

APPENDIX I: SITE ASSESSMENT EXAMPLE

Below is an example of a previously conducted site assessment for aquatic ecosystem restoration areas. This particular area contains fish eradication waters currently in-progress (previously approved) and waters proposed for piscicide treatments under alternatives B and D in this Restoration Plan/DEIS. All sites proposed for fish eradication would have a similar assessment completed before eradication is initiated. Site assessments are undertaken by field crews to determine the feasibility of restoring high elevation lakes and streams to their natural fishless state. The goals for site assessments include: assessing fish distribution; quantifying and marking strategic barriers; surveying for MYLF distribution; providing input for the restoration techniques exclusive to the site; assessing accessibility and safety; finding a low-impact, long-term base camp; and establishing a safe helicopter landing zone or stock drop-point.

Proposed restoration sites are thoroughly evaluated prior to initiating restoration. One to two employees visit each site and collect detailed information to formulate strategies that consider all aspects of the area. Some of the pertinent information can be quantified, but qualitative observations are also relied upon. Along with additional resources (e.g., data from cooperators and local knowledge), the results of site assessments formulate prescription plans for future restoration work.

Mountain Yellow-legged Frog Restoration Project: Amphitheater Basin Site Assessment Sequoia and Kings Canyon National Parks March 12, 2010

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Introduction

From August 7th to 9th, 2009, we conducted a site assessment of Amphitheater Basin to evaluate the feasibility of restoring 4 lakes and adjacent streams to their natural fishless state. We used the five digit lake ID's from the Knapp lake assessment project for nomenclature (Map 2). Our goals for site assessments include: assess fish distribution, quantify and mark strategic fish barriers, survey for mountain yellow-legged frog distribution, provide input for the restoration techniques exclusive to the site, assess accessibility and safety, find a low impact long-term base camp and establish a safe helicopter landing zone. The following text outlines the results of the Amphitheater Basin site assessment.

Proposed Site

Amphitheater Basin is located in the headwaters of the Middle Fork Kings River. All lakes within this basin drain directly into Cataract Creek (Map 1). Proposed restoration work occurs from 3,200 to 3,403 m elevation. There are four small to large fish containing lakes and many small, shallow fishless ponds. In addition, there is approximately 2 km of stream habitat. This number is misleading, however, because it only includes traceable streams from a USGS 7.5' GIS map layer. On the ground, there are many braided sections of stream which would double or possibly triple that length.

Trout distribution extends up to 3,400 m elevation. Fish occupy an estimated 85% of all stream habitat. In addition, trout inhabit much of the deep water lake habitat. Above 3,400 m, there are four large fishless lakes and several small, shallow fishless ponds.

Proposed Methods

To restore the entire basin, we would most likely employ a “hybrid” fish-removal technique (Map 3). This includes using physical methods of fish removal (i.e. gill netting and electrofishing) in all areas where possible and using piscicides in areas where physical methods would not be an effective strategy.

Restoration of Amphitheater Basin would likely be completed in two phases. Proposed Phase 1 includes using gill nets to restore three fish-containing lakes (Lakes 10266, 10233 and 11396). We would use a backpack electrofisher to restore all adjacent inlet and outlet streams of the abovementioned lakes. Pending approval of piscicide use, proposed Phase 2 restoration includes gill netting Lake 10232 (Amphitheater Lake) and using piscicides in adjacent streams. There is a fish barrier that separates Phase 1 restoration area from Phase 2. This ensures that Phase 1 restoration can be completed independent of Phase 2 approval.

