5.2.2.4 Reach 4

North of Rutherford Road to the southern boundary of the C Mee property (encompassing Round Pond, E Mee and Emmolo on the west bank and McDonnell, Honig and Carpy Connoly on the east bank).

In this reach the river is very constricted and confined by levees. The channel has a low width to depth ratio (is narrow and deep) compared with other reaches. The most common condition in this reach is classified as Stage 4 with some 'early' Stage 5, indicating that the channel is incised and widening, but has not yet widened sufficiently to form a new floodplain within the old banktop margins. The reach has excess energy during high flows as water cannot escape laterally onto the floodplain and dissipate erosive energy. This excess energy is expended in bank erosion and mass failure, contributing fine sediment to the river.

No-action scenario

Under a no-action scenario the river will continue to erode its banks until it has created a sufficiently wide channel to develop a floodplain and low flow channel. When the channel is sufficiently wide erosion will cease as excess energy will be dissipated on the new floodplain rather than the banks. The no-action scenario will generate sediment at accelerated rates until equilibrium is reached, and will cause the loss of bank and banktop vegetation and canopy cover. Since the riparian zone here is very thin, bank erosion will remove almost all cover, leading to increased water temperatures and potential impairment of aquatic habitat. Natural recovery under this scenario is estimated to take 50 to 100 years.

Hard bank protection

Hard bank protection will reduce the bank erosion rate locally, but will not solve the underling problem of confined flow and excess energy. Reducing the ability of the river to expend excess energy on the banks may lead to increased vertical scour of the bed, creating deep continuous pools and potentially undermining the banks further. It will also potentially pass the problem downstream to unprotected reaches.

Biotechnical protection

Biotechnical protection that successfully prevents bank erosion poses the same risks as outlined for hard protection; though locally more environmentally friendly than hard protection, biotechnical protection in this reach will not solve the underlying problem of excess erosive energy.

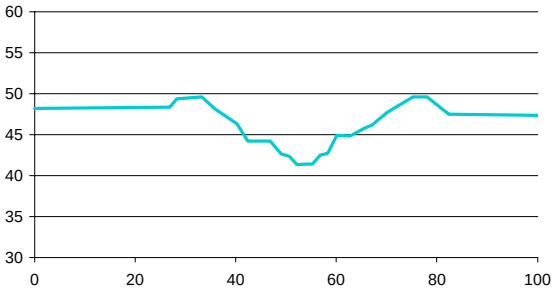
Banktop setbacks

Banktop setbacks and creation of a new floodplain at the bankfull level are the only method of directly solving the underlying problem in this reach. Setbacks will provide the river with sufficient width to create a new floodplain, relieving erosive energy during high flows and so returning erosion (and subsequent downstream sedimentation) rates to natural levels. Setbacks will allow a sustainable river corridor to develop, and will lead to more diverse channel conditions with long continuous pools replaced by riffle-pool sequences. Based on a comparison between average banktop to banktop width in this reach and in reaches elsewhere that have reached equilibrium, we recommend an average setback of 65 feet on one side of the river (generally the west bank in order to preserve mature riparian vegetation on the east bank). The principal constraint on setbacks is economic; a 65-foot setback in reach 4 will take up to 5.2

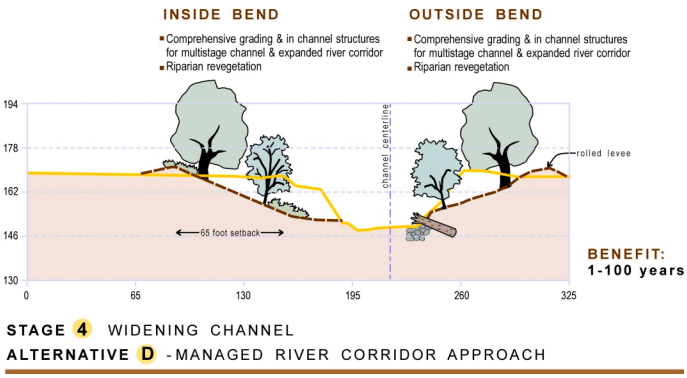
acres of land, depending on whether the levees are pulled back or rolled. Mature banktop vegetation poses less of a constraint, since there is little mature vegetation left. Vegetation that does exist is threatened by loss due to bank collapse under the no action scenario.

The preferred alternative restoration approach

We recommend that for Reach 1 the preferred alternative is a setback of approximately 65 feet on one side (in general the west side to preserve mature riparian vegetation on the east bank) and the creation of a new floodplain at bankfull level, accompanied by bank regrading to a stable angle and revegetation using appropriate native species. Though there will be temporary disruption of the channel banks during construction, the net effect of setbacks will be greatly beneficial. It will greatly increase the underlying geomorphic stability of the Napa River, reducing bank erosion rates and fine sediment problems. It will restore a high degree of natural physical function to the river, leading to more diverse and valuable aquatic habitat and improved conditions for several listed species including Chinook salmon and steelhead. The restored river will require less human intervention and maintenance than the current channel. Flood levels will be lowered in the wider channel, reducing flood risk and improving drainage from the floodplain. The recommended restoration conceptual alternative is 4D and 5D (page 39 and page 40). The total length of channel involved is 3,500 feet. The area for a 65-foot set back over the entire reach would be 227,500 square feet (5.2 acres).



