Ackerson Meadow Restoration Project
Additional Questions and Answers from the 8/5/2020 Webinar

Q1: Are any actions planned for mitigation, or whatever to take place before the project begins, prior to spring 2021?

Breeding bird surveys, aquatic surveys including detection of amphibians by environmental DNA sampling, and invasive plant treatments have been ongoing since 2018 and are expected to continue in 2021. Nine existing pilot Hand-Built-Structures (BDAs) will continue to be maintained and monitored for efficacy. Hydrologic data, such as sedimentation rate, stream flow and groundwater height, will continue to be collected. In addition, non-native brown trout may be removed from identified restoration reaches in the meadow. Archeological surveys and rare plant surveys are completed.

Q2: Are resident organisms relocated during the big fill option? (The bulldozer picture made me kind of nervous.)

Prior to disturbance under any fill scenario, Western pond turtles would be relocated outside the project area, likely to South Ackerson Meadow or the creek downstream. Turtles will likely eventually find their way back to the meadow post-restoration; the project team would not intentionally move them back in unless otherwise warranted. Work will be done outside nesting season to avoid disturbing nesting birds prior to fledging. Wetland plants and willows on gully bottoms will be excavated and saved ("salvaged"), then replanted on the surface after the gully is filled.

Q3: It sounds as though grazing would be temporarily excluded- is that just on the USFS lands? I hope grazing on NPS lands would be (or already are) excluded.

Grazing would not be allowed on NPS-administered land. Grazing would be temporarily excluded from fragile restoration areas after restoration on USFS-administered land until vegetative recovery occurs and the restoration sites have stabilized.

Q4: The various methods have varying success, in part due to local conditions- are they all equally expected to work at Ackerson?

Each method is expected to be successful, though the landscape outcome and time frame would vary. The full fill option would result in the flat topography with wetland vegetation similar to what was present before the gully network developed. Unnatural draining of meadow soils would cease. One hundred acres of wet meadow would be restored three to five years after earthmoving. The intermittent fill option would result in a number of deepwater ponds in the area of the gully network with meadow and wetland vegetation on the periphery of the ponds. Unnatural draining of the meadow soils would cease. 80 acres of wet meadow and 20 acres of open-water pond would be established three to five years after earthmoving. The beaver dam analog (BDA) option would restore wetland and meadow topography in shallower segments of the erosion gully, at the base of the gully network, with ponded areas behind the BDAs. Sediment from the walls of the gully network would erode and deposit behind the BDAs, backing up water and raising the water table level incrementally, but not to the top of the gullies in deep gully segments. Ten acres of wet meadow and two acres of shallow open-water pond could be restored in the short-term, with additional wet meadow restoration possible over many decades of additional BDA construction and maintenance.

Q5: There is an active volunteer community for meadow restoration that could help with a BDA or hybrid restoration process.

Thank you! To date, volunteers assisted the park in pilot installation of 9 hand-built structures/BDAs to begin collecting information on sedimentation rates. We will continue to reach out to the volunteer community for assistance as opportunities arise.

Q6: What is the anticipated total water storage under each alternative?

We have not calculated total water storage. We would expect the full fill and partial fill options to store more water in a shorter time frame than the BDA option, since the fill options would raise the water table near the meadow surface for 100 acres vs. 12 acres for BDAS (phase 1, short-term).

Q7: Is there interest in concurrent restoration of neighboring private Stone Meadow? The gullies aren't as deep, but it could certainly be improved.

Stone Meadow is on private land. The option to restore Stone Meadow is up to the landowners.

Q8: Are there trout in Ackerson Creek?

Yes, the Yosemite aquatic ecologist positively identified Brown trout (*Salmo trutta*) in South Ackerson Meadow and suspect they are the same species in Ackerson Meadow as well.

Q9: Did willow flycatcher return after the Rim Fire?

We have records of willow flycatchers returning to Ackerson Meadow in 2016, which is the first year breeding bird surveys were done after the Rim Fire.

Q10: As the project moves forward, do Park and Forest Service officials anticipate any further adjustment of boundaries do to land swaps, etc.? that might affect management of meadow acres?

The 400-acre Ackerson Meadow parcel, formerly private land, was purchased by the Trust for Public Land and donated to the National Park Service in September 2016. This parcel was adjacent to the boundary of the Park but within the boundary of the Stanislaus National Forest. Both the Park and the Forest support a land exchange of 160 acres, with the eastern 160 acres going to the NPS and the western 160 going to the Forest, in order to form more logical boundaries and streamline management (see Attachment A, below). However, the USFS currently lacks the authority for an administrative boundary adjustment without legislative approval.

