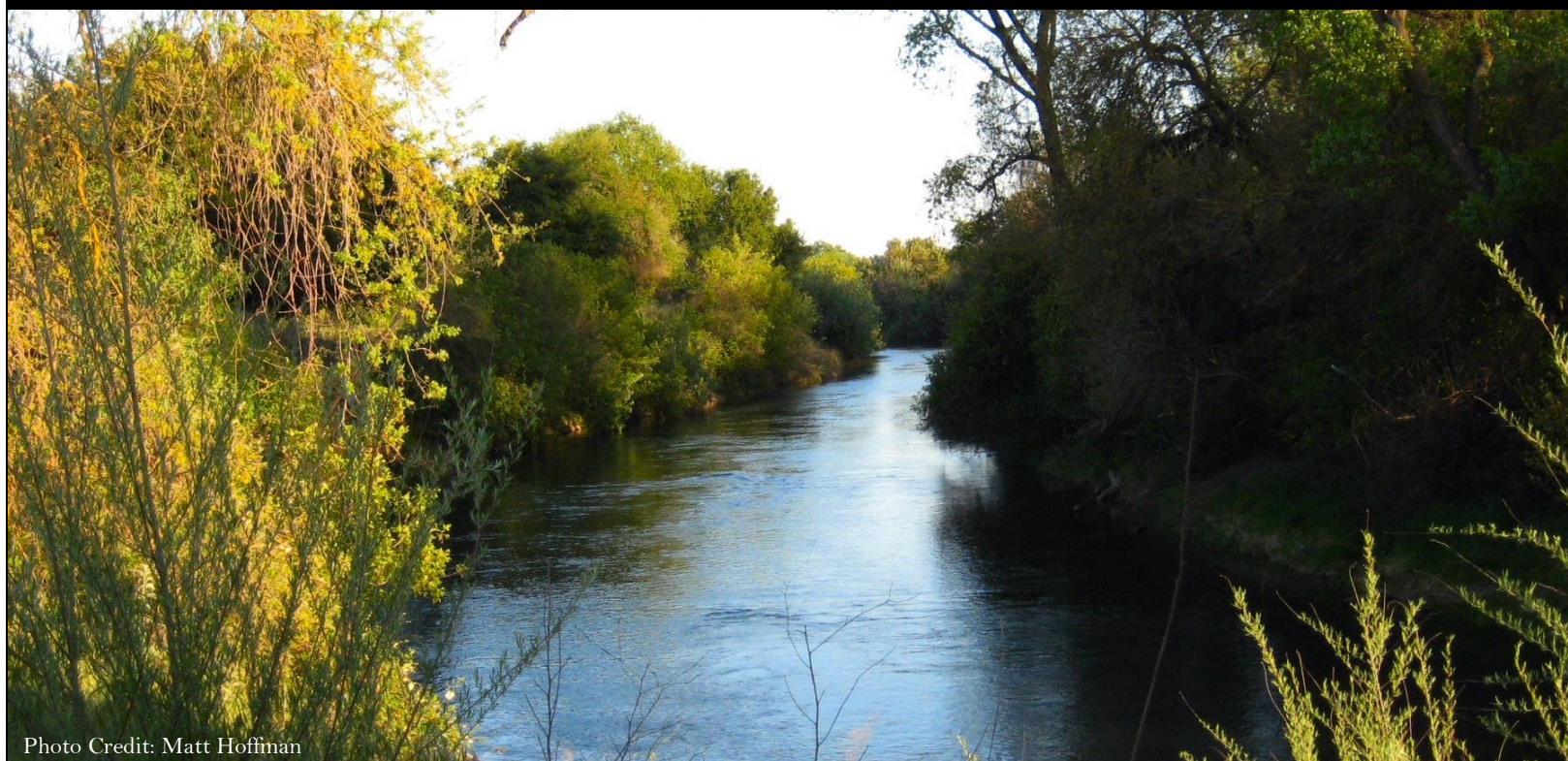


Lower Mokelumne River Restoration Assessment



In 2014, Sustainable Conservation set out to conduct an assessment to provide a high-level view of the environmental benefits and costs of conducting riparian restoration along the Lower Mokelumne River, to help address an information gap identified by local stakeholders and inform outreach and funding decisions for restoration.