Typical cross section (distances in meters)



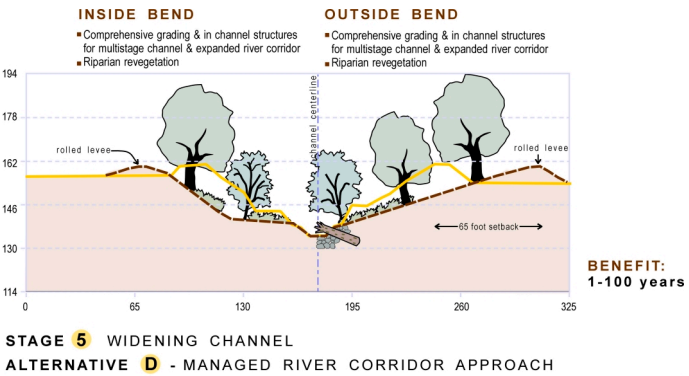


Figure 14. Typical existing conditions and conceptual design for Reach 4

5.2.2.5 Reach 5

Within the Wilsey property (both banks) immediately south of Rutherford Rd.
This reach has recovered equilibrium and only minor revegetation is needed.

5.2.2.6 Reach 6

From the southern boundary of the Peju Provinces (west bank) and Round Pond (east bank) properties to the northern boundary of the Star Vineyards property (west bank) and middle of the Round Pond boundary (east bank).
The reach is 2,140 feet long. This reach is a Stage 5 section that has come close to equilibrium. The channel has widened and excess material has formed a new floodplain, reducing excess erosive energy during floods.

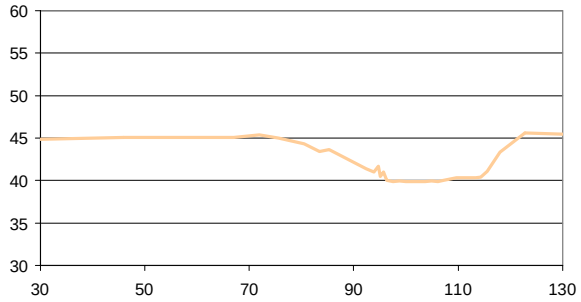
No-action alternative
Under no action this reach will continue to experience some bank erosion as final widening occurs. The eroded material will largely stay in-reach, as new floodplain deposits. Recovery to Stage 6 will take place in an estimated 25 to 50 years.

Local hard bank stabilization
The magnitude of erosion, the type of land being lost, and the volume of sediment generated from the reach does not justify hard bank stabilization. The impact of installing hard protection, and its effect on the channel processes, would exceed any benefit.

Biotechnical stabilization
In some places biotechnical stabilization is recommended as a means of reducing erosion from local 'hotspots' of erosion.

Setbacks
The channel has almost reached equilibrium width in this reach, and the benefit of slightly accelerating recovery does not justify the damage to riparian cover and potential sedimentation problems caused by bank earthworks.

Preferred alternative
This is a suitable reach for a combination of natural recovery and local biotechnical bank stabilization on eroding hotspots, with some assistance in the form of Arundo removal, vegetation planting and management in places. The recommended restoration alternative is 5B (6.5.2 page 40).



Typical cross section (distances in meters)

Figure 15. Typical existing conditions for Reach 6

5.2.2.7 Reach 7

The eastern boundary of the St Supery property (west bank) and Wilsey property (east bank).
This reach is largely recovered and has reached new equilibrium conditions, so that only minor revegetation is needed.

5.2.2.8 Reach 8

From the southern boundary of the Cakebread property to the northern end boundary of the Sawyer property (west bank) and the Laird, Gmelch and southern Wilsey properties (east bank).
This reach is 4,350 feet long. The northern portion of this reach is in Stage 5, with point bars developing into a new floodplain, but bank erosion behind the bars and on opposing outside bends. The southern

portion of the reach is in Stage 4, with little point bar development and extensive bank erosion. In addition to the priority sites identified in Section 5.2.1 this reach has some smaller scale erosion areas.

No action alternative

Under the no action alternative this reach will continue to erode its banks until it widens to the point where excess erosive energy is dispersed on the newly formed floodplain. This will result in loss of land and riparian canopy cover, and will generate excess fine sediment into this reach and downstream. We estimate that natural recovery will take 50 to 100 years.

Local hard bank stabilization

Hard bank stabilization