List RGC as Threatened Under the Endangered Species Act

In September, 2013, Wild Earth Guardians (WEG) submitted a petition to the U.S. Secretary of the Interior, acting through the U. S. Fish and Wildlife Service (USFWS) to list the Rio Grande chub as “threatened” under the federal Endangered Species Act (Wild Earth Guardians, 2013; WEG; <https://www.regulations.gov/document?D=FWS-R2-ES-2016-0019-0003>). The petition cited habitat loss within a significant portion of its range, predation from several fish species including non-native brown trout, the inadequacy of existing regulatory mechanisms to protect the chub, and climate change, as the primary threats to the species. WEG also requested that USFWS designate critical habitat throughout the species’ historical range.

The initial 90-day finding regarding the petition was due at the end of December 2013, but the USFWS is prioritizing review of other species on the candidate list pursuant to a settlement agreement previously reached with Guardians. Under the terms of the settlement, WEG agreed not sue on missed deadlines until the settlement ran its course in Sept. 2016.

On March 15, 2016, the USFWS announced its initial findings on the petition to list the RGC, finding that there was “substantial scientific or commercial information indicating that the petitioned actions may be warranted”. Based upon a review of available scientific and commercial data and other information regarding these species, it is the intention of USFWS to issue a 12-month finding on the petitions, which will address whether the petitioned action is warranted, as provided in section 4(b)(3)(B) of the Act. To date, no final action has been taken.

Management of Rio Grande chub in New Mexico

Currently, there is no active management of the species in NM. Additionally, the RGC has no regulatory protection within New Mexico and is considered a non-game fish open to unlimited harvest, by whatever means that are not specifically prohibited by general state fishing regulations. However, Propst (1999) has stated that in the absence of both state or federal protection, that the “RGC may warrant state protection”.

Fish Community Status and Trends at PECO

The New Mexico Department of Game and Fish (NMGF) has conducted fish community monitoring within PECO since 1992, shortly after the FLR was acquired by the NPS. Monitoring has occurred in 1992, 2004, 2007, 2010, 2013 and 2014. Six species of fish have been caught within PECO during this time; Rio Grande chub, longnose dace, white sucker, fathead minnow, brown trout, and rainbow trout (*Oncorhynchus mykiss*). The first four are native to the Pecos River within PECO.

A May 7, 1993 letter from NMGF to PECO indicates that four species of fish were caught during the initial, largely anecdotal, 1992 survey; brown trout, white sucker, longnose dace, and fathead minnow. The letter notes that 52 white suckers were caught and references a spreadsheet summarizing fish captures. However, the spreadsheet appears unavailable at this time. What is of note is the apparent absence of RGC within PECO in 1992.

Pittenger (personal communication) reported the occurrence of five species in Glorieta Creek in 1997, including the presence of RGC, and brown trout.

A more comprehensive and systematic survey effort was instituted in 2004 that involved conducting population estimates for three or four sites within PECO, using multiple pass, removal methods (2004, 2007, 2010, 2013, 2014). Capture of fishes during monitoring is summarized below (Table 1).

The status and trends of the PECO fish community were summarized by NMGF (Blakney, 2015, and references therein). The report showed that prior to the June 2013 Tres Lagunas Fire, the Pecos River within PECO was numerically dominated by non-native trout which comprised the majority of the biomass in the reach (~60%). After the fire, the situation reversed as native trout were almost completely eliminated from the reach. NMGF stated that “In 2014, Rio Grande Chub were the most common species observed and made up nearly 69% of the total catch (Table 1). Similarly, Rio Grande Chub was the most common species encountered last year [2013] and represented 58.9% of the total catch. This species abundance has increased significantly since 2010 where it only represented 6% of the total catch.” (Table 1; Figure 3). Released from predation and competition from brown trout, the abundance of the native fish community also increased 40% from 2013 to 2014.

	2004	2007	2010	2013	2014
Rio Grande Chub	51 (12.7)	110 (11.0)	23 (6.1)	359 (59.0)	727 (68.8)
Longnose Dace	40 (10.0)	143 (14.3)	62 (16.5)	141 (23.2)	210 (19.7)
White Sucker	83 (20.7)	137 (13.7)	67 (17.8)	99 (16.3)	90 (8.5)
Brown Trout	227 (56.6)	594 (59.5)	214 (56.9)	1 (0.2)	16 (1.5)
Rainbow Trout	2 (0.5)	14 (14.0)	10 (2.7)		13 (1.2)
Fathead Minnow				9 (1.5)	1 (0.01)
TOTAL	403	998	376	609	1057
Native Fish	174 (45.4)	390 (39.1)	152 (40.4)	608 (99.8)	1028 (97.2)
Non-Native Trout	229 (56.6)	608 (60.9)	224 (59.6)	1 (0.2)	29 (2.8)

Table 1. Summary of fish community data collected within PECO, by year. Information in parentheses is the percentage of the total number of fish caught represented by each species, or representing native and non-native fish.

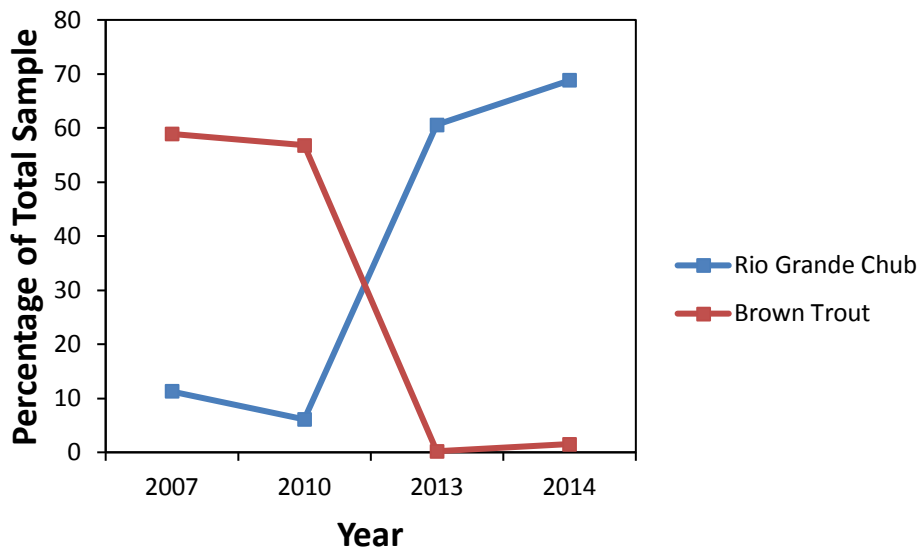


Figure 3. Top predator trends (percentage of total sample) for Brown Trout and Rio Grande Chub at PNHP, 2007-2014. Flood flows originating from the area of the Tres Lagunas Fire eliminated all trout just prior to the 2013 sampling event (from Blakney, 2015).

Blakney further summarized his findings, which are provided in full below, and summarized the management challenges regarding simultaneously managing for a native fish community and a non-native recreational fishery;

“The increase in the abundance of Rio Grande Chub at the PNHP seems to parallel the decline in abundance of Brown Trout (Fig. 2). Both species are mid-water carnivores that feed on aquatic insects and small fish (Sublette et al. 1990). Thus it is possible they compete directly for food. Brown Trout are highly piscivorous especially as adults and their presence within the native range of the Rio Grande Chub has been suggested as a reason for the decline or extirpation of the species in some streams through predation and/or competition (Rees et al. 2005). In the Jemez River, downstream of the town of Jemez Springs Rio Grande Chub make up a significant portion of the fish community and Brown Trout are absent from this reach, likely to due to above optimal summer water temperatures . As Brown Trout become more abundant in an upstream direction, chubs become less abundant. This could be due to predation/competition with Brown Trout and/or due to ecological changes in stream conditions. Bestgen et al. 2003, noted Rio Grande Chub were found in streams up to 20 °C and that the species was absent from warmer lotic environments. The authors also noted that chub became more abundant in a downstream direction as waters warmed and Brown Trout became less abundant. Thus the upstream abundance of chub may be limited by Brown Trout predation and competition, even though these area may be more suitable to the species life history requirements (Bestgen et al. 2003). It is possible that with climate change and the associated warming of streams, the section of the Pecos River at the PNHP may become less hospitable to trout and become more favorable to Rio Grande Chub and other non-game fish species. This will however depend on the species ability to tolerate warmer water temperatures. At this time little is known about the thermal tolerance of the species, other than the observation from the study cited above.....