Proposed Lakes

Phase 1 Fish Removal- Lakes 10266, 10233 and 11396

Lake 10266 is a solitary fish-containing lake. This lake is 30 acres with a shoreline perimeter of 1,691 m, a max depth of 18.5 m and an elevation of 3,403 m (Map 2). Inhabiting Lake 10266 are rainbow X golden trout hybrids (*Oncorhynchus spp.*). The trout population is self-sustaining, with abundant spawning habitat around the littoral zone of the lake. During the site assessment, many large (12 in. total length) and young of year trout were detected. There is no inlet stream habitat. There is approximately 100 m of outlet stream habitat down to the definitive barrier. During the site assessment, the outlet was nearly dry. The downstream barrier is a 5 m waterfall (Map 3).

In the same visit, a frog survey revealed a small population of mountain yellow-legged frogs. Detected were 6 subadults and 53 tadpoles. These frogs were persisting in a small sheltered rocky area on the southern shoreline. This area presented the best cover opportunity to avoid fish predation. This is a perfect restoration opportunity because of the limited stream habitat, definitive waterfall barrier and existing source population of mountain yellow legged frogs. Complete eradication can be achieved with minimal to no electrofishing effort and a deployment of 40 to 50 gill nets.

Lake 10233 is a fish-containing lake adjacent to several small, fishless ponds (Lakes 11395, 11393, 11391 and 11392). This lake is 6 acres with a shoreline perimeter of 1,076 m, a max depth of 6 m and an elevation of 3,335 m (Map 2). Lake 10233 contains abundant rainbow X golden trout hybrids of all life stages. The trout population is self-sustaining, with plentiful spawning habitat around the littoral zone of the lake and inlet streams. There is a significant amount of adjacent stream habitat. There are two perennial inlet streams and one intermittent inlet stream (Map 3). The intermittent stream dries early, so there is no need to project any electrofishing effort. The major inlet (southwest inlet) appears to have a barrier very close to the lake. Thorough visual fish surveys detected zero trout upstream of this area. This was astonishing because the barrier appeared insufficient for blocking fish passage. The minor inlet (southeast inlet) contains abundant trout in a variety of stream habitats. Also included in this inlet is a braid that opens up into two small ponds. This inlet includes at least 500 to 600 meters of electrofishing. The outlet of this lake is only a slight change in gradient into Lake 11396. These two lakes basically function as one lake. For the purpose of this project and for continuity of pre-existing data, they will remain separate entities. During a recent site visit, a frog survey detected zero mountain yellow-legged frogs. Complete eradication of trout can be achieved with substantial electrofishing in the inlets and a

deployment of 25 to 30 gill nets in the lake. In addition, 2 to 4 nets should be placed in fish-containing ponds that exist in the minor inlet.

Lake 11396 is a fish-containing lake downstream of Lake 10233. This lake is 0.8 acres with a shoreline perimeter of 418 m, max depth of 3 m and an elevation of 3,338 m (Map 2). This lake contains abundant adult rainbow X golden trout hybrids. There is very little spawning habitat. Trout from this lake are probably spawning in Lake 10233 and its inlets. The inlet does not require electrofishing effort. The outlet stream travels approximately 350 m and drops 66 m in elevation to Lake 10232 (Amphitheater Lake, Maps 2 & 3). This section is high gradient with many steep cascades. During the site assessment, a precise location of a definitive barrier was not determined. In reality, there are probably several that inhibit fish travel from Lake 10232 to Lake 11396. In August, much of the outlet was subsurface and surface water was mostly limited to residual pools. There were zero fish detected in the entire stream. It is presumed that the large talus field near the perimeter of Lake 10232 acts as a definitive barrier (Map 3). Three mountain yellow-legged frog subadults and one large tadpole were detected during the site assessment trip. Complete eradication of trout can be achieved with substantial electrofishing in the outlet and a deployment of 8 to 10 gill nets in the lake.

Phase 1 fish removal includes using 75 to 94 gill nets in 3 lakes and 2 small river ponds. In addition, there is at least 1 km of electrofishing, excluding the many braided channels.