Both the Park and the Forest have submitted and support legislation for this land exchange, and in the meantime have agreed to cooperatively manage the property consistent with these future boundaries. There is no additional land exchange currently being considered.

Q11: If restoration work is proposed on FS lands, and a goal is to continue grazing on Ackerson Meadow lands belonging to the FS, will there at least be a minimum exclusion of livestock from the restoration areas for 5 years or longer?

There will be a temporary livestock exclusion as necessary for vegetation in newly restored areas to establish and stabilize. The Stanislaus National Forest has done several gully and meadow restoration projects over the past decades, both full fill and partial fill projects, and vegetation/site recovery is typically three to five years. Forest Plan Standards and Guidelines will be applied when grazing resumes.

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Q12: Will the Plumas Corporation be engaged as a consultant for the meadow restoration, or will restoration be fully handled by Park and FS staff with CARDNO support?

The NPS and USFS project team is partnering with Yosemite Conservancy and American Rivers to contract with Applied Ecohydrology Institute (Evan Wolf) and Westmoreland Watershed (Randy Westmoreland, retired USFS) to design a range of restoration concepts. We have also consulted with Damion Ciotti (US Fish and Wildlife Service) and other restoration professionals on Beaver Dam Analogs. Cardno is supporting NEPA compliance. We may continue to engage with these and other contractors and partners to support restoration.

Q13: Since Ackerson Meadow is so incredibly rich with such diverse and unique habitat for birds and other species, restoration of the gullies and head cuts obviously will be priceless in terms of value. Will the Park be willing to spend high amounts of money to do the most effective possible option for treatment, or does limited funding realistically mean that the Park will need to pick a moderate or lower cost alternative?

We will apply for California Parks and Water Bond Act (proposition 68) grants and other funds that support watershed and wetland restoration. The Yosemite Conservancy and its donors may continue to support the ecological restoration of this property that they helped acquire. A leveraging of federal, state, and private funding sources will be needed to support a higher-cost alternative.

Q14: Dawn assures that standards and guidelines will assure protection for riparian and wetland vegetation, but the Forest Service is now in court due to litigation filed because the Forest Service does not consistently enforce livestock regulations and does not often protect degraded meadow areas. Why would that change here at Ackerson Meadow since the FS has inadequate staff and resources to monitor and enforce livestock regulations?

One of the main challenges associated with protecting riparian and wetland areas adjacent to grazed areas is broken fences (often from falling trees) that allow cattle move into an area. Funding requests for project implementation will include funding to construct heavy-duty livestock fences and remove dead trees that could fall and break fences. Ackerson Meadow is a high-priority focal point for both the USFS and the NPS.

Q15: What would the impact be of heavy equipment (compaction?) and how would that be mitigated? What measures will be taken to avoid soil compaction during the restoration?

A primary strategy to limit soil compaction and the impacts of heavy equipment will be to confine equipment travel to the gully itself. In the full fill option, this can be done by filling the gully ahead of the equipment and using it as a road in the process of filling. When gully fill is complete, this surface would be decompacted (or "ripped") prior to planting and seeding. The incorporation of organic matter (wood chips) as 30% of the fill will also keep fill soils from becoming over-compacted. The intermittent fill option may have more impacts since some equipment travel would run along the meadow surface adjacent to the gully rather than entirely within the gully. Equipment travel across intact wetland will be avoided, but where there is no other option, temporary protective mats can be used to distribute weight and protect vegetation and soil from compaction. For borrow sites, topsoil will be stored and placed loosely over the finished grade. Decompaction measures would be applied as a last step in restoration implementation just before equipment would leave the site. Erosion control mats, seeding, and planting of locally harvested native materials will help soils to recover from any compaction that might occur.

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Q16: Have you done a sediment budget so that can estimate how long it would take for the streambed elevation to recover to meadow surface elevations? If so, what is your estimate for how long it will take using BDAs?