The Rio Grande Chub was petitioned for listing under the Endangered Species Act in 2013. The authors of the petition cited numerous reasons for listing the species including a significant reduction in the species’ native range, widespread habitat degradation and presence of non-native predators as well inadequate regulatory mechanisms to protect the species and its habitats (WildEarth Guardians 2013). The National Park Service’s General Principles for Managing Biological Resources states the agency will maintain as parts of the natural ecosystems of parks all plants and animals native to park ecosystems. This includes the protection of rare, threatened and endangered species (NPS MP 2006). Continued monitoring of the fish community at the Park is recommended. Depending on landscape scale ecological processes related to snowpack, drought, and fire it is unclear if conditions will continue to favor Brown Trout populations that have lived in this portion of the river. It is likely that if Brown Trout return to post-fire abundance, the abundance of Rio Grande Chub will decline (Fig. 3). It is possible that trends towards warmer stream temperatures might naturally exclude Brown Trout, but this shift in community composition is difficult to predict. ***This presents a unique challenge for management of the Pecos River within PNHP: how do you manage a recreational fishery for a non-game [the author meant non-native] sportfish while also trying to conserve populations of Rio Grande Chub and other native non-game fish?*** (Emphasis added).

The superintendent of the PHNP, Karl Cordova, is especially interested [in] management that befits native species and natural ecosystem processes. There has been discussion about the possibility of reintroducing Rio Grande Cutthroat Trout (RGCT) into the Park, but it is unlikely that this population could be self-sustaining due [to] higher than optimal thermal conditions, the presence of non-native competitor/predators and the lack of proximal spawning habitat. A winter put-take RGCT fishery could be established if NMDGF was to begin production of the Pecos

strain of RGCT in a hatchery setting. At this time, only the Rio Grande strain of RGCT is being propagated.”

Predicted Future Trends in Fish Community

The Pecos River fish community within PECO was last surveyed in 2014. At that time, the trout population had increased slightly from that observed in 2013, but was still greatly reduced compared to its abundance prior to the 2013 Tres Lagunas Fire (Table 1). However, in response to the reduction in brown trout, the Rio Grande chub, and other members of the native fish community had increased by more than an order of magnitude ($> \times 10$). It is unknown what the exact composition of the fish community is within PECO at this time (February 2018). However, it is expected that the trout population is increasing rapidly as water quality and trout spawning conditions improve, and is now likely dominated by strong year classes of younger age fish (1-3 year olds).

It also likely that native fish abundance is now relatively high, and perhaps increasing still, as RGC, white sucker and longnose dace respond positively to the reduction in predation and competition due to the decrease in trout abundance. It is anticipated that the trout population will continue to increase in the future and that it may be expected to reach its pre-fire abundance and age structure within ~7 years (Blakney, 2015). In the future, without management intervention, it is predicted that the native fish community will decrease in response to increased predation and competition from non-native trout, likely decreasing to its low abundance of 2010.

Management and Regulation of Fishing at PECO

Upon acquisition of Forked Lightning Ranch the Park became responsible for the management of approximately 3 miles of the Pecos River, and the lower portion of Glorieta Creek. Accordingly, the NPS now has the primary authority to manage the fish community, and regulate fishing in a manner that is consistent with the key management related provision of the NPS Organic Act, and NPS policies.

Almost immediately, there was considerable interest from local groups to open the Pecos River within PECO to fishing, and specifically to create a catch and release, limited access fishing opportunity that would protect the high quality brown trout fishery that had developed under the protection afforded when the ranch was in private ownership. In Fall 2008, the park implemented a permitted, “pilot” recreational, catch and release fishing program with the goal of evaluating the impacts of a catch-and-release fishing program on fish resources within the Park (Medley 2015), and issued temporary fishing regulations (Appendix III) under the authority of the Superintendents Compendium (36CFR1.5, 1.6, 1.7). The pilot program was never meant to be permanent, but to provide information, along with fish community and habitat monitoring data, to evaluate the pilot program, with which the park could use to inform a future, more permanent fishing program.

A September 23, 2008 blogspot announcement on the High Desert Angler (Santa Fe, NM fishing shop) website reported: “The Upper Pecos Watershed Association and the Truchas Chapter [of

Trout Unlimited] helped open the Forked Lightning Ranch unit of the Pecos National Historical Park to fishing this autumn. This pilot program will begin on September 4th and runs through November 3rd. This program is somewhat modeled after the one on Valles Caldera. The main difference is that there are only three fishing beats. Each beat is roughly one mile long and up to three anglers are allowed on each beat. One is only available on a first come first served basis. The other two can be reserved by fax or mail. Currently they do not take reservations over the internet. The FAX number is 505-757-7207. Their mailing address is Fishing Program/ Pecos NHP, PO Box 418, Pecos NM 87522.”

(http://highdesertanglerannouncements.blogspot.com/2008_09_01_archive.html).

The pilot Fishing Program was instituted in 2008. It was implemented continuously until Fall 2013 when it was suspended in response to safety concerns related to the occurrence of high stream flows resulting from the 2013 Tres Lagunas Fire. It remained closed during 2014, but was reinstituted in 2015 and has been in effect since.

Evaluation and Impact of the Fishing Program

In the summer of 2013, the Pecos River experienced episodes of increased flows and sediment concentrations in response to the Tres Lagunas Fire in the upper Pecos watershed, that caused significant fish kills. NMGF fish monitoring in 2013 showed that the brown trout population had been almost eliminated, but the native fish community, including the chub population was doing well. In response to safety concerns associated with the fire, the fishing program was suspended in 2013 and 2014, but reinstituted in 2015. This event greatly complicated the evaluation of the fishing program, but did provide an excellent natural experiment that provided valuable information on the impact of non-native trout on the native fish community.

Recreational angling at PECO is currently limited to catch and release angling (artificial flies and lures with barbless hooks) is allowed five days a week (Thursday through Monday). Therefore, there are 45 potential angler-days per week at PECO. There are three short fishing seasons during spring, summer, and autumn. The dates of these seasons are set annually by the Superintendent. For 2018, the seasons will be; Spring: March 8 – April 16; Summer: June 14 – August 6; Fall: September 13 – November 5).

Based on angler data for 2015 and 2016 (compiled by park volunteer, Bruce Herr), fishing pressure was light to moderate. During 2015, it ranged from 26 angler days used of 180 available (14.4%) in spring to 159 used of 450 available (35.3%) in autumn. In 2016, angler use was greatest in summer (168 used of 309 available, 54.4%) and least in spring (103 used of 270 available, 38.1%). Fishing pressure was most often greatest in Beat 1 and always least in Beat 3. Total usage in 2016 (48.8%) was almost twice that of 2015 (27.1%). There were no data on angler success.

The NMDGF report does not address impacts associated with implementation of the fishing program. While the data is sufficient to document gross trends, it was always going to be difficult to detect cause and effect relationships between the pilot fishing program and the fish community.

The most robust experimental design for such studies is a replicated, Before-After-Control-Impact (BACI) experiment. This requires replicated control (where fishing does not occur) and treatment (where the fishing pilot program is implemented) river reaches (usually 3), and temporally replicated data from before and after implementation of the fishing program.

