PROJECT GOAL – DELIVER 50 GALLONS PER MINUTE OF FLOW TO REDWOOD CREEK JULY - NOVEMBER

~50 gal/minute flow in creek

Zero flow conditions occurring for ~3 summer months during typical dry season
STORAGE POND LOCATION
PROJECT DESIGN OVERVIEW

• 16 million gallon pond

• Input from rainwater catchment and diversion during wet season

• Managed outflow to Redwood Creek

• Gully remediation in adjacent tributaries
FLOW AUGMENTATION DELIVERY POINT INTO REDWOOD CREEK
GEOMORPHIC ASSESSMENT

- Identify and characterize site geomorphology and potential hazards
- Assess risks associated with potential hazards
- Support opportunities and constraints assessment
- Inform project designs
Assessment Approach

- Topographic survey integrated with 2007 NCALM LiDAR
- Existing data review
  - Geologic mapping
    (McLaughlin et al. 2000 - USGS Miscellaneous Field Studies MF-2336)
  - Geomorphic/landslide mapping
    (Spittler 1984 - DMG Open-File Report 84-10)
  - Historical aerial photos
- Geomorphic mapping and site assessment
- Geotechnical investigation
GEOTECHNICAL INVESTIGATION

- Three deep (~50 ft) geotechnical borings on $Qt_2$
- Three ~10 ft deep test pits on $Qfp_2$
- One ~10 ft test pit on $Qt_2$
- Six groundwater wells with data loggers
Geotechnical borings on Qt₂

- 8-19 ft deposit of silt with sand (overbank deposit)
- Approximately 8 ft fining upward deposit of silty sand with gravel (channel lag fining upward into overbank deposit)
- Fractured siltstone shale bedrock 16-27 ft below ground surface (629-633 ft elevation)
- Hydraulic conductivity ~3x10⁻⁷ to 8x10⁻⁶ cm/sec (very slowly permeable)
HYDROLOGIC EVALUATION

FILLING RESERVOIR:
• Determine minimum annual precipitation
• Data sources:
  • Mattole Restoration Council
  • PRISM
• 5th percentile = 45”; we are using 48”

Briceland Annual Precipitation (interpolated from PRISM)
<table>
<thead>
<tr>
<th>SOURCE TO FILL RESERVOIR</th>
<th>POTENTIAL PRODUCTION (MILLION OF GALLONS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Rainfall</td>
<td>6</td>
</tr>
<tr>
<td>Sheet Flow from Hillslope (2.5 acres, C=0.4)</td>
<td>1.3</td>
</tr>
<tr>
<td>Diversion from Eastern Tributary (20 acres, C=0.2)</td>
<td>1.1</td>
</tr>
<tr>
<td>Diversion from Western Tributary (20 acres, C=0.2)</td>
<td>5.2</td>
</tr>
<tr>
<td>Diversion from Redwood Creek (60 gpm for 90 days)</td>
<td>7.8</td>
</tr>
<tr>
<td>Total</td>
<td>21.4</td>
</tr>
</tbody>
</table>
DESIGN ALTERNATIVES

• Up to ~21.5 million gallon pond

• Input from multiple sources

• Outflow to filtration/cooling gallery, then to Redwood Creek

• Passive or managed outflow?

• Gully remediation in adjacent tributaries
## DESIGN ALTERNATIVES

<table>
<thead>
<tr>
<th>POND VOLUME (MILLIONS OF GALLONS)</th>
<th>POND VOLUME MINUS EVAPORATION LOSS (MILLIONS OF GALLONS)</th>
<th>FLOW BENEFIT WITH MECHANIZED OUTFLOW VALVE, ASSUMES 5 MONTH RELEASE TIME (GPM)</th>
<th>FLOW BENEFIT WITH PASSIVE OUTFLOW, ASSUMES 8 MONTH RELEASE TIME (GPM)</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td>4.0</td>
<td>19</td>
<td>12</td>
<td>Fills with rainfall only</td>
</tr>
<tr>
<td>8.5</td>
<td>5.7</td>
<td>26</td>
<td>16</td>
<td>Fills with rainfall, hillslope, and eastern tributary</td>
</tr>
<tr>
<td>13.5</td>
<td>9.0</td>
<td>42</td>
<td>26</td>
<td>Fills with rainfall, hillslope, eastern tributary, and western tributary</td>
</tr>
<tr>
<td>16.3</td>
<td>10.9</td>
<td>50</td>
<td>31</td>
<td>Fills with rainfall, hillslope, eastern tributary, and water pumped from Redwood Creek</td>
</tr>
<tr>
<td>21.5</td>
<td>14.3</td>
<td>66</td>
<td>41</td>
<td>Maximum capacity based on site and hydrologic constraints</td>
</tr>
</tbody>
</table>

Maximum capacity based on site and hydrologic constraints.
EXPECTED STREAM FLOW RESULTS

Graphic representation of post-project hydrograph

- Redwood Creek Prorated from SF Eel
- RC-1.8
- Redwood Creek Discharge with Diversion
- RC-1.8 with Flow Enhancement

60 GPM diversion from December 15-Mar15 represents 0.3% of total discharge during this period.

Data plotted on logarithmic scale, 0.01 on this figure represents "0" or "no flow".

Assumed discharge following significant precipitation event.
• Water Rights - need appropriative water right to fill pond from diversion

• This project fits into broader conservation efforts on the Marshall Ranch with the entire ownership under protection with a Conservation Easement

• Operations and Maintenance - Solar array added to project to cover long term O&M

• Emergency Fire Suppression Integration - Working with BVFD to include fire suppression component - additional tanks and pump system included in overall plan; will seek funding from additional sources
CURRENT PROJECT STATUS

- Currently developing 65% engineering design plans; CEQA permitting process also underway
- Apply for construction/implementation grant funding in September
- Start of construction target date: June 2021
GENERAL POND PLANNING AND DESIGN CONSIDERATIONS

- **Choosing pond location:**
  - Gentle/stable terrain
  - No drainages or wetlands

- **Sizing pond**
  - Estimate water use
  - Site constraints
  - How to fill pond

- **Lined or unlined?**

- **Permitting:**
  - typically only need Grading Permit from Humboldt County

- **Issues with cannabis**