Hanson Russian River Ponds Floodplain Restoration: Feasibility Study and Conceptual Design

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# Contents

**Executive Summary**

1 Introduction

1.1 The Problem: Loss of Historical Floodplains

1.2 The Opportunity

1.3 Reclamation of the Hanson Ponds: Evolving Strategies

1.4 Project Purpose, Feasibility Study Goals and Objectives

1.5 Project Design Considerations

1.6 Feasibility Study Conclusions and Project Implementation

1.7 Feasibility Study Report Purpose

2 Approach and Methodology

2.1 Establish project structure

2.2 Conduct stakeholder outreach

2.3 Complete literature review

2.4 Compile existing and collect new data

2.5 Complete Phase I and II Environmental Site Assessments

2.6 Complete watershed assessment for the Russian River

2.7 Engage Scientific Working Group and Peer Review Panel

2.8 Complete Stage I modeling for preliminary floodplain elevations

2.9 Complete Stage II modeling to refine terrain model and characterize the best restoration concept

2.10 Develop the restoration design concept

3 Data Compilation and Collection

3.1 Topographic data collection

3.2 Bathymetric data collection

3.3 Creating the digital terrain model

3.4 Soil and sediment sampling for grain size distribution and fill characterization

3.5 Soil and sediment sampling for contaminants

3.6 Water sampling for contaminants

3.7 Hanson ponds temperature and dissolved oxygen profiles, and water clarity data collection

3.8 Characterization of fish assemblages of the Middle Reach ponds

3.9 Middle Reach hydrology and hydraulics

4 Russian River Watershed Land Use History, Existing Conditions, and Field Investigation Results

4.1 Watershed land use history

4.1.1 Watershed description

4.1.2 Watershed assessment

4.1.3 Historical ecology of the Middle Reach

4.1.4 History of development and land use changes in the Middle Reach

4.1.5 Hanson Russian River Ponds: Mining and reclamation history and status

4.2 Existing conditions

4.2.1 Sediment transport in the Middle Reach

4.2.2 Hydromodification impacts on habitat

4.2.3 Hydrology, hydraulics and groundwater

4.2.4 Biogeochemistry
4.2.5 Status of salmonid populations and critical habitat in the Russian River Basin........4-32
4.2.6 Vegetation types and aquatic habitat restoration potential........................................4-41
4.3 Field investigation results ............................................................................................4-47
  4.3.1 Topographic mapping ..............................................................................................4-47
  4.3.2 Sediment and water quality characterization..........................................................4-56
4.4 Characterizing the fish assemblage of Middle Reach ponds........................................4-69
  4.4.1 Background and purpose.........................................................................................4-69
  4.4.2 Results of fish investigations of the Hopkins, Doyle and Passalaqua ponds........4-70
  4.4.3 Fish sampling of the Hanson Richardson pond....................................................4-72
  4.4.4 Fisheries summary................................................................................................4-73
4.5 Existing conditions summary......................................................................................4-74

5 Literature Review...........................................................................................................5-1
  5.1 Key findings of literature review.................................................................................5-1
  5.2 Implications for restoration goals...............................................................................5-2
  5.3 Selected abstracts......................................................................................................5-4

6 Restoration Goals and Objectives..................................................................................6-1
  6.1 Project goal ................................................................................................................6-2
  6.2 Geomorphic goals......................................................................................................6-2
  6.3 Flood elevation goal ................................................................................................6-2
  6.4 Fisheries goals...........................................................................................................6-3
  6.5 Aquifer restoration goal.............................................................................................6-4
  6.6 Water quality goals..................................................................................................6-4
  6.7 Vegetation community goals ....................................................................................6-4
  6.8 Public amenities goal................................................................................................6-5

7 Restoration Scenario Modeling Approach, Methodology and Results.................................7-1
  7.1 Developing terrain concepts ......................................................................................7-1
  7.2 Defining floodplain elevations..................................................................................7-1
  7.3 Stage I: Digital terrain modeling...............................................................................7-2
  7.4 Results of Scientific Working Group and Peer Review Panel review.......................7-4
  7.5 Stage II: Developing the superior terrain concept......................................................7-4
  7.6 Design and construction feasibility review..............................................................7-6
  7.7 Preferred Scenario II-E scenario..............................................................................7-7