While replicated pre and post-treatment fisheries data exist, the treatment effect (catch and release fishing) is very weak, limiting the ability of the data to discern treatment differences. Prior to the pilot program, the Pecos River had been in private ownership and little fishing and harvest occurred. When the pilot program was implemented, fishing pressure remained low, and harvest was prohibited. Consequently, the “treatment” effect of the pilot fishing program was the impact of low intensity, catch and release fishing on a previously well protected fishery. Given the weak “fishing treatment effect”; the general difficulty in implementing fish studies with sufficient statistical precision to detect weak effects; and the interruption of the study by the 2013 flood, there is little that can be concluded about the effect of the catch and release fishing program on the fish community within PECO, other than it is likely to have had little effect.

Impact of the 2013 Tres Lagunas Fire

While the fish monitoring data were limited in their ability to document the impact of the fishing program, the NMGF monitoring report clearly demonstrated the significant impact of the 2013 Tres Lagunas Fire. Prior to the fire there was a large, non-native brown trout population co-residing with populations of Rio Grande chub, longnose dace and white suckers. This changed in the Fall of 2013, after a high flow event containing high concentrations of ash and sediment essentially eliminated the brown trout population from within the park. The 2013 and 2014 data show that the native Rio Grande chub, longnose dace and white sucker populations fared well. The latest monitoring (Fall 2014) suggests that native fish community within PECO is increasing, likely due to a greatly diminished brown trout population. The report concludes that the increase in native fish is likely due to decreased predation by the brown trout population.

While the native fish populations may respond favorably in the next few years, the trout population will likely recover as the reach becomes repopulated from upstream. Consequently, the impacts associated with the Tres Lagunas Fire should provide an opportunity to observe the response of the native fish community to loss, and subsequent recovery, of the non-native brown trout population, unless a non-native control program is initiated. Continuation of annual monitoring is recommended to better understand the relationships between flows, habitat, the abundance of non-native predatory brown trout and the recent recovery of the native fish community.

II. The Fish and Fishing Management Strategy

The primary goal of the Native Fish and Fishing Management Strategy is to conserve the native fish community within PECO. The petition to list the Rio Grande chub is an indication that the species may be in trouble throughout its range, and should be a priority for NPS management action. Protection of this species will also afford benefits to other native fish species.

The primary threat to the native fish community is the presence of a large population of predatory, non-native trout. The most efficient vehicle for addressing the threat is aligning the regulations of the PECO recreational fishing program with the NPS goal of protecting native fish, by allowing increased harvest of brown and rainbow trout.

If this strategy is successful in reducing non-native trout numbers, this action alone will address the primary threat, and go a long way in securing the native fish community within PECO. Should the fishing program by itself not meet the goal of reducing trout numbers, then an active removal program (through electrofishing) can be employed

Purpose of Management Strategy

The purpose of Fish and Fishing Management Strategy is to align management at PECO with the park's natural resource management goals, the NPS Mission, and NPS Management Policies (NPS 2006). The Strategy identifies the programmatic considerations for preserving and restoring native fishes; removing and/or limiting the impact of non-native fish, and providing appropriate recreational fishing opportunities that support these goals. The use of piscicides is not considered at this time.

Need for Management Strategy

The need for the implementation of a fish and fishing management strategy is driven by PECO's statutory, regulatory and policy responsibilities to manage native fish populations to avoid unacceptable impacts to the resource.

When the pilot fishing program was adopted (2008) there was considerable pressure on PECO to quickly create a public recreational fishing opportunity in the park. A pilot fishing program focusing on preservation of the non-native trout fishery was suggested, likely reflecting the interests of those involved in the conversation, and all agreed, but no consideration was given to the larger NPS mission to conserve all the natural resources of the park including conserving the native fish. With the recognition of the importance of the native Rio Grande chub population within the park, and the continuing USFWS review process to address the petition for listing the fish under the federal Endangered Species Act, managing for other natural resource values other than the non-native trout fishery has taken on a greater importance.

While the Rio Grande chub has been the focus of a federal listing petition, and much discussion, there has not been a formalized, coordinated effort to inventory, monitor, or protect the fish. Consequently, potential threats to the species remain, and no comprehensive, integrated management strategy has been initiated to stabilize and protect the chub population at PECO. Conservation of remaining Rio Grande chub population is critical, and the protection of the population within PECO is considered an urgent park management priority.

More specifically, the need for the Strategy is for PECO:

- to meet its legal obligation to preserve unimpaired the natural resources and systems of the park, and to manage fish and fishing in a manner that protects the at-risk population of Rio Grande chub within the park;
- to manage the larger fish community and fishing consistent with NPS missions, goals, and current NPS management policies to protect native, and at-risk species, and the habitats on which they depend.
- to provide appropriate fishing opportunities that promote conservation of important natural resources, including the at-risk population of Rio Grande chub.

Management Standards and Thresholds to Prevent Unacceptable Impacts

NPS Management Policies make clear that the primary statutory responsibility of the NPS is to leave park resources unimpaired. The impact threshold at which impairment occurs is not always apparent. Therefore the NPS ensures that impairment does not occur by managing to avoid “unacceptable impacts” that may lead to impairment, and identifies management standards and thresholds as benchmarks that must be attained.

With respect to the fish and fishing, and associated aquatic resources at PECO, the following benchmarks have been identified as initial management objectives. These thresholds may be adjusted in the future through an adaptive management process if monitoring results indicate the need.

Native Fish Community

No quantitative threshold has been identified for an unacceptable impact to the native fish community because it is unknown what specifically that might be, or if it can be attained by currently proposed management actions. However, NPS policy is clear that non-native fish that interfere with the natural functioning of the aquatic ecosystem should be removed to the extent prudent, feasible and attainable. Accordingly, the management goal is to remove as many non-native trout as possible, and reduce abundance to the lowest attainable, as rapidly as possible, by whatever management tool is available.

Management Goal: The fish community within PECO shall be dominated by historically occurring native fish species in their natural abundances, diversities, dynamics, distributions, habitats and behaviors.

Unacceptable Impact Threshold: *Introduced non-native trout (brown trout plus rainbow trout) shall not be present at an abundance that prevents the attainment of a fish community dominated by historically occurring native fish species in their natural abundances, diversities, dynamics, distributions, habitats and behaviors.*

Water Quality

The New Mexico Surface Water Quality Bureau (SWQB), under the authority of the New Mexico Water Quality Act, has determined that ‘high quality coldwater aquatic life’ is the highest attainable “designated use” of the Pecos River and Glorieta Creek within the borders of PECO. Specifically, this means that; water temperature cannot not exceed 20°C for more than 4 hours in a 24-hour period on more than three consecutive days, maximum water temperature may not exceed 23°C; pH is within 6.6 to 8.8; specific conductance may not exceed 300 µS/cm; and monthly geometric mean of *E. coli* bacteria shall not exceed 126 cfu/100 mL and single sample shall not exceed 235 cfu/100 mL. In addition, the *Resource Stewardship Strategy* for PECO identifies total phosphorous should not exceed 18µg/L (NPS and Public Lands History Center. 2011).

Under the NPS Inventory and Monitoring Program, surface water quality data, including parameters that define ‘high quality cold-water aquatic life’, of the Pecos River within PECO are seasonally collected from an index reach that extends from the confluence of Glorieta Creek with the Pecos River downstream to the PECO boundary.

Management Goal: Water quality within PECO should meet the SWQB water quality standards for the “high quality cold-water aquatic life designation”.

Unacceptable Impact Threshold: *No single water quality parameter should exceed the SWQB benchmarks in two successive, seasonal sampling events.*

Aquatic Macroinvertebrates

Aquatic macroinvertebrates are an important food source for native fish within PECO. A diverse benthic macroinvertebrate assemblage has been documented in both Glorieta Creek and Pecos River (Jacobi and Jacobi, 1998; Sanders, 2008). Using a variety of physical, anthropogenic, and benthic macroinvertebrate measures, Jacobi et al. (2006) developed a rating system for wadeable New Mexico streams. Based on data collected in October 1996 from a site just above the confluence of Glorieta Creek, the Pecos River within PECO was classified as in ‘intermediate’ condition. But using only benthic macroinvertebrates from the same collection, Jacobi and Jacobi (1998) determined the river was ‘not impaired’ biologically. That determination was made by comparing a suite of indices derived from benthic macroinvertebrate data from the PECO site to those of a reference site upstream of the village of Pecos. The comparison indicated that the indices of the PECO site were 87% of the reference site; the threshold for impairment was determined to be <83%.