As a pilot, a series of BDA/Post-Assisted Log Structure (PALS) were installed in Ackerson Meadow in fall of 2019 and the pond bottom of each was surveyed to centimeter-level accuracy. A resurvey was conducted in 2020 and was unable to detect evidence of sediment accumulation. However, this resurvey only captures a single annual peak flow event, which is what transports most sediment. In addition, the peak flow event of 2020 was below average. But, based on carbon dates of the sediments accumulated in Ackerson Meadow over the past 2,500 years, it has taken 5-20 years to accumulate 1 cm of meadow sediment. This sediment accumulated in a dispersed flow environment that created the level slope of Ackerson Meadow. In the currently confined gully, stream power is far more concentrated and erosive, so artificially creating depositional environments within these confines will be far more challenging than if flow were dispersed across the entire meadow width. Lastly, sediment tends to move episodically in response to large flood events in systems like Ackerson Meadow. The challenges of capturing sediment in these events, both to determine a sediment budget but also to restore the gully from within, is difficult. Currently we assume that within-gully restoration by the Hand-Built Structure concept could take anywhere from 20 years to more than a century.

Q17: Will there be a Value Analysis as part of the alternative selection?

The project team will have a workshop to recommend a preferred alternative to the Park Superintendent and Forest Supervisor after the preliminary analysis is complete. The team has not determined whether it will be a bona fide Value Analysis or some other type of decision-making process.

Q18: If beaver were thought to have inhabited the meadow, why is the goal for sheet flow? Sheet flow meadows are much less diverse. Why not aim for beaver recolonization? Why is the low tech or DBA alternative so structured (3 ft rise spaced down channel) when could use strategically placed structures to kick water on the meadow surface or to capture sediment? Seems like the low-tech option is not well thought out and could be much improved with a thorough and creative plan.

There is no evidence to date that beaver were present before 1850 or performed a geomorphically significant role at Ackerson Meadow, despite their introduction and reported short-term (roughly seven years) occupation of the meadow in the 1940s. The meadow surface descends gradually rather than in the stair-step fashion typical of beaver-maintained meadows (see Persico 2009). The extensive gully wall complex has been searched for evidence of past beaver dams and none were found. This type of evidence is readily visible in former long-term beaver-inhabited meadows of the northern Sierra and elsewhere in the western U.S. Evidence at Ackerson Meadow suggests a sheet-flow meadow with shallow braided channels or swales. We could still consider introducing beaver to do the work of restoration, but this would require further assessments of Ackerson Meadow's capacity to provide adequate habitat, the surrounding region's ability to support beaver meta-populations that may move around, the consequences to at-risk wildlife and aquatic species, and concerns for introduced beaver to move off of the National Park and Forest Service lands.

We are working to expand the low-tech option to be adaptive and process oriented. Note that the BDA alternative does not specify locations of dams, but rather illustrates the goal for stair-stepping ponds to avoid scour, trap sediments, and raise water level to the height of active dams. Placement of these structures, similar to the plugs within the Intermittent Fill concept, would be strategically located to optimize rewetting meadow habitat.

Note that BDAs are typically three feet tall, and 1,340 feet of the total gully length of 10,830 feet is three feet high or shallower. Phase 1 of BDAs in this 1,340-foot section would rewet an estimated ten acres of meadow surface. The remaining 9,490 linear feet of gully is deeper than three feet (and up to 14 feet depth) and multiple phases of treatments and sedimentation would be needed to raise the water to the surface and rewet the remaining 90 acres of dewatered meadow.

Q19: What type sources will be used to restore water levels and maintain targeted levels?

We are sorry that we don't understand the question, but we invite you clarify and re-submit.

Q20: Which invasive species are there? I know Sisymbrium is [present] and think it is widespread. Will the increased moisture cause it to decline?

The highest priority invasive plant species we've detected and mapped are medusa head (*Elymus caput-medusae*) and velvet grass (*Holcus lanatus*). While velvet grass can tolerate a wide range of moisture conditions, other non-native plant species like *Sisymbrium* may be outcompeted by vigorous native sedges in the wet conditions following restoration.

Q21: Please consider Forest Service sensitive plants in this project. I did not see any mention of them so far.

USFS has provided a comprehensive list of sensitive plants in the area to the project team. In addition, Yosemite staff surveyed Ackerson Meadow for special status plants in 2018. All sensitive species will be considered in the alternative analysis.

Q22: I'm concerned about the increasing intensity and episode essity of rainfall via "atmospheric rivers". I hope you are planning on larger events than you might have considered in the past. I would not want all the fill you are using to end up in Don Pedro.

The increasing intensity of rainstorms below 9,000 feet elevation in the Sierra Nevada adds to the need for restoration of the gully and dispersion of runoff. For the full-fill concept, the final fill surface in the erosion gully would match the contours of the adjacent meadow, producing level-in-cross-section topography. This landscape configuration would restore a sheet flow hydrologic regime with no erosive channelized flow paths.