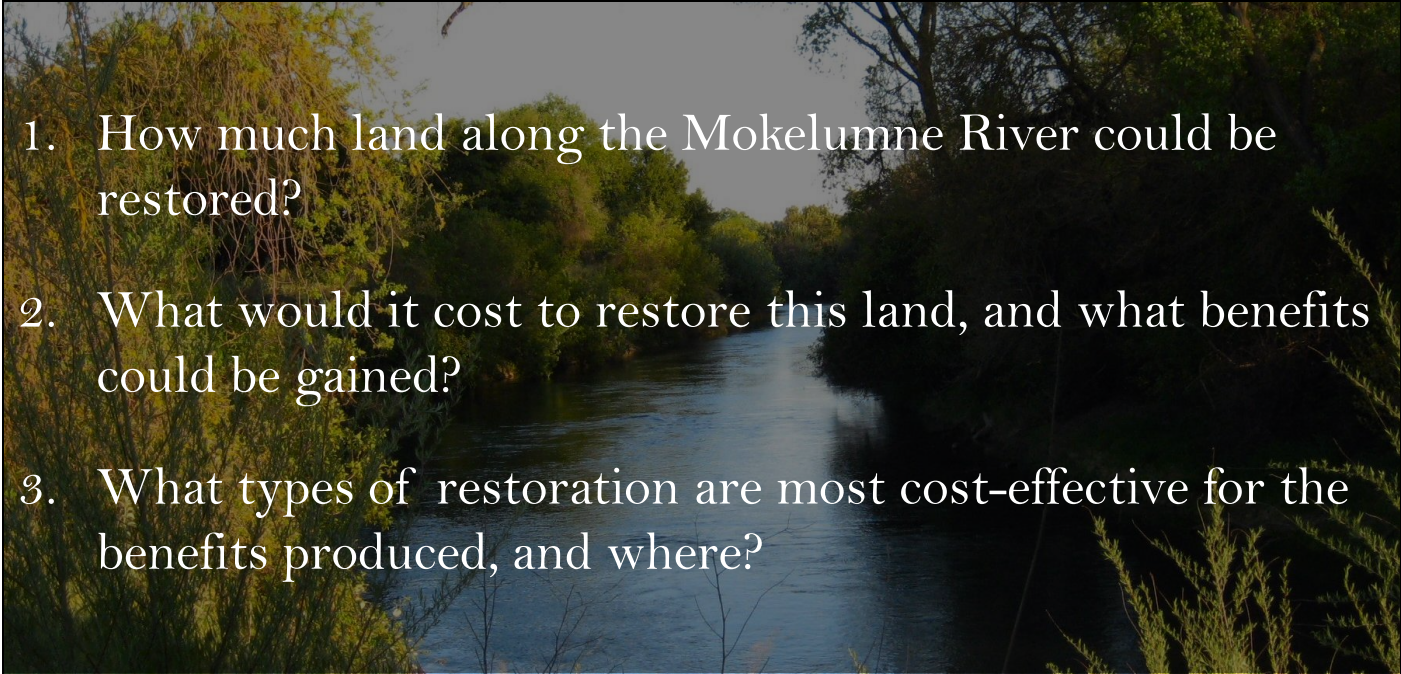
Lower Mokelumne River Restoration Assessment

Primary goal:

Provide decision support info for more efficient and effective resource allocation for restoration

Our hope is for this information to be a valuable decision support tool to help public agencies, conservation practitioners, and stakeholder groups effectively target limited resources to achieve the greatest environmental benefit from riparian restoration. The result – achieving conservation outcomes like clean water and wildlife habitat in a more cost-effective way – is a win-win for the environment, landowners, and restoration funders.