Management Goal: The aquatic macroinvertebrate community on the Pecos River within PECO should be representative of a healthy, un-impacted community naturally found within this reach.

Unacceptable Impact Threshold: *The Pecos River macroinvertebrates community within PECO should not be statistically different from that of a reference site, upstream of the town of Pecos.*

Riparian Vegetation

The *Resource Stewardship Strategy* for PECO (2011) provides desired conditions and landscape goals for riparian habitats. Among those relevant to the riparian corridor are absence of exotic plants, trails, vegetation trampling, bank degradation, litter, and human waste. This RSS also calls for eliminating bank erosion or having it under control.

Riparian conditions prior to opening the Pecos River within PECO to recreational fishing were characterized as ‘highly functioning’ and the riparian corridor was subject to ‘relatively few anthropogenic stressors’ (Wagner and Martin. 2011). The authors noted that impacts to the riparian corridor most likely attributable to anglers were associated with increases in soil disturbance and these would be manifested in trails and eroded areas. A condition assessment completed in 2011 rated the Pecos River within PECO as ‘Proper Functioning Condition’ while Glorieta Creek was rated ‘Functional-At Risk’ (Johnson et al. 2011).

Management Goal: Some impacts from angler use are unavoidable. Determination of an unacceptable impact to the riparian corridor attributable to anglers is largely a qualitative assessment, but the threshold would be dependent upon the observation of permanent fishing trails and bare areas at pools and along the river bank, that do not recover from one growing season to the next (i.e. between fishing seasons). The park will need to develop a monitoring program to measure disturbance from anglers and may consider restricting fishing access to specific beats to allow vegetation to recover if necessary.

Unacceptable Impact Threshold: *Bare ground at pool sides and along the river margin should not exceed a magnitude and intensity that does not allow recovery between fishing seasons, that the Superintendent believes constitutes an unacceptable impact.*

Visitor Carrying Capacity (M.P. 8.2.1):

“Visitor carrying capacity is the type and level of visitor use that can be accommodated while sustaining the desired resource and visitor experience conditions in the park. By identifying and staying within carrying capacities, Superintendents can manage park uses that may unacceptably impact the resources and values for which the parks were established (NPS MP 2006)”.

Management Goal: Usually, park managers are concerned about the negative impact of a visitor use (recreational fishing) on a valued park resource (exploited, native fish species). However, at PECO, the park is contemplating the use of recreational fishing as a management tool to remove a non-native gamefish species, with associated positive effects on an unfished, at-risk native species. Therefore, it is desirable to maximize the recreational fishing effort up to the point at which unacceptable impacts happen to other associated resources, for example, the

establishment of fishing trails, or an increased mortality of non-target fish (Rio Grande chub), and set visitor carrying capacity accordingly.

Unacceptable Impact Threshold: *It is proposed that visitor carrying capacity be assessed using a surrogate indicator of use; that used to assess riparian vegetation damage. Accordingly, permanent bare ground of a magnitude and intensity at pool sides and along the river margin that does not recover between fishing seasons, and that the Superintendent believes constitutes an unacceptable impact will be used to track and manage visitor carrying capacity.*

Outline of Proposed Strategy

There are many possible management strategies that can be conceived for the future management of native fish and the fishing program, and countless combinations of fishing regulations that may be used to meet the identified management goals, but ultimately they all involve changing the balance between the differential harvest of non-native trout and the release of native species, mediated through the regulation of non-native fish harvest and the implementation of other tools to reduce non-native trout abundance (targeted electrofishing, harvest days).

The NPS proposes to manage native fish populations in PECO by creating the conditions that sustain a naturally functioning assemblage of native fishes, including an abundant, mixed-age population of Rio Grande chub, in the Pecos River within PECO. The primary impediment to achieving this goal is the presence of predatory, nonnative brown and rainbow trout. An appropriately designed and implemented recreational fishing program is the preferable approach to managing nonnative trout numbers sufficiently so that a viable native fish assemblage is present that meets the standards and thresholds defined in NPS Management Policies. If the initial fishing regulations that allow non-native trout removal by anglers proves inadequate to achieving the management goal, other management tools may be considered.

Fundamentally, the proposed fishing management strategy is very simple; change the management focus of the current recreational fishing program from the protection of a recreational, catch and release, non-native trout fishery, to the protection of the native fish community and control of non-native fish by allowing harvest of non-native trout during recreational fishing.

Accordingly, the strategy contemplates the implementation of a recreational fishing program that will realign its fishing program goals with the NPS Mission and policy mandates, with the following elements:

- Implementation of a recreational fishing program with the goals of increasing a diverse array of fishing opportunities for all, and removing large predatory, non-native trout.
- Modification of the current pilot fishing program, and the temporary regulations governing its use promulgated under the authority of the Superintendent Compendium (36CFR1.5), to allow harvest of brown trout during recreational fishing.
- Implementation of an annual fish community monitoring program

- Implementation of an adaptive, non-native fish control program should the recreational fishing program not be sufficient to meet the management standards and thresholds thought necessary to protect native fish consistent with NPS native fish management and policy goals for current and future generations.
- Establishment of a managed, catch and release, native, Pecos-strain Rio Grande cutthroat trout fishery that will restore the native trout to the Pecos River fish community within PECO, mitigate for the loss of the catch and release brown trout fishery, and provide an opportunity for education and outreach about native fish within PECO
- Reestablishment of a population of native flathead chubs within PECO

Recreational Fishing Program

The recreational fishing program and regulations will be the same as those currently adopted under the pilot fishing program, but it is contemplated that the harvest regulations will be changed in an initial effort to reduce the abundance of non-native trout in PECO.

Regulations

The current pilot Fishing Program is regulated by temporary Special Park regulations, issued under the authority of the Superintendents Compendium (36CFR1.5). It is anticipated that any future regulations will be similar to those of the current fishing program, but that it will have more liberal harvest regulations.

It is proposed that the harvest regulations be amended to be consistent with the New Mexico Fishing Rules that allow the harvest of 5 trout daily, with no size limit restrictions. The NPS regulation prohibiting the take of native fish from PECO waters will remain in place.

If fish community monitoring indicates that this level of harvest is not meeting the desired fish community management thresholds, then PECO will consider increasing voluntary harvest levels, perhaps removing all limits to non-native trout harvest, or even requiring an angler to remove all trout captured during angling. Such approaches are used in other national park units to control non-native trout for the benefit of native species (see Yellowstone National Park; Shenandoah National Park; Grand Canyon National Park; Dinosaur National Monument; and currently proposed for Mount Rainier National Park).

Permits

Under the authority of 36CFR1.6, the superintendent may issue a permit to authorize an otherwise prohibited or restricted activity. The 1997 General Management Plan for Pecos National Historical Park states “Fishing would be allowed by permit only and would be strictly managed to preserve and protect the sensitive riparian habitat, cultural resources, and public health.” Accordingly, it is anticipated that a permit will still be required for each angler, for each time they fish at PECO, similar to that issued under the current program. The data collected under this permitted fishing program help park staff in managing the natural resources of the Pecos River.

Cost

PECO is proposing to implement a new permitting system during the 2018/2019 fishing season through the use of the website Recreation.gov (<https://www.recreation.gov>). Recreation.gov is a one-stop shop for trip planning, information sharing and making reservations for 12 federal participants. The site is operated and maintained by *Reserve America* under contract with USDA, Forest Service and other National Recreation Reservation Service participating agencies, including the NPS. Currently, the minimum cost to use the system is \$8 per reservation.