8 Evaluation of the Physical and Biological Responses in Alternative Restoration Scenarios..........8-1
  8.1 Hydraulic and sediment transport modeling summary..............................................8-1
  8.2 Evaluation of physical responses to modeled restoration alternatives.....................8-1
    8.2.1 Fine sediment predictions.....................................................................................8-6
    8.2.2 Vegetation predictions.........................................................................................8-7
  8.3 Evaluation of the biological response to modeled restoration alternatives................8-8
    8.3.1 Evaluation salmonid population benefits.............................................................8-16
    8.3.2 Estimating rearing habitat extent.........................................................................8-18
    8.3.3 Estimating spawning habitat extent......................................................................8-19
    8.3.4 Evaluating non-native fish assemblage and salmonid population dynamics........8-19
9 Evaluation of Restoration Alternatives

9.1 Evaluating the restoration alternatives

9.2 Recommended restoration alternative and associated floodplain restoration benefits

10 Recommended Restoration Alternative Conceptual Design

11 Feasibility Study Conclusions and Next Steps

11.1 Regulatory feasibility

11.2 Legal feasibility

11.3 Financial feasibility

11.4 Summary, conclusions and next steps

Literature Cited

Appendices - all separate documents

A. Russian River Watershed Assessment

B. San Francisco Estuary Institute Historical Ecology Report

C. Scientific Working Group Meetings Summaries

D. Literature Review

E. Results of Phase I and II Environmental Site Assessments, Laboratory Results, and NOAA’s NMFS Water Quality Summary

F. Affiliated Researchers, Inc., Summary Report


H. Water Quality Profiles

Figures

Figure 1.1. The Russian River watershed and Hanson property location map

Figure 1.2. The Hanson Russian River Ponds

Figure 1.3. Gravel ponds in the Middle Valley

Figure 1.4. Aerial view of gravel ponds along the Russian River Middle Reach

Figure 2.1. Project structure for the Feasibility Study

Figure 3.1. LiDAR coverage

Figure 3.2. Russian River hydrograph during the bathymetry surveys

Figure 3.3. Russian River Middle Reach digital terrain model

Figure 3.4. Terrestrial sediment sampling locations around the Hanson ponds

Figure 3.5. Russian River channel sediment sample locations

Figure 3.6. Hanson pond locations for sediment and soil samples

Figure 3.7. Location of Hanson ponds soil and sediment samples for contaminants

Figure 3.8. Soil, sediment, and water quality sample locations in the Russian River channel

Figure 4.1.1. The Russian River watershed showing major streams and alluvial valleys