In addition, for the Full Fill and Intermittent Fill concepts we would apply a variety of erosion control measures to immediately stabilize fill until wetland plantings establish and hold soil in place. These would include erosion control fabric rated for shear stress above what would be predicted by a hydrologic flow model and placement of coir or straw wattles. Rapid, dense cover by wetland plants with mat-forming root systems will ultimately hold soils in place. To accomplish this, we would replant salvaged sod in critical locations where erosion is a concern, plant plugs propagated from locally collected native wetland plants, and seed with locally collected native seeds. The Hand-Built Structures concept does not immediately distribute and spread flows outside of the gully, and thus increasing intensity of rainstorms would be a concern for this concept. However, any uprooted willows from BDAs may wash down-meadow and re-establish.

The entire final downstream slope, where fill transitions back to the bed of Ackerson Creek, would have a subsurface layer of rock as base control to prevent headcutting and gully reformation.

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Q23: Are the earthen barriers strong enough? How much sediment can be expected from upslope to fill in behind them?

The earthen barriers (or plugs) in the intermittent fill option are substantial structures: generally at least 50 feet or more in length, and sufficient to achieve a 2:1 slope or less on the downstream side of the plug. Moreover, the plugs would be designed to reduce the chance that water would flow over them into the downstream pond, which could cause plugs to erode. The plugs are also constructed in ~18-inch lifts until the desired height is achieved, whereby each lift is placed and compacted to a desired resistance force before a subsequent lift is added. The plugs, however, have some vulnerabilities. Until vegetation becomes densely established on the plugs, there is erosion potential on the meadow-level plug tops. In addition, this alternative leaves gully-depth topographic depressions throughout the meadow, as ponds. Most ponds are designed to maintain a water level close to the meadow surface, but several may have water levels up to 2 feet below meadow surface elevation at their upper end. Water will drain from the meadow or upstream plug surface to these lower levels, and as it cascades over the edge into the pond, this lip of meadow is a knickpoint where head cutting may occur. Additional risks are associated with any plug failing to retain its designed pond level, which will then increase the potential for cascading flow and groundwater piping into the unfilled depression. Each pond would be monitored during and after restoration (for 3-5 years) for headcut formation and erosion. Maintenance may be necessary if the monitoring detects this.

The ponds would have similar or lower sedimentation rates as for the hand-built structures in Question 16, because sediment-carrying surface water flows would remain on the surface and spread out onto the meadow and into relict channels, and thus by design would avoid the ponds. As such, the ponds would be anticipated to be long-term features of the meadow should this method be incorporated into the selected final designs.

Q24: Why would the combination of methods use more fill than the intermittent option?

The combination of methods, also known as the hybrid design, would include gully segments of full fill in addition to gully segments of intermittent fill and Beaver Dam Analogs. The BDAs would be used in shallower gully segments that would not require much soil to fill to the meadow surface. The full fill segments, however, would use much more fill than the intermittent fill. Thus, the hybrid would likely require a fill volume somewhere in between the full fill and intermittent fill options.

Q25: What does "enhance within the gully network" mean?

In relation to the beaver dam analog alternative, "enhance within the gully network" refers to increasing water retention and water saturation to support meadow and wetland vegetation. This restoration would take place at a lower elevation than the meadow surface, within the gullies themselves.

Q26: Can you supply a map with the boundary lines?

Yes, please see Attachment A below.

Q27: Any changes to the Aspen Valley road/access?

No, there will be no changes to the Aspen Valley Road or road access as a result of this project.

Q28: Any changes to Evergreen Road shoulder parking/access?

We do not currently plan any changes to parking at the Evergreen Road turnout area where most people park other than to clearly delineate the edge of parking to contain vehicles within this area.

Q29: There are "dispersed camping" sites along Ackerson Creek, West of Evergreen Road. Are these within the project? Can they be improved, i.e., moved further from the creek and suchlike?

The area west of Evergreen Road is outside the project area and thus not within the scope of the project.

Q30: The NPS has stated that there are no historical buildings on the parcel. Some might dispute this.

The park has not completed National Register of Historic Places documentation for the barn. For the purposes of consultation with the State Historic Preservation Office (SHPO), the park and Forest are seeking SHPO concurrence that the barn in Ackerson Meadow can be treated as eligible for listing on the National Register of Historic Places.