The cost of a permit to fish under the initial pilot fishing program was \$25. For many anglers seeking to catch and release large trout, this price was acceptable. However, the high cost was likely prohibitive for many. In the future, as increased harvest reduces the abundance of trout, it is likely that fewer “catch and release” anglers will pay to fish. At some point, as trout size also decreases, few “harvest” anglers may also not be willing to pay. In order to increase angling opportunities, and to encourage all anglers to visit the park, PECO is contemplating lowering the new price in an attempt to balance access, attainment of the goal to reduce non-native trout abundance, and the need to administer the program. At this time, it is unclear how effective the proposed harvest regulations will be on reducing trout abundance, but it is likely that the permit price will need to be kept low and harvest limits may need to be increased in order to draw anglers to the park.

Restoration of the Native Fish Community

1. Restoration of a managed, native Rio Grande cutthroat trout fishery.

As PECO considers reducing the abundance of brown trout to protect native fish, it is important to recognize that it would be unpopular with some groups of anglers, though popular with others. One way to mitigate a perceived loss of the brown trout fishery is to establish another fishery (NMGF 2015). The Rio Grande cutthroat (RGCT), the native trout of the Pecos River, is currently managed under a Conservation Agreement, although there have been repeated petitions to list it under the federal ESA. The 2006 Western Native Trout Status Report states that “fish population manipulation (non-native removal, re-introduction, supplemental stocking, spawn-taking, maintaining broodstocks....; regulatory actions (fishing regulations...), and developing educational and outreach efforts” are primary actions that can be taken to improve the status of the Rio Grande cutthroat trout.

The establishment of a managed, catch and release, native trout fishery that can be sustained through supplemental stocking as necessary, can further many of these goals. It can provide a unique fishing experience that is consistent with the NPS goals of native species restoration and public enjoyment, while providing an opportunity for outreach and education.

It should also be noted that there may be some questions regarding the possibility of reintroducing RGCT within PECO based upon the temperature tolerance of the species and whether or not it is considered a priority use of available hatchery cutthroat trout. However, it is certain that the species was present historically within PECO from early descriptions from Coronado’s 1541 Expedition of trout occurring in what was likely Glorieta Creek within PECO

(see Trotter and Bisson, 1988). RGCT were quickly displaced by brown trout after initial stocking.

In order for this proposal to work, it requires the availability of hatchery raised, Pecos strain, Rio Grande cutthroat trout. A recent conversation with NMGF (Kirk Patton, NMGF Coldwater Fisheries Biologist) suggests that it could be another 10 years before NMGF is likely to reintroduce RGCT into the main stem of the Pecos River within the lower elevation river reach within the park. While the realization of this management strategy is a long time in the future, the park intends to stay in communication with NMGF and explore opportunities for RGCT restoration as they arise.

2. Restoration of extirpated flathead chub population

The other common fish thought to be missing from the Pecos River native fish community is the flathead chub. While the exact reasons for its extirpation are uncertain, the presence of non-native trout was almost certainly unhelpful. With the proposed control of brown trout, restoration of a population of the species may perhaps be as easy as reintroducing the fish to the system, perhaps establishing a nursery area in the lower reaches of Glorieta Creek. PECO will continue to work with NMGF and explore opportunities for flathead chub restoration as they arise.

Monitoring and Adaptive Management of Non-Native Fish

While complete eradication of non-native trout is not feasible in the Pecos River within PECO, it is hoped that the Fishing Program will greatly reduce non-native trout abundance. However, it is uncertain if the fishing pressure and the magnitude of harvest under more liberal NM Fishing Rules will reduce trout numbers sufficiently to prevent continued unacceptable impacts to the native fish community.

Initial calculations suggest that it may be difficult to reduce trout abundance through fishing alone. A population estimate using trout catch data from 2004 produces an estimate of 299 brown trout within the approximately 400 m of stream sampled (~75/fish per 100m). This suggests that there are about 3,500 brown trout in the Pecos River within PECO. If every permitted fishing opportunity was reserved in 2018 (21 weeks x 45 anglers = 945 angler days), and every angler took the 5 fish allowed under current NM Fishing Rules, 4,725 fish could be taken during the year. However, it is unlikely that all reservations will be filled, or that all anglers will take their limit, or any fish at all. Consequently, it is uncertain how successful the fishing program will be at removing fish.

It is proposed that the success of the Fishing Program to reduce non-native trout, and the condition of the native fish community, will be monitored through continuation of the cooperative fish monitoring effort between PECO and NMGF. If monitoring indicates that the fishing program is not meeting the stated goals, adaptive management options are available including increased fishing harvest including “no-limits” fishing, and free “harvest” days, and implementation of an active removal program which may include removal of non-native fish during annual fish community monitoring, or as deemed necessary.

Fish Consumption Advisory within PECO

PECO must comply with Department of the Interior Policy on fish consumption advisories (Department Manual Release 515 DM 5). Parks must work with the NPS Office of Public Health and cooperate with state and tribal health departments to provide fishers with information on fish and shellfish consumption advisories in effect for waters within park units and the risks to human health associated with eating fish and shellfish caught in those waters.

Tests have shown many of New Mexico's waters are contaminated with mercury, PCBs and in some instances DDT. To help anglers make informed choices about what can be safely eaten, the NMGF Department publishes consumption advisories that are published in the annual New Mexico Fishing Rules. Occasional consumption of fish from these waters does not constitute a substantial health risk, however higher consumption over a longer period of time could result in health problems. These advisories are guidelines only and do not suggest any health risks from camping, swimming or boating in these waters. Also, handling fish will not result in exposure to dangerous contaminants

Currently, the waters within PECO are subject to a mercury consumption advisory that states that an single individuals consumption of brown trout not exceed 4 fish between 14 and 18 inches in a calendar month.

For questions about these advisories, contact the New Mexico Environment Department–Surface Water Quality Bureau at: (505) 827-2470 or toll free: 1-866-885-2997. For questions about health concerns relating to consumption of contaminants, contact the New Mexico Department of Health–Environmental Health Epidemiology Bureau at: 1-888-878-8992. Further information is also available online at: https://nmtracking.unm.edu/environ_exposure/fish/ www.epa.gov/waterscience/fish/ www.nmenv.state.nm.us/swqb/advisories/index.html.

Provision of Opportunities for Visitor Enjoyment

The Organic Act authorizes park resources to be managed for public enjoyment. With regards to park fish resources, this is often interpreted only as needing to allow recreational fishing. However, recreational fishing is but one way to provide visitor enjoyment of the Pecos River within PECO. Other equally important visitor experiences may include;

- Native fish viewing
- Wildlife watching
- Hiking
- Finding peace and solitude
- Visitor education and outreach
- Knowing that the natural and cultural resources and values of the park are protected and that such places exist, even if many individual will never see it in person

Currently, PECO uses the permit system to balance the provision of a recreational fishing program with the provision of other ways of enjoying the natural resources and values, and sets limits for the times and places that fishing may occur that protects these other ways for visitor enjoyment. Any future fishing program will have similar considerations.

Fish Habitat Management in response to the impacts of the June 2013 Tres Lagunas Fire in the upper Pecos River watershed.

The type and abundance of aquatic habitat available for a fish to live is dependent upon channel form, which provides the primary physical framework within which it lives and evolves. Understanding the fundamental relationships between riverine habitat, the processes that create and maintain it, and the ecology and life history requirements of the native fish community is essential for developing effective restoration strategies.

The form of a river channel (cross section, planform, longitudinal profile) and how it relates to its adjacent floodplain is determined by a suite of interacting, fundamental variables; valley slope; the magnitude, duration, frequency, timing and variability of flows; the quantity and size of available sediments and; local and regional constraints that affect the rate at which a river can erode its banks and migrate laterally across the valley floor (e.g. underlying geology, bedrock outcrops, shoreline vegetation and manmade structures such as bridges and bank reinforcements). These variables may change naturally from year to year, but over long periods of time, they vary and interact in a predictable way. It is the long term balance between these fundamental variables and the dynamic equilibrium around a most probable state that determines a river's characteristic form. If any of these controlling variables change, the balance will shift and the river will evolve towards a new configuration with a new characteristic form.