Figure 4.1.2. Historical ecology of the Middle Reach Valley of the Russian River

Figure 4.1.3. Changes in the Middle Reach of the Russian River

Figure 4.1.4. Topographic map series of the Middle Reach

Figure 4.1.5. Reduction of the Middle Reach floodplain by 75%

Figure 4.1.6. Gravel mining ponds in the Middle Reach
Figure 4.2.1. Changes in sinuosity of the Russian River Middle Reach ........................................4-13
Figure 4.2.2. Channel bed elevation and slope changes over time ...........................................4-14
Figure 4.2.3. Channel incision at Storey Creek ........................................................................4-15
Figure 4.2.4. Levee washout at Syar ponds .............................................................................4-15
Figure 4.2.5. Bank erosion in the Middle Reach ......................................................................4-16
Figure 4.2.6. Connection between Hanson Richardson Pond and the Russian River ..........4-16
Figure 4.2.7. Sonoma County Water Agency reservoirs and infrastructure ........................4-20
Figure 4.2.8. Annual flows in the Middle Reach and at the Hanson site ................................4-21
Figure 4.2.9. Recent dry season flows in the Middle Reach and at the Hanson site ............4-21
Figure 4.2.10. Geologic map of the Middle Reach Valley .......................................................4-22
Figure 4.2.11. Gaining and losing reaches of the Russian River ...........................................4-24
Figure 4.2.12. Project reach hydrology selected for modeling ..............................................4-26
Figure 4.2.13. Map of the Russian River Watershed Total Maximum Daily Loads ...............4-29
Figure 4.2.14. Thermal stratification of the ponds .................................................................4-30
Figure 4.2.15. Key drivers and controllers of water quality processes at the Hanson ponds ....4-31
Figure 4.2.16. Important internal biogeochemical processes that influence Hanson pond water quality ..................................................................................................................4-31
Figure 4.2.17. Decline of California and Central Coast Coho salmon populations in the late 20th century ...............................................................................................................................4-34
Figure 4.2.18. Adult Chinook salmon returns at Van Arsdale Fisheries Station ....................4-35
Figure 4.2.19. Adult Chinook salmon returns at Benbow Dam fish ladder ...........................4-36
Figure 4.2.20. California Coastal Chinook salmon population counts in the Russian River ...4-36
Figure 4.2.21. Russian River steelhead: California Department of Fish and Game early century estimates/casts ......................................................................................................................4-38
Figure 4.2.22. Adult steelhead returns at Warm Springs Fish Hatchery ..................................4-39
Figure 4.2.23. Potential floodplain restoration areas in the lower Russian River watershed ....4-40
Figure 4.2.24. Plant communities of the Russian River watershed .......................................4-41
Figure 4.2.25. Emergent wetland plant community in the lower Klamath River Basin ........4-43
Figure 4.2.26. Seasonal wet meadow plant community in the lower Klamath River Basin ..4-43
Figure 4.2.27. Floating aquatic vegetation plant community of the lower Sacramento River 4-44
Figure 4.2.28. Developing woodland wetland plant community along Willow Creek in the lower Russian River ..............................................................4-44
Figure 4.2.29. Existing vegetation types of the Hanson property ............................................4-46
Figure 4.3.1. Middle Reach Valley digital terrain model ........................................................4-47
Figure 4.3.2. Topographic map of the Hanson Piombo pond ................................................4-49
Figure 4.3.3. Topographic map of the Hanson Mariani pond ................................................4-50
Figure 4.3.4. Topographic map of the Hanson Richardson pond .........................................4-51
Figure 4.3.5. Topographic map of the Hanson Vimarke pond ...............................................4-52
Figure 4.3.6. Topographic map of the Syar ponds .................................................................4-53
Figure 4.3.7. Bathymetry traces for a short example reach of the river channel in the vicinity of the Richardson pond ........................................................................................................4-54
Figure 4.3.8. Example of short section of the river channel bathymetry integrated into grid mesh of LiDAR derived topography of the Middle Reach floodplain ..........................4-55
Figure 4.3.9. LiDAR coverage of the Middle Valley with the project area outlined in red ...4-56
Figure 4.3.10. Wentworth particle size scale .........................................................................4-57
Figure 4.3.11. Terrestrial sediment sampling locations around the Hanson ponds ..............4-58
Figure 4.3.12. Hanson pond core sampling locations for sediment texture and geochemical analyses .........................................................................................................................4-61
Table 7.1. Summary of data compilation and collection.........................................................3-2
Table 4.3.1. Existing dimensions of the Hanson ponds..........................................................4-48
Table 4.3.2. Terrestrial material sample properties.................................................................4-59
Table 4.3.3. Texture of Hanson pond sediment core samples...............................................4-62
Table 7.1. Digital terrain models developed for evaluation in Stage I of the feasibility study.....7-3
| Table 7.2. | Hydraulic modeling results | 7-4 |
| Table 7.3. | Construction review meeting participants | 7-6 |
| Table 7.4. | Descriptions of terrain scenarios developed for consideration in Stage II | 7-9 |
| Table 8.1. | Estimated salmonid population for Scenario II-E | 8-17 |
| Table 9.1. | Evaluation of scenarios | 9-2 |
Executive Summary

Sonoma County’s Russian River valleys are well known for their scenic beauty, surrounding rolling hills, oak woodlands, extensive vineyards, and fine wines. Less well known is that many of these valleys have channelized streams and levees, and retired gravel mining ponds along the river banks, a legacy of open pit aggregate mining. The Middle Reach Valley of the Russian River, where the Hanson Russian River Ponds Floodplain Restoration Project is located (Figure A), has approximately 800 acres of these gravel ponds (Figure B). The ponds are separated from the river by an unstable levee system preventing the river from connecting with the floodplain, thus eliminating ecologically critical off-channel slow shallow water floodplain habitats. Historically the broad alluvial valley habitats provided critical nursery, rearing, and refuge habitat for juvenile steelhead, coho and Chinook salmon – all federal Endangered Species Act listed species. The historical floodplain also afforded critical habitat for other sensitive native wildlife species such as western pond turtle, foothill yellow-legged frog, and migrating songbirds and waterfowl.

The 358-acre Hanson property, located just west of the Sonoma County town of Windsor, includes four retired gravel ponds (Figure C) providing an opportunity to address the extensive ecological losses within the reach. With the support of the property owner, Hanson Aggregates Mid-Pacific, Inc., the Endangered Habitats Conservancy, NOAA’s National Marine Fisheries Service, Sonoma County Permit and Resource Management Department, California State Coastal Conservancy, and U.S. Geological Survey completed this feasibility study evaluating ecological restoration alternatives for the Hanson property.