Lower Mokelumne River Restoration Assessment

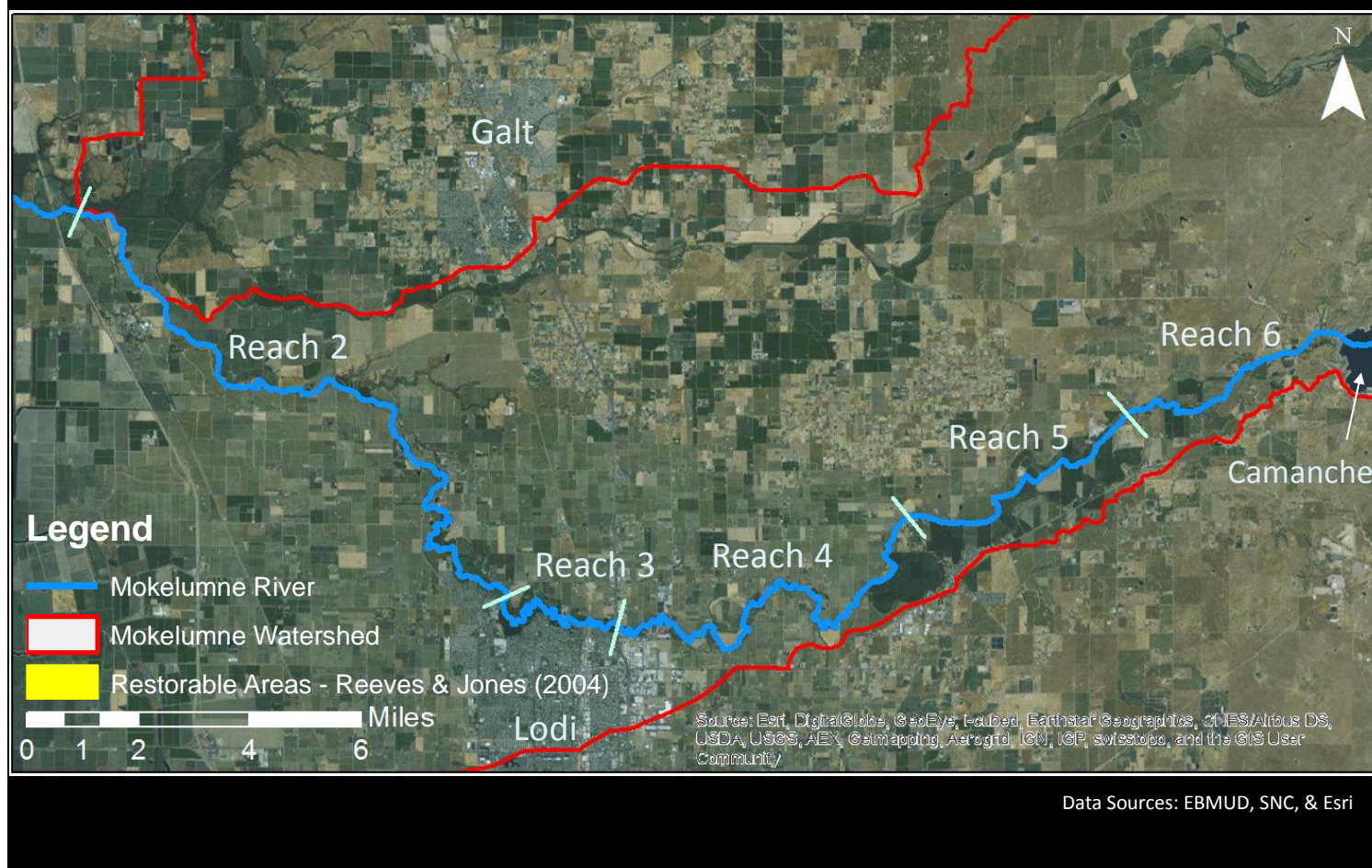
- 
1. How much land along the Mokelumne River could be restored?
 2. What would it cost to restore this land, and what benefits could be gained?
 3. What types of restoration are most cost-effective for the benefits produced, and where?

To help fill this information gap, we set out to answer three questions focused on riparian restoration:

- How much land could be restored along the Lower Mokelumne River? (Restoration in this case means actively converting the dominant vegetation type on a site from a low functioning habitat type, such as non-native annual grassland or invasive shrubs or trees, to a high functioning habitat type, such as native riparian forest/shrub habitat)
- What would it cost to restore that land, and what benefits could be gained?
- What types of restoration are most cost-effective for the benefits they produce, and where? In other words, help identify areas for focused landowner outreach, and provide decision-support information for stakeholders and agencies to make funding decisions.

I'm going to walk through a quick recap of what we did, and the key results, using these visuals.