These geomorphic adjustments in stream type may happen slowly in response to long-term climatic or geological changes. Alternatively, they may occur quickly in response to sudden changes in land management and watershed condition (e.g. fire) causing a stream to evolve through a characteristic series of stream channel adjustments in response to rapid changes in hydrology, sources and types of sediments and local constraints. Contemporary stream channels are often in one of the intermediate stages of degradation or recovery as they continue to adjust from the impacts of historical land use. Piecing together the exact sequence of events that led to the current state of the channel requires information from a variety of sources and historical accounts and photographs often make it easy to document. In some regions of the U.S. the impacts of land management and the subsequent changes in channel form are so well documented that it is possible to describe the exact sequence of events that led to the current state of a stream.

Fire is a natural occurrence in the southwest. While there is often an impulse to manage recovery from a presumed “impact”, in this instance there is nothing to be done other than let the river and the fish community respond to the immediate effects of the fire, and subsequently recover concomitant with the recovery of the watershed. Additionally, NPS Management Policies (M.P. 4.4.3) clearly state that habitat manipulation for harvested species....”will not include the artificial manipulation of habitat to increase the numbers of a harvested species above its natural range in population levels”, and that the habitat should be left to recover by natural processes.

Native fish communities in the southwest U.S. have evolved life histories and physiological traits that allow them to survive in the highly variable riverine environments typical of the region. The 2014 fish monitoring data supports this contention; native fish populations appear to be

doing well, and there has been no clear reduction in the number of individuals, while non-native brown trout have been greatly reduced. The data might even suggest the start of a recovery of the native species' populations as a result of release from predation by brown trout.

In summary, while the fire has caused some temporary changes to the Pecos River within PECO, and has been devastating to the non-native brown trout population which is often the management focus, the natural geomorphology of the Pecos River is still in excellent natural condition, and the native fish community is likely to survive intact and may even prosper in response to reduced abundance of brown trout.

Compliance to Implement the Native Fish Management Strategy

The NPS is required to conduct an environmental and legal review to disclose the environmental impacts of implementing the Strategy. The following is a brief discussion of the applicable laws that must be met for the implementation of activities, and identification of the process that will be used to ensure adequate regulatory compliance.

The Native Fish and Fishing Management Strategy is a high level, programmatic document that identifies a wide range of activities that will be implemented as funds and opportunities become available. Accordingly, the Strategy is considered a broad administrative document that in itself has no significant environmental impacts. Many of the activities proposed in this Strategy are already covered under previously completed environmental compliance or NPS National Environmental Policy Act (NEPA) Categorical Exclusions (CE).

Endangered Species Act (ESA)

Federal agencies are required by the ESA of 1973 to ensure that their actions do not jeopardize the continued existence of any species listed as an endangered or threatened under the ESA or Critical Habitat. The ESA requires agencies to ensure that any actions authorized, funded or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species, or its habitat, and must, when appropriate, consult with the Secretary of Interior. At this time, the Rio Grande chub has not been listed under the ESA. Consequently, regulatory compliance under the ESA is not required.

However, NPS policy requires that “the NPS will inventory, monitor and manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible. In addition, the NPS will inventory other native species that are of special management concern to parks (such as rare, declining, sensitive, or unique species and their habitats) and will manage them to maintain their natural distribution and abundance (NPS MP 4.4.2.3)”.

National Environmental Policy Act (NEPA)

The NPS is subject to the provisions of The National Environmental Policy Act of 1969 (NEPA), and is required to evaluate the impacts of implementing the PECO Fish and Fishing Management Strategy.

It is anticipated that the adoption of the NPS Management Strategy, and the removal of predatory fish consistent with the existing NPS general fishing regulations (36CFR2.3), can be conducted under NPS NEPA Categorical Exclusion (CE) 3.4 (E) 3: Actions Related to Resource Management and Protection: Restoration of noncontroversial native species into suitable habitats within their historic range and elimination of exotic species.

This CE should only be used when the action under the CE would result in no, or minor impacts. The Environmental Screening Form should be used to determine the level of potential impacts. This CE is from 43 CFR § 46.210 and 516 DM 12. NPS Directors Order 12, Section 3.4.

Since the previous fishing program was a temporary pilot fishing program, cancellation of the program would only return fishing regulations back to the previous, federally adopted state fishing regulations, consistent with the NPS Servicewide general fishing regulations at 36CFR2.3(a).

Other Activities

Other activities identified in the management Strategy will undergo environmental compliance and review as appropriate. Many are anticipated to be covered under existing NPS NEPA. For example, fish community monitoring activities may be covered under at least two CX's: CX 3.3 Y, and 3.4 (E) 5.

CX 3.3. CEs for Which No Formal Documentation is Necessary

Y. Day-to-day resource management and research activities.

Guidance: This CE applies to cultural and natural resource management and research activities that have no impact on the human environment and that are not otherwise listed in section 3.4.

3.4 (E). Actions Related to Resource Management and Protection for Which a Record is Required

5. Nondestructive data collection, inventory (including field, aerial, and satellite surveying and mapping), study, research, and monitoring activities.

Any action not covered under existing CX's will undergo further project specific environmental compliance and review as appropriate.

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Appendix I – NPS Law, Regulation and Policy

Chapter 1: The Foundation

1.4.1 The Laws Generally Governing Park Management

The most important statutory directive for the National Park Service is provided by interrelated provisions of the [NPS Organic Act of 1916](#) and the [NPS General Authorities Act of 1970](#), including amendments to the latter law enacted in 1978.

The key management-related provision of the Organic Act is as follows:

[The National Park Service] shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified ... by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations. ([16 USC 1](#))

1.4.3 The NPS Obligation to Conserve and Provide for Enjoyment of Park Resources and Values

The fundamental purpose of the national park system, established by the [Organic Act](#) and reaffirmed by the [General Authorities Act](#), as amended, begins with a mandate to conserve park resources and values for the benefit and inspiration of all people of the United States, and to regulate their use accordingly..... NPS managers must always seek ways to avoid, or to minimize to the greatest extent practicable, adverse impacts on park resources and values.

The fundamental purpose of all parks also includes providing for the enjoyment of park resources and values by the people of the United States.Congress, recognizing that the enjoyment by future generations of the national parks can be ensured only if the superb quality of park resources and values is left unimpaired, has provided that when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant.

1.4.5 What Constitutes Impairment of Park Resources and Values

The impairment that is prohibited by the [Organic Act](#) and the [General Authorities Act](#) is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values.

1.4.7.1 Unacceptable Impacts

The impact threshold at which impairment occurs is not always readily apparent. Therefore, the Service will apply a standard that offers greater assurance that impairment will not occur. The Service will do this by avoiding impacts that it determines to be unacceptable. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment. Park managers must not allow uses that would cause unacceptable impacts; they must evaluate existing or proposed uses and determine whether the associated impacts on park resources and values are acceptable.

Important Definitions from Glossary

Impairment— An impact that, in the professional judgment of a responsible NPS manager, would harm the integrity of park resources or values and violate the 1916 NPS Organic Act's mandate that park resources and values remain unimpaired.

Professional judgment— a decision or opinion that is shaped by study and analysis and full consideration of all the relevant facts, and that takes into account the decision-maker's education, training, and experience; advice or insights offered by subject matter experts and others who have relevant knowledge and experience; good science and scholarship; and, whenever appropriate, the results of civic engagement and public involvement activities relating to the decision.

Unacceptable impacts— impacts that, individually or cumulatively, would

- be inconsistent with a park's purposes or values, or impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the park's planning process, or
- create an unsafe or unhealthful environment for visitors or employees, or
- diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or
- unreasonably interfere with
 - o park programs or activities, or
 - o an appropriate use, or
 - o the atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park.
 - o NPS concessioner or contractor operations or services.

Chapter 4: Natural Resource Management

The National Park Service will preserve and protect the natural resources, processes, systems, and values of units of the national park system in an unimpaired condition to perpetuate their inherent integrity and to provide present and future generations with the opportunity to enjoy them.

The Service manages the natural resources of parks to maintain them in an unimpaired condition for present and future generations in accordance with NPS-specific statute.