Phase 1 – Mountain yellow-legged frog recovery

Mountain yellow-legged frogs are persisting at the Phase 1 proposed restoration area in a highly fragmented landscape. We expect that fish removal in the proposed lakes would vastly increase frog populations. Recovery time would be minimal due to the existing presence of frogs. The small breeding population at Lake 10266 should increase recruitment after one year of fish removal.

There were only four individuals detected in Lakes 10233 and 11396 combined. The detection of one tadpole suggests that there has been minimal successful breeding in these lakes. Fortunately, there are several fishless ponds within a very short distance. Two of the ponds (Lake 11395 and 11392) support frog populations. A survey of Lake 11395 revealed 46 subadults and 484 tadpoles (photo 1). This lake is only 2 meters from Lake 11396 (photo 2). We expect rapid recovery of frog populations in Lakes 10233 and 11396 due to the close proximity to a source population, Lake 11395 (photo 3). There should be an immediate positive frog response in these lakes after one year of fish removal.



Photo 1. Lake 11395 tadpoles (August 8, 2009)



Photo 2. View of Fish Lake 11396 from 11395

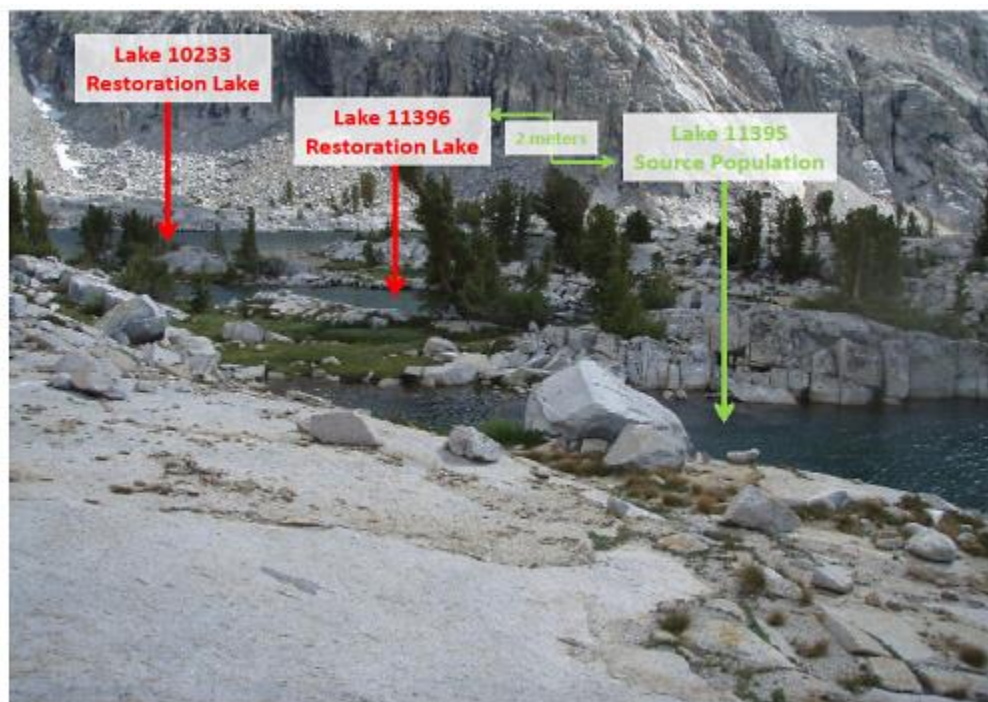


Photo 3. Phase 1 restoration area in Amphitheater Basin. This picture shows the proximity of the source frog population to the proposed restoration lakes.