The feasibility study identified a restoration alternative that achieves the primary project goal of re-establishing a stable seasonal river-floodplain interface. This re-connection will begin to unwind and restore essential ecological attributes and habitat-forming processes to the Russian River ecosystem and address a primary project objective of contributing to the recovery of listed steelhead, coho, and Chinook salmon. Additional project objectives include establishing science-based standards and strategies for similar river restoration projects; promoting and demonstrating the use of the state Surface Mining and Reclamation Act (SMARA) to achieve ecosystem restoration; and accommodating public access for recreation, environmental education, and wildlife observation.

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Figure A. The alluvial valleys of the Russian River watershed. The Hanson Russian River Ponds Floodplain Restoration Project is located in the Middle Reach Valley just west of the town of Windsor, Sonoma County.
The Russian River’s Middle Valley has over 800 acres of gravel ponds along its banks.

Figure B. Gravel ponds in the Middle Valley.

Hanson Property

Riverfront Regional Park
The Russian River Middle Reach of the Past

A 2014 historical ecology study by the San Francisco Estuary Institute indicates the Middle Reach alluvial floodplain and riparian forests were seasonally inundated by winter river flows that provided abundant off-channel shallow water floodplain habitats rich in food resources for fish and wildlife. The floodplain was a dynamic matrix of landscape features including meandering channels, tributary sloughs, spring-fed blind channels, oxbow lakes, seasonal wetlands, marshes, and extensive riparian forest. The river channel was relatively shallow and winter inundations spread across a large area, making these seasonal flood events a time of enhanced and highly productive fish habitat. The feasibility study examined restoration strategies that would recover those lost physical properties and ecological functions, and addressed other compromised hydro-geomorphic conditions such as increased flooding, ongoing channel incision, bank instability, and water quality related issues.

The Russian River Middle Reach Today

Analysis of current versus historical conditions shows that the eight-mile Russian River Middle Reach Valley’s geomorphic and ecological attributes are degraded to historic lows. Channel straightening, dredging, and levee building during the 1950s and 60s left the river bed deeply incised and isolated from the floodplain during all but the largest storm events. Subsequent decades of floodplain encroachment for aggregate mining and various land uses further diminished the ecological value of the reach, and the river continues to incise. Not surprisingly, the incised channel and over-steepened banks and levees separating the river from the floodplain and terrace gravel mining ponds are geotechnically unstable requiring frequent, expensive, and difficult to permit repairs.

Although the river has perennial flow, current conditions provide poor habitat for salmonids and other native fish. Even though the Russian is historically one of California’s largest gravel bed rivers, the Middle Reach river channel today has essentially no suitable spawning gravel habitat for salmonids. During high flow events, the leveed and straightened channel provides little refuge from the artificially high water velocities and scant suitable refuge or rearing habitat. Furthermore, the ponds themselves provide ideal habitat for warm water non-native fish such as largemouth bass that prey on ESA-listed juvenile salmonids and native amphibian species.

Water quality in the Middle Reach is impacted by fine sediment during winter runoff events, and there are no remaining sediment deposition zones in the valley except during extreme flood events. In summer months, nutrient rich and artificially warmed water flows subsurface from the ponds into the river affecting downstream water temperature and quality. The deep, stratified ponds also promote biogeochemical processes that convert naturally occurring mercury into highly toxic methylmercury, and accumulate and cycle nutrients resulting in eutrophic conditions in the bottom of the ponds. This is a significant issue as the gravel ponds sit atop the relatively small and shallow alluvial aquifer that is the drinking water source for 600,000 residents in Sonoma and Marin Counties.

Feasibility Study Outreach and Engagement

The feasibility study plan involved extensive outreach to stakeholders including agricultural interests, conservation groups, and adjacent landowners. Led by then-Sonoma County Supervisor Mike McGuire, several scoping meetings were held with resource and regulatory agencies, and local conservation organizations. The scoping meetings focused on long-standing concerns about the existing reclamation plans for the Hanson property, the feasibility study work plan, feasibility study goals and objectives, and ideas for developing an ecologically superior restoration plan for the property.
This advisory group became the Partners Planning Group offering input at key junctures during the development of the feasibility study. A Management Team, consisting of Endangered Habitats Conservancy (EHC), NOAA’s National Marine Fisheries Service (NMFS), Sonoma County Permit and Resource Management Department (PRMD) and the California State Coastal Conservancy (SCC), also convened the Scientific Working Group (SWG), a multidisciplinary panel of 30 technical experts and the smaller Peer Review Panel. The SWG reviewed the modeling methodology and evaluated results for several restoration scenarios, ultimately identifying the restoration alternative that best achieved the SWG-identified project goals and objectives. Throughout the study, the Peer Review Panel provided guidance to the Management Team and SWG in developing project goals, objectives, the alternatives analyzed, and feasibility study report conclusions.