4.1 General Management Concepts

Preserving park resources and values unimpaired is the core or primary responsibility of NPS managers. The Service cannot conduct or allow activities in parks that would impact park resources and values to a level that would constitute impairment. To comply with this mandate, park managers must determine in writing whether proposed activities in parks would impair natural resources. Park managers must also take action to ensure that ongoing NPS activities do not cause the impairment of park natural resources. In cases of uncertainty as to the impacts of activities on park natural resources, the protection of natural resources will predominate.

4.1.5 Restoration of Natural Systems

The Service will reestablish natural functions and processes in parks unless otherwise directed by Congress.Impacts on natural systems resulting from human disturbances include the introduction of exotic species;.....; and the disruption of natural processes. The Service will seek to return such disturbed areas to the natural conditions and processes....., to restore the biological and physical components of these systems,. Efforts may include, for example

- removal of exotic species
- restoration of native plants and animals

4.4 Biological Resource Management

4.4.1 General Principles for Managing Biological Resources

The National Park Service will maintain as parts of the natural ecosystems of parks all plants and animals native to park ecosystems. [including “fish”). The Service will successfully maintain native plants and animals by

- preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur;
- restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions; and
- minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them.

4.4.1.3 Definition of Native and Exotic Species

Native species are defined as all species that have occurred, now occur, or may occur as a result of natural processes on lands designated as units of the national park system. Native species in a place are evolving in concert with each other. Exotic species are those species that occupy or could occupy park lands directly or indirectly as the result of deliberate or accidental human activities. Exotic species are also commonly referred to as nonnative, alien, or invasive species. Because an exotic species did not evolve in concert with the species native to the place, the exotic species is not a natural component of the natural ecosystem at that place.

4.4.2 Management of Native Plants and Animals

Whenever possible, natural processes will be relied upon to maintain native plant and animal species and influence natural fluctuations in populations of these species.

4.4.2.1 NPS Actions That Remove Native Plants and Animals

Whenever the Service removes native plants or animals, manages plant or animal populations to reduce their sizes, or allows others to remove plants or animals for an authorized purpose, the Service will seek to ensure that such removals will not cause unacceptable impacts on native resources, natural processes, or other park resources.

In addition, the Service will manage such removals to prevent them from interfering broadly with

- natural habitats, natural abundances, and natural distributions of native species and natural processes
- rare, threatened, and endangered plant or animal species or their critical habitats
- scientific study, interpretation, environmental education, appreciation of wildlife, or other public benefits
- opportunities to restore depressed populations of native species
- breeding or spawning grounds of native species

4.4.2.2 Restoration of Native Plant and Animal Species

The Service will strive to restore extirpated native plant and animal species to parks whenever all of the following criteria are met:

- Adequate habitat to support the species either exists or can reasonably be restored in the park and if necessary also on adjacent public lands and waters; once a natural population level is achieved, the population can be self-perpetuating.
- The genetic type used in restoration most nearly approximates the extirpated genetic type.
- The species disappeared or was substantially diminished as a direct or indirect result of human-induced change to the species population or to the ecosystem.
- Potential impacts upon park management and use have been carefully considered.

4.4.2.3 Management of Threatened or Endangered Plants and Animals

The Service will survey for, protect, and strive to recover all species native to national park system units that are listed under the Endangered Species Act. The Service will fully meet its

obligations under the NPS Organic Act and the Endangered Species Act to both proactively conserve listed species and prevent detrimental effects on these species. To meet these obligations, the Service will

- cooperate with both the U. S. Fish and Wildlife Service and the NOAA Fisheries to ensure that NPS actions comply with both the written requirements and the spirit of the Endangered Species Act. This cooperation should include the full range of activities associated with the Endangered Species Act, including consultation, conferencing, informal discussions, and securing all necessary scientific and/or recovery permits;
- undertake active management programs to inventory, monitor, restore, and maintain listed species' habitats; control detrimental nonnative species; manage detrimental visitor access; and reestablish extirpated populations as necessary to maintain the species and the habitats upon which they depend;

The National Park Service will inventory, monitor, and manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible. In addition, the Service will inventory other native species that are of special management concern to parks (such as rare, declining, sensitive, or unique species and their habitats) and will manage them to maintain their natural distribution and abundance.

4.4.3 Harvest of Plants and Animals by the Public

Public harvesting of designated species of plants and animals, or their components, may be allowed in park units when

- recreational fishing is not specifically prohibited;

Where harvesting is allowed and subject to NPS control, the Service will allow harvesting only when (1) the monitoring requirement contained in section 4.4.2 and the criteria in section 4.4.2.1 above have been met, and (2) the Service has determined that the harvesting will not unacceptably impact park resources or natural processes, including the natural distributions, densities, age-class distributions, and behavior of

- harvested species
- native species that the harvested species use for any purpose, or
- native species that use the harvested species for any purpose

In consultation and cooperation, as appropriate, with individual state or tribal governments, the Service will manage harvesting programs and any associated habitat management programs intended to restore and maintain habitats supporting harvested plant or animal populations to conform with applicable federal and state regulations.

Habitat manipulation for harvested species may include the restoration of a disturbed area to its natural condition so it can become self-perpetuating, but this will not include the artificial manipulation of habitat to increase the numbers of a harvested species above its natural range in population levels.

The Service may encourage the intensive harvesting of exotic species in certain situations when needed to meet park management objectives.

4.4.4 Management of Exotic Species

Exotic species will not be allowed to displace native species if displacement can be prevented.

4.4.4.2 Removal of Exotic Species Already Present

All exotic..... animal species that are not maintained to meet an identified park purpose will be managed—up to and including eradication—if (1) control is prudent and feasible, and (2) the exotic species

- interferes with natural processes and the perpetuation of natural features, native species or natural habitats, or
- disrupts the genetic integrity of native species, or.....

High priority will be given to managing exotic species that have, or potentially could have, a substantial impact on park resources, and that can reasonably be expected to be successfully controlled. Where an exotic species cannot be successfully eliminated, managers will seek to contain the exotic species to prevent further spread or resource damage.

Chapter 8: Use of the Parks

The Service will focus special attention on visitor enjoyment of the parks while recognizing that the NPS mission is to conserve unimpaired each park's natural and cultural resources and values for the enjoyment, education, and inspiration of present and future generations.

8.2.2.5 Fishing

Recreational fishing will be allowed in parks when it is authorized or not specifically prohibited by federal law provided that it has been determined to be an appropriate use per section 8.1 of these policies. When fishing is allowed, it will be conducted in accordance with applicable federal laws and treaty rights, and non-conflicting state laws and regulations. The Service will manage fishing activities to achieve management objectives. Before the Service issues regulations or other restrictions, representatives of appropriate tribes and state and federal agencies will be consulted to ensure that all available scientific data are considered in the decision-making process. Any such regulations or other restrictions will be developed with public involvement and in consultation with fish and wildlife management agencies as appropriate, consistent with departmental policy at 43 CFR Part 24, and as described in section 4.4.3

Appendix II: Species Descriptions

Common Name: Rio Grande chub

Scientific Name: *Gila pandora*



Figure 4. Rio Grande chub (*Gila pandora*). Illustration by W. Howard Brandenburg.

Distribution: This species was widespread in creeks in the upper Rio Grande and Pecos watersheds in New Mexico and the Rio Grande and San Luis basin in Southern Colorado with isolated populations within the Davis Mountains of Texas (Sublette et al. 1990). The native range of the Rio Grande chub is in the Rio Grande and Pecos River drainages (Sublette et al. 1990) and the San Luis Closed Basin (Rees et al. 2005). It is likely that this species is rare in the mainstream Rio Grande and now is mainly found in tributary streams (Bestgen et al. 2003, SM Carman pers. comment).

Common Name: Longnose Dace

Scientific Name: *Rhinichthys cataractae*



Figure 5. Longnose Dace (*Rhinichthys cataractae*). Illustration by W. Howard Brandenburg.