Phase 2- Fish Removal –Lake 10232

Lake 10232, Amphitheater Lake, is a large fish-containing lake immediately downstream of the Phase 1 restoration area (photo 4). This lake is 59 acres with a shoreline perimeter of 2,195 m, max depth of 30 m and elevation of 3,272 m (Map 2). There are abundant rainbow x golden trout hybrids of all life stages. There is ample spawning habitat in the lake littoral zone and extensive stream habitat of the outlet. Phase 2 restoration presents problems in achieving complete fish eradication using only physical methods. It may be feasible to eradicate trout in the lake using gill nets but it is not realistic to remove fish from the outlet using only an electrofisher. Therefore, Phase 2 necessitates implementing a “hybrid” treatment. In this scenario, we would deploy 50 to 60 gill nets (or more if possible) in the lake. This may be successful in removing trout but we must consider its size to be a likely hindrance in our effort. Accomplishing physical removal in Lake 10232 is desirable because it would drastically reduce the amount of piscicides used. However, we should be prepared for possible failure removing fish with gill nets. The inlet is included in the proposed Phase 1 restoration work (using an electrofisher). The outlet includes 800+ m of stream habitat. This doesn't include extensive braided sections and connecting pond habitat. The outlet stream ends at a definitive waterfall barrier at the lip of the basin at 3,220 m (photo 5). We propose application of piscicides from the outlet of Lake 10232 to this downstream waterfall barrier. Also included in Phase 2 is the outlet of Lake 10266 from the waterfall barrier (identified in Phase 1) to the downstream confluence with the outlet of Lake 10232. Excluding braided side channels, this section includes 650 m of stream habitat. We propose the application of piscicides in this stream section because it is not possible to remove trout using physical methods.

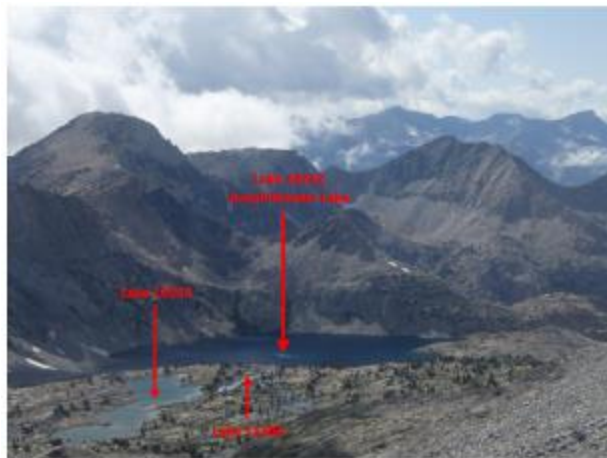


Photo 4. Lake 10232.



Photo 5. Cataract Canyon, Lake 10232 barrier.

Phase 2 fish removal includes using at least 50 to 60 gill nets in one lake. In addition, there is at least 1.5 km of stream (excluding braided channels) to treat with piscicides. Furthermore, we should consider the use of piscicides in Lake 10232 a likely possibility.

Phase 2 – Frog Recovery – Lake 10232

During the August site assessment trip, a partial shoreline survey detected zero frogs. The restoration of Lake 10232 would provide much needed deep water habitat to mountain yellow-legged frogs. Phase 2 would open up the entire basin, restoring a metapopulation of frogs that has been highly fragmented since fish introduction. Successful Phase 2 restoration would connect frogs from Lake 10266 to those of Lakes 10233 and 11396. We expect a slower recovery time in Lake 10232 due to the large dispersal distance from source populations. However, this connection will promote outbreeding, increasing genetic diversity of mountain yellow-legged frogs in Amphitheater Basin.

Additional Information

Accessibility

Amphitheater Basin restoration site cannot be accessed using a developed trail. There are two ways to enter the basin. If you are travelling the John Muir Trail (JMT)/Pacific Crest Trail (PCT) from Bench Lake, you can take a cross country pass located to the WSW of Mather Pass (Map 4). The pass is located directly south of unnamed peak 3868. This route is a class 1 to 2 walk from the east side. The west side is a little trickier, though only rated at a class 2. There are exposed ledges on this side that create potentially dangerous falling hazards. This route is not recommended with heavy packs (>40 lbs.). Field crews should only travel this route in a group.