Q31: Are the Forest Service Roads IS25 and IS89, to the North of Ackerson Meadow (currently used for cattle and fishing access to the Middle Fork of the Tuolumne) affected?

The team has identified potential staging and fill borrow areas off these roads, but no changes in access are planned.

Q32: Which roads and trails in the meadow itself be eliminated, converted, restored, improved?

The only recently used road and trail we know of in the meadow is between the Evergreen Road Turnout and the barn, and there is currently no plan to change that use as a trail. We will look comprehensively at how to provide visitor access to the meadow, but no major new development is planned. Short sections of two roads in the upland forest between the two meadows are proposed for outsloping or obliteration in association with the Full Fill and Intermittent Fill options, with fill soil collected as part of the recontouring process. These are both short spur-roads that are no longer needed for cattle or timber operations, given the donation of the land parcel to Yosemite National Park and the anticipated land exchange between the Forest Service and Park Service.

Q33: What are the considerations regarding traffic when filling the eroded areas?

A traffic control plan would be required to manage traffic flows during the project for either Full or Intermittent Fill concepts. Thank you for pointing out this issue.

Q34: How will it be minimized and how will the land be restored to recover loss of natural habitat?

Wildlife biologists will specify mitigations to protect critical habitat and birds during breeding season. In particular, maintaining adequate willow habitat during restoration will be carefully planned. Western pond turtles will be removed from the project area and relocated before the gully is disturbed. Measures to prevent invasive non-native bullfrogs from occupying the meadow are being considered. Wildlife impacts will be analyzed in the environmental analysis for public review in early 2021.

Q35: Where will the material that will be introduced come from and what precautions have been taken to mitigate material containing evasive plant, insects etc.?

Fill sources are proposed from borrow sites in surrounding upland areas burned during the 2013 Rim Fire. As much as possible, we will propose borrowing from disturbed sites with few green trees, and dead trees will be removed and ground for wood chips to add to the fill. We will avoid archeological sites, critical wildlife habitat, and sites with invasive plants. We will look for co-benefits like outsloping bermed dirt roads that are no longer used. We will also continue to search for suitable mineral soil that is generated as waste from other projects in the area, such as road repairs, new construction, or facility maintenance. However, these fill sources must have low risk of introducing invasive plants and must have a suitable percentage of fine sand and silt (vs. large rock) for a meadow.

Q36: How much area will be limited, unauthorized or completely removed from public access? Before, during and at the completion of the restoration process.

During restoration construction activities, the park and Forest will close the site to the public for safety reasons. When heavy equipment work is complete, the public will have full access to the site as prior to the project.

Q37: Will there be an introduction of predatory and other animals such as beaver that once inhabited the wetlands? If so, has there been decisions made and who was involved?

See answer to Q18. We are not proposing to introduce beaver or predatory animals. We would like to further assess the role of beaver as geomorphic agents for meadow formation and maintenance in this region of the Sierra Nevada.

Q38: Is the grazing mention be in the same areas and how will that be brought to acceptable restoration standards?

Grazing will continue on USFS-administered lands as shown in the map on Attachment A. Also see answer to Q14.

Q39: Where did the characterization for the ultimate restoration plan originate?

Subject matter experts from Yosemite National Park and Stanislaus National Forest contributed ideas and collaborated with contractors with experience in this type of restoration on NPS, USFS, and FWS lands (Evan Wolf, Randy Westmoreland, Damion Ciotti). See answer to Q12.

Q40: How much will it cost? How long will it take? What if the budget is surpassed, who will ensure the land will not be compromised?

Depending on which alternative is selected, restoration could cost tens of thousands of dollars annually for many decades to build and maintain hand-built structures, or several million dollars over a shorter time period to partially or fully fill the erosion gully. We will apply for California Parks and Water Bond Act (proposition 68) grants and other funds that support watershed and wetland restoration. The Yosemite Conservancy and its donors may continue to support the ecological restoration of this property that they helped acquire. Any funding proposal should contain contingency funds and adequate maintenance dollars to ensure the project is a success. We anticipate having a NEPA decision document in Spring 2021 after completing an environmental analysis, then will begin seeking funding for implementation.

Q41: Will there be charitable contribution portals?

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Yosemite Conservancy is currently funding most of the restoration planning and compliance through charitable contributions. They may continue to support the implementation of this project in the future, and would provide avenues for contributions by interested public.

Attachment A