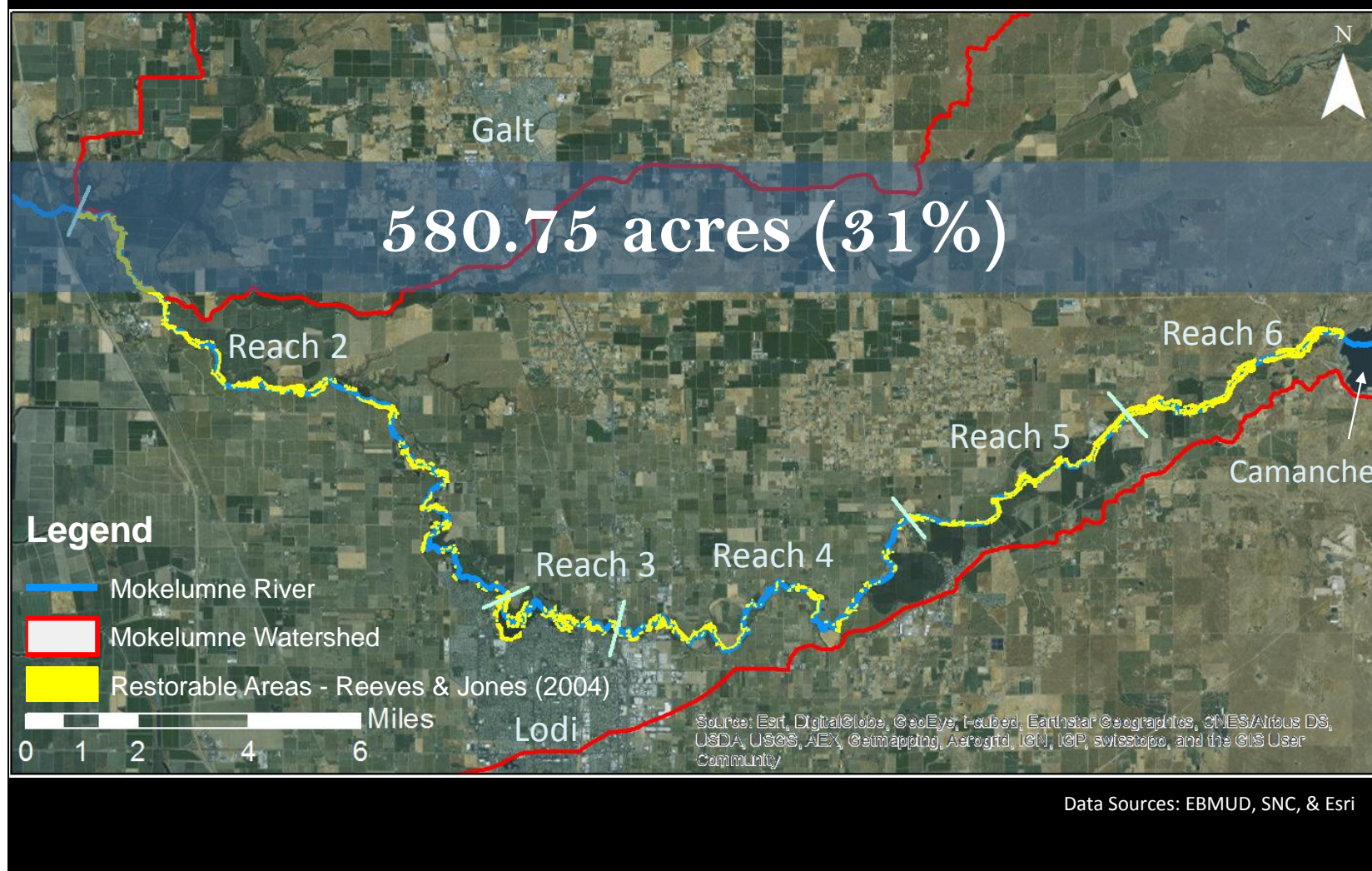
Restorable Area along Mokelumne



To answer the question of area, we used an updated version of the vegetation map produced by Kent Reeves & James Jones in 2004. This vegetation map was the result of one of the goals contained in the restoration element of the Lower Mokelumne River Watershed Plan (2003). Rather than conducting a brand-new vegetation survey ourselves, it made sense to build on this great work, and update it based on the recent restoration projects that have taken place over the past decade.