The second route can be taken if travelling from the north on the JMT/PCT. From the JMT/PCT, take the Cataract Creek Trail at the junction in Deer Meadow, just below the Golden Staircase (Map 4). The Cataract Creek Trail ends roughly five miles up the steep canyon, approximately 300 m down canyon of Lake 10232. This route includes a considerable amount of cross country travel in steep terrain. Although less hazardous than the southern route, we recommend that field crews only travel in groups.

Base Camp

When looking for a low impact long-term base camp, we prioritize sites with granite slabs or decomposed granite substrate absent of vegetation. These areas must be out of the colonization route mountain yellow-legged frogs take from the source pond to the restoration lakes. In considering visitor wilderness experience, we attempt to blend into the surrounding environment. This involves using trees for

camouflage and staying away from developed trails. Our camp sites should be in close proximity to water for camp supply. We look for sites that provide efficient access to all restoration lakes.

The best camp found fits the abovementioned requirements, but is also located near the helicopter landing zone (Map 4). This is ideal for gear transport during site mobilizations and demobilizations. Travel to all restoration lakes is minimal. Lake 10266 is a 30 minute hike from camp. Lakes 10233 and 11396 are 5 minutes. There are several nearby small ponds to collect drinking and cooking water.

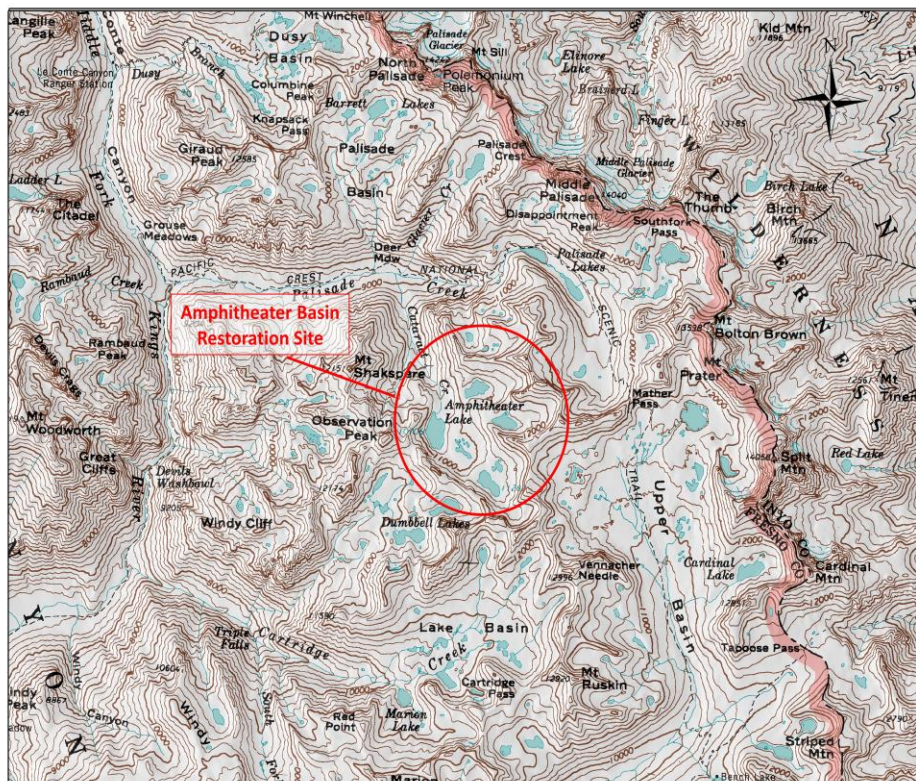
Landing Zone

Because there are no stock trails into this site, we can only use helicopters for gear transport. There are several factors to consider when looking for a good landing zone. First, the general area should be void of trees and boulders that could pose a threat to helicopter rotors. Second, the landing zone should be on flat, level surface. Lastly, we look to minimize exposed areas that may leave the helicopter subject to heavy winds. To maximize safety and performance of the mobilization, we choose sites with in-ground effect.