**Key Feasibility Study Findings**

The feasibility study employed an analytical framework guided by the restoration goals and objectives to explore a range of restoration alternatives. The development of the study was also guided by a review of relevant scientific literature. The literature search helped identify feasible restoration priorities, information gaps, necessary additional field data, and direct existing data compilation. A key component of the feasibility study was the contribution from the U.S. Geological Survey Geomorphology and Sediment Transport Laboratory of Golden, Colorado. The lab used state-of-the-art multidimensional surface-water and sediment transport/landscape evolution modeling of the eight-mile Middle Reach channel to evaluate the performance of restoration alternatives. Figure D illustrates the consensus restoration alternative that best achieves the geomorphic and ecological restoration goals and objectives of the project.

*Research indicates restored off-channel and wetland habitat complexes may support fish population densities as much as five times greater and growth rates up to six times higher than main channel habitats for coho salmon and other salmonid species endemic to the Russian River Basin (Swales and Levings 1989; Sommer et al. 2001, Hiner et al. 2009; Morley et al. 2005; Limm and Marcheti 2009; Peterson 1982).*

*The feasibility study determined that the preferred alternative is feasible and accomplishes the following project goals and objectives:*

1. **Significantly increase salmonid habitat** by an order of magnitude including spawning gravels and shallow off-channel calm water winter and spring nursery, rearing, and refuge habitat for salmonids.

2. **Make a significant contribution to recovery** of the federally- and state-listed Central California Coho salmon population, and federally-listed California Coastal Chinook salmon, and Central California Coast steelhead populations, and provide population level benefits for multiple federally- or state-listed Species of Special Concern.

3. **Significantly reduce production of non-native fish populations** that prey on native fish species by eliminating the warm water habitats favored by the predators.

4. **Halt ongoing river bed degradation** and scour by significantly reducing Middle Reach river flood elevations and water velocities, thus minimizing the erosive scour potential which has resulted in ongoing channel bed incision and destabilization of banks during high flow events.
5. **Improve onsite and downstream water quality** by eliminating the artificial open water ponds that seep warm water into the river, and by restoring annual seasonal floodplain sediment deposition to the reach.

6. **Stimulate ecosystem productivity** by restoring the natural seasonal floodplain pulse-flow dynamics of the valley, and increase aquifer recharge by restoring extensive annual floodplain inundation for significant durations in the winter and spring.

7. **Enhance overall ecosystem function** by restoring connectivity between the river channel and off-channel floodplain shallow water habitats, and seasonal aquatic ecotone interactions with riparian and upland habitats.

8. **Promote recovery of native flora and fauna** by restoring the natural seasonal variability of floodplain and river channel habitat complexity, and natural seasonal heterogeneity and connections of off-channel aquatic habitats under which native species have evolved and flourished.

9. **Restore the structure and function of the riparian corridor** by restoring the landforms and physical processes necessary for supporting a natural riparian vegetation progression from aquatic beds to mature seral stage upland riparian forests.

10. **Lowers water surface elevations** in the study area by approximately 1 meter for all flood flows including the 100-year flood event.

11. **Present an ecologically superior, feasible, and exemplary alternative to typical SMARA reclamation plans**, thus providing a science-based rationale to promote the use of SMARA to accomplish ecological restoration goals.

12. **Provide recreational and environmental education opportunities** compatible with ecosystem restoration.
Figure C. The current configuration of the Hanson Russian River Ponds.
Figure D. Hanson Russian River Ponds Floodplain Restoration Conceptual Design.
**Next Steps**

Next steps toward the implementation of the preferred restoration scenario include:

- Secure approval from Sonoma County Permit and Resource Management Department and California Department of Conservation Office of Mine Reclamation for an amended reclamation plan that facilitates the initiation of the preferred ecological restoration alternative.

- Complete CEQA/NEPA review (Mitigated Negative Declaration or Environmental Impact Report), including impact analysis, detailed design and engineering plans.

- Concurrently, develop the implementation budget and funding strategy that includes a monitoring and adaptive management plan.

- Secure funding for preferred ecological restoration alternative.

- Secure fee title transfer from Hanson to Endangered Habitats Conservancy at no cost.

- Complete engineering and design of preferred restoration alternative and construct ecologically superior restoration plan over one or two construction seasons.

- Once restoration is complete, transfer property for long-term management and operation to an appropriate partner. Sonoma County Regional Parks has expressed interest in accepting the property to establish a campground, trails, and kayak launch to expand public access to the Russian River.