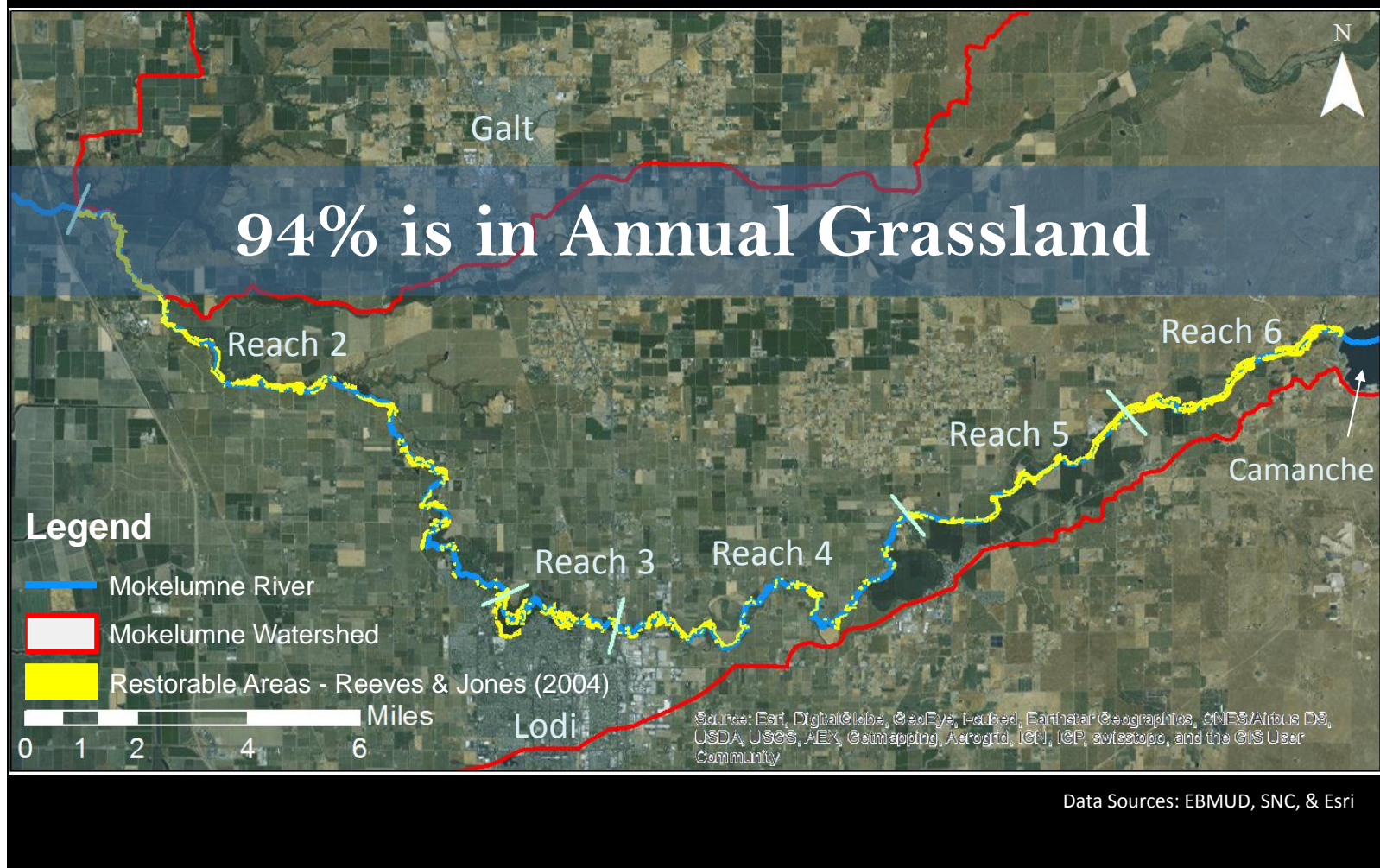
This assessment focuses on the area 100m on either side of the Lower Mokelumne River from the confluence of the Cosumnes River upstream to the Camanche Dam (Reaches 2-6).