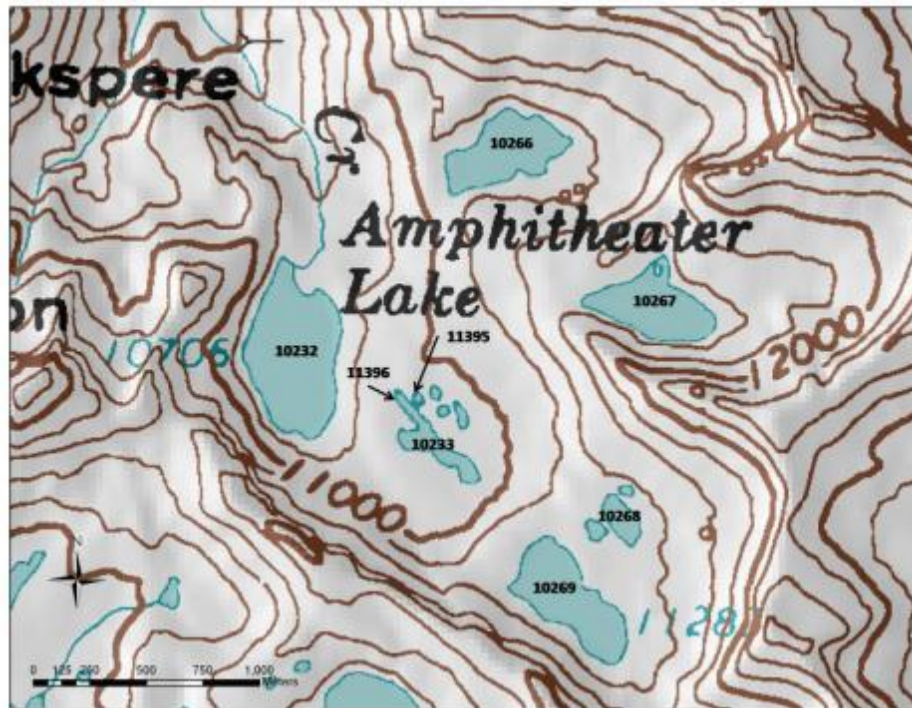
The landing zone chosen in Amphitheater Basin exhibits all of the above conditions (Map 4). The only foreseeable hazard is from up canyon winds. The landing zone is also in close proximity to the chosen base camp.

Safety Hazards

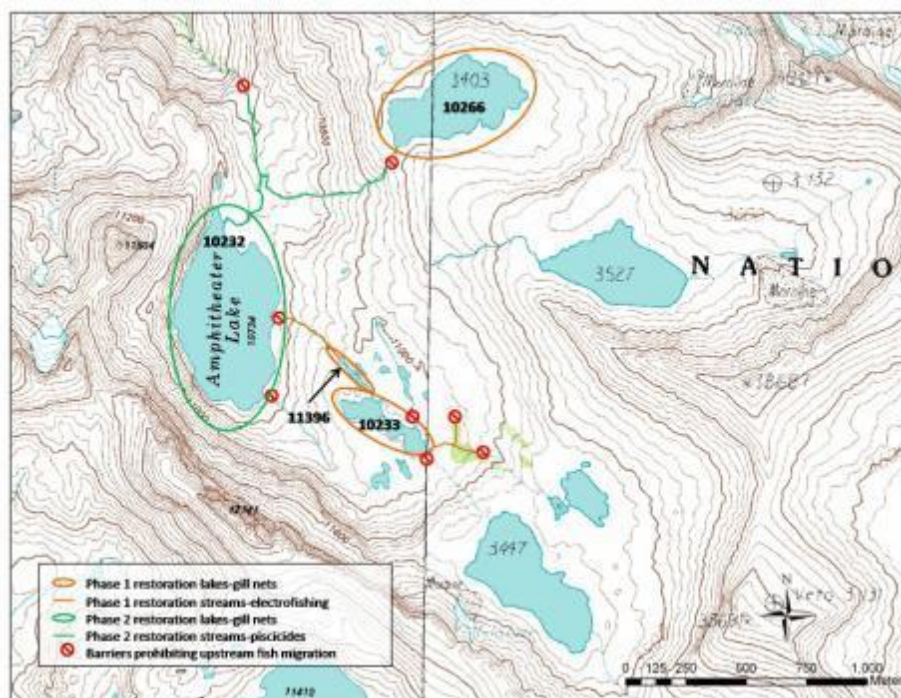
The following safety hazards exist at this site: gill netting, electrofishing, exposure to extreme weather, lightning, dehydration, hypothermia, heat-related illnesses, exhaustion, altitude sickness, hiking related injuries, exposure to cliffs and cross-country route finding.