Distribution: This species of dace has is distributed north of 40 degrees north latitude from coast to coast; north to the Arctic Circle in the Mackenzie River drainage; south in the Appalachian Mountains to northern Georgia, south through the Rocky Mountains into the Rio Grande drainage of Texas and northern Mexico, and south along the Atlantic coast to Virginia (Page and Burr 2011, NatureServe 2015). Longnose dace is

native to the middle and upper elevations of the Rio Grande, Pecos, and Canadian drainages (Sublette et al. 1990). This species was introduced into the lower segments of these drainages that have been modified impoundments that simulate the higher elevation environment (Sublette et al. 1990).

Common Name: White Sucker

Scientific Name: *Catostomus commersonii*



Figure 6. White Sucker (*Catostomus commersonii*). Illustration by W. Howard Brandenburg.

Distribution: The white sucker has a wide range which includes Atlantic, Arctic, Great Lakes, and Mississippi River basins from Labrador to the Mackenzie River, south to the Tennessee River drainage, northern Alabama, and the Arkansas River drainage, New Mexico; south on the Atlantic Slope to the upper Savannah River drainage, Georgia; South Carolina; upper Rio Grande drainage, New Mexico; Skeena and Fraser river drainages, British Columbia (Page and Burr 2011, NatureServe 2015). White sucker is native to the middle elevations of the Pecos and Canadian drainages in New Mexico (Sublette et al. 1990). This species of sucker has been introduced elsewhere within the state including the Rio Grande, San Juan drainage, and the San Francisco River.

Common Name: Fathead minnow

Scientific Name: *Pimephales promelas*



Figure 7. Fathead minnow (*Pimephales promelas* Rafinesque). Illustration by W. Howard Brandenburg.

Distribution: Fathead minnow is found throughout North America, from Alberta and Northwest Territories to Quebec and New Brunswick, south to Alabama, Texas, northern Mexico, and New Mexico (NatureServe

2015). Fathead minnow is native to the Mimbres, Rio Grande, Pecos, and Canadian drainages (Sublette et al. 1990). This species was introduced into the San Juan and Gila drainages by the 1950s and into the Zuni and San Francisco drainages by the 1960s (Sublette et al. 1990).

Common Name: Rio Grande cutthroat trout
Scientific Name: *Oncorhynchus clarki virginalis*



Figure 8. Rio Grande cutthroat (*Oncorhynchus clarki virginalis*). Illustration by W. Howard Brandenburg.

Distribution: The Rio Grande cutthroat trout is a subspecies of cutthroat trout, endemic to the Rio Grande, Pecos, and possibly the Canadian River Basins in New Mexico and Colorado. The historic range of the Rio Grande cutthroat is not fully known; however, it likely encompassed all waters presently capable of supporting trout in the Rio Grande drainage, including the Chama, Jemez, and Rio San Jose drainages (Sublette et al. 1990). The current range includes high elevation streams of New Mexico and Colorado. The southernmost distribution of Rio Grande cutthroat trout is presumed to be Indian Creek in the Lincoln National Forest and the Animas Creek in the Gila National Forest, southern New Mexico (Rinne 1995). Rio Grande cutthroat trout ranges north to headwater tributaries in the Rio Grande and San Juan national forests in southwestern Colorado; there are few lake and introduced populations. See Sublette et al. (1990) for details on distribution in New Mexico.

Common Name: Brown Trout
Scientific Name: *Salmo trutta*



Figure 9. Brown trout (*Salmo trutta*). Photo credit: USFWS

Distribution: Brown trout are native to Europe and western Asia. This species was introduced and established throughout most of the United States and southern Canada and is locally common (NatureServe 2015). In New Mexico, brown trout is exotic and has been introduced into most major drainages of the state during the early 1900s (Sublette et al. 1990).

Common Name: Rainbow Trout

Scientific Name: *Oncorhynchus mykiss*



Figure 10. Rainbow Trout (*Oncorhynchus mykiss*). Illustration by USFWS.

Distribution: Rainbow trout are native to streams along the Pacific coast of North America from the Kuskokwim River, Alaska, south to northern Baja California; also the upper Mackenzie River drainage, Alberta and British Columbia, and some basins of southern Oregon (NatureServe 2015). In New Mexico, rainbow trout was introduced into the state in 1896 when it was stocked in Bluewater Creek and Eagle Creek (Sublette et al. 1990). This species is now found in all major drainages within the state.

Appendix III

Pecos National Historical Park Fishing Regulations, 2018

Fishing is allowed only as part of a permitted fishing program and shall be authorized and managed through the issuance of a special use permit. The following Federal conditions and restrictions apply to the fishing program within Pecos National Historical Park, in addition to State of New Mexico general fishing regulations. Where State and Federal regulations conflict, Federal regulations take precedence.

1. CONDITIONS AND RESTRICTIONS:

The superintendent may impose closures and establish conditions or restrictions, in accordance with the criteria and procedures of 36 Code of Federal Regulations, Sec. 1.5 and 1.7, on any activity pertaining to fishing, including, but not limited to, seasons and hours during which fishing may take place, size, creel and possession limits, species of fish that may be taken and methods of taking.

2. FISHING LICENSE:

As per State law, all anglers must possess a valid New Mexico One Day, Five Day, or Annual Fishing License and a Habitat Management and Access Validation.

3. SEASON DATES:

The Superintendent shall annually determine specific dates that the Pecos River within Pecos National Historical Park shall be open for fishing.

4. DAYS OF FISHING:

The Pecos River within Pecos National Historical Park shall be open for fishing Sunday, Monday, Thursday, Friday and Saturday of the effective season.

5. HOURS OF FISHING:

a. With the exception of paragraph “b” below, during the effective days of the defined season (see above) the Pecos River within Pecos National Historical Park shall be open for fishing between the hours of 8:30 a.m. and 3:00 p.m.

b. When the effective days of the defined season (see above) encompass any days between the Saturday before Memorial Day and Labor Day inclusive, the Pecos River within Pecos National Historical Park shall be open for fishing between the hours of 8:30 a.m. and 4:30 p.m. on those days.

6. LIMITS:

a. The daily limit shall be 5 non-native trout (brown trout, rainbow trout).

b. ALL fish caught, and not retained under 6a., must be immediately returned to the water from which they were caught.

7. FISHING METHOD, EQUIPMENT and BAIT:

- a. Fishing is permitted only by use of one handheld rod and line.
- b. Only artificial flies or lures having one single barbed hook may be used.
- c. The use of more than two flies per line is prohibited.
- d. The possession of any bait other than artificial flies or lures is prohibited.

8. RELEASING AND HANDLING FISH:

Anglers will make every reasonable effort to follow the guidelines below pertaining to releasing and handling fish:

- a) Land the fish as quickly as possible to minimize the fish's fatigue.
- b) Use a landing net whenever possible and leave the fish in the water while removing the hook.
- c) Wet your hands and do not squeeze or hold the fish by the eyes or gills.
- d) Minimize time out of water for photos.
- e) If the fish is hooked deeply, cut the line and leave the hook in.
- f) Safely release fish in quiet water, near point of capture.

9. CLOSED WATERS: The following waters within Pecos National Historical Park are closed to fishing;

- a. Glorieta Creek
- b. Galisteo Creek

10. Fishing in closed waters or violating a condition or restriction established by the superintendent is prohibited.

Determination Statement: The 1997 General Management Plan for Pecos National Historical Park states "Fishing would be allowed by permit only and would be strictly managed to preserve and protect the sensitive riparian habitat, cultural resources, and public health." Park staff is currently working on a long-term plan which will allow fishing activities while protecting both visitors and sensitive resources. Pecos National Historical Park will conduct a permitted fishing program with the intent to allow fishing within the park in order to collect data to assist park staff in formulating a long-term fishing plan. Considering the hazardous nature of the Pecos River (rocks, snags, fences, etc.) and the need to protect public health and sensitive riparian habitat throughout the park, all park waters are closed to boating, swimming, bathing and other water sports.