Restorable Area along Mokelumne



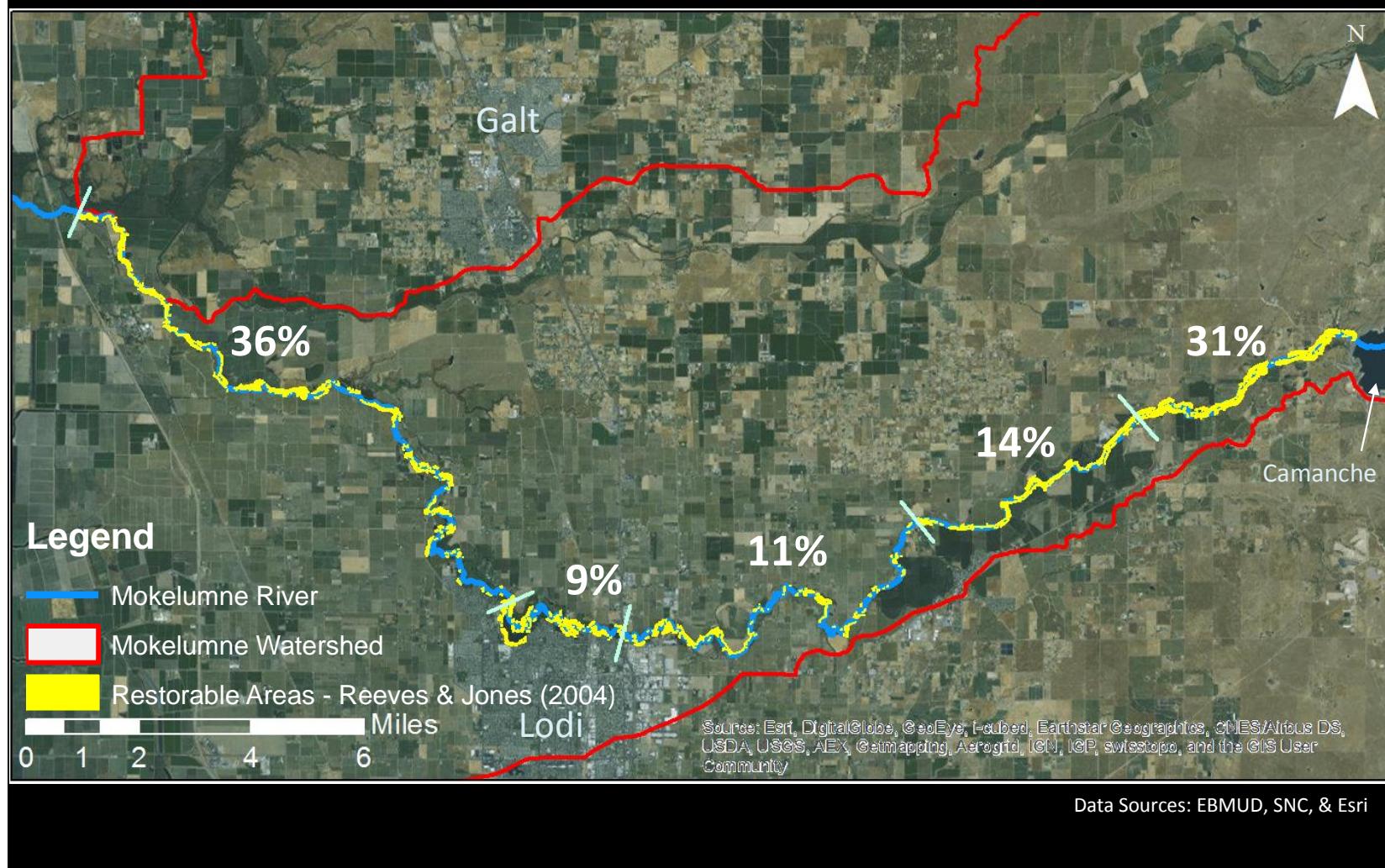
Using this updated vegetation map, we found that 31% (or about 580 ac) of the riparian habitat along the Lower Mokelumne River could be restored to native riparian forest and shrub habitats. We considered all land within 100 meters of the river as riparian habitat, excluding agricultural and urban areas.

Restorable Area along Mokelumne



The majority (94%) of these 580 acres are made up of Annual Grasslands, which are typically composed of primarily non-native and invasive plants (as described by Reeves & Jones, 2004). The remaining 6% of this area is made up of introduced riparian shrubs, introduced riparian forests, introduced perennial grasslands, and riprap.

Annual Grassland distribution by Reach



A large amount of the benefits could be gained by targeting outreach and restoration to specific areas. The Executive Summary identifies the areas that have the most annual grassland, including the distribution by reach (shown here), which could help you target your outreach efforts geographically.

Total Cost



- \$6,601,527 for 580.75 ac.
- \$113,000/10 ac project
- \$330,000/yr over 20 years

After identifying the areas that could be restored, we estimated the amount these projects would cost using the NRCS' 2015 conservation practice cost estimates. Assuming the projects' costs to include planning, permitting and three general actions: vegetation removal, native re-planting and establishment, we estimate that it would cost a total of \$6.6 M to restore these 580 acres.

If this total area is broken into ~10 acre projects, this makes up about 60 projects total, which we estimate would cost about \$113,000 each.