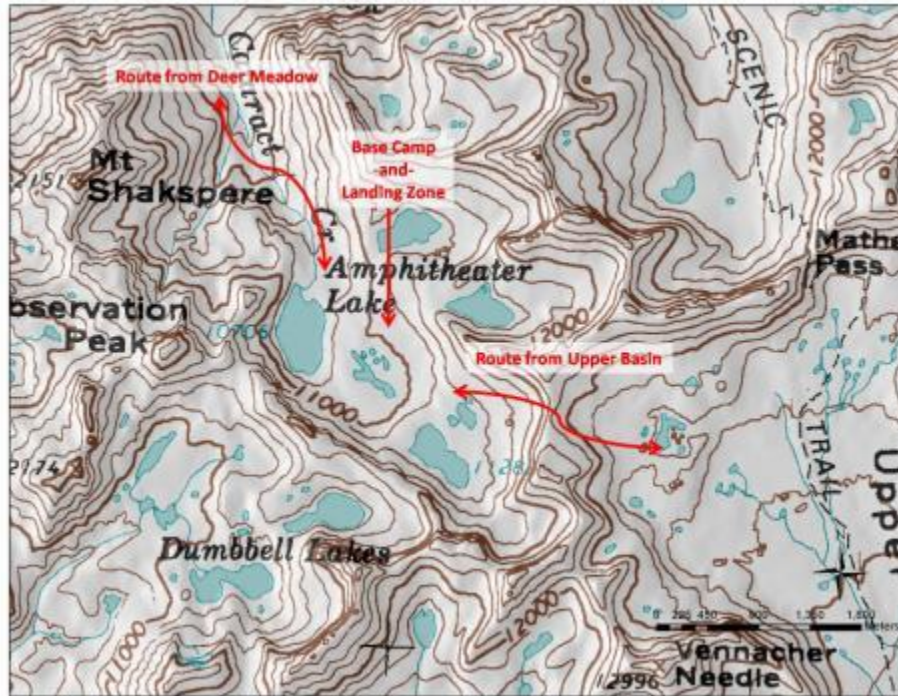
Map 1. Location of Amphitheater Basin proposed restoration site in Kings Canyon National Park, CA.



Map 2. Lakes included in the site assessment in Amphitheater Basin, Kings Canyon National Park, CA. Lake 10232, 10233, 11396 and 10266 are fish-containing lakes. Lakes 11395, 10267, 10268 and 10269 are fishless lakes.



Map 3. Hybrid treatment fish removal plan for Amphitheater Basin, Kings Canyon National Park, CA. Phase 1 physical restoration includes all lakes and streams located above Amphitheater Lake. Phase 2 restoration includes gill netting Amphitheater Lake and using piscicides in adjacent stream.



Map 4. Accessibility, base camp and helicopter landing zone in Amphitheater Basin restoration site, Kings Canyon National Park, CA. Both hiking routes are off-trail. The base camp and landing zones are in the same area.