In a hypothetical situation in which 3 projects were implemented each year, it would require about \$330,000/yr over 20 years to complete the work – of course this is entirely dependent on landowner willingness and funding availability.

Total Benefits

Riparian Ecosystem Functions:

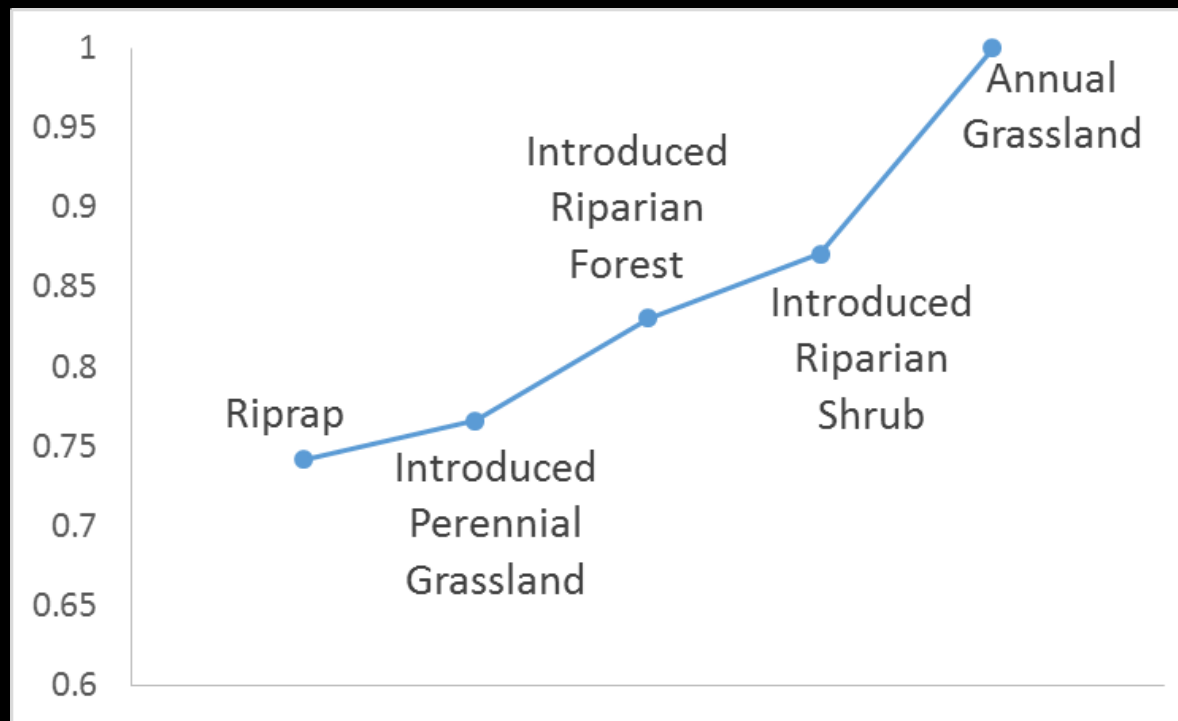
- Bird habitat – x4
- Fish habitat – x2
- Overall – x2

We then used the riparian habitat quantification tools to estimate the environmental benefits of these types of restoration practices, for riparian habitat for wildlife like birds & fish.

We found that by restoring these 580 acres, we saw a 4-fold increase in the function of riparian bird habitat. We saw the function of riparian habitat for fish double, and we saw the overall function of the riparian habitat double.

As mentioned earlier, we only considered restoration actions to improve vegetation, ruling out major changes to the physical structure of the river or floodplain (such as levee setbacks). This explains why we did not see restoration returning these ecosystem functions all the way back to 100%. This is particularly important for the fish habitat and flood attenuation ecosystem functions, which require additional aquatic habitat and floodplain connectivity.

Cost/Benefits *relative to Annual Grassland*



After estimating the costs and benefits of restoring this land to native riparian forest or shrub habitats, we found that the most benefit relative to cost is gained by restoring Annual Grasslands, compared to the other habitats like introduced perennial grassland.

Annual grassland is the cheapest type of vegetation to restore, and also offers the highest benefit.

This assessment is a tool that can help stakeholders target outreach and funding efforts for riparian restoration to achieve the best environmental return on your investment, by targeting a specific vegetation community, Annual Grasslands, and the specific locations in the watershed where the majority of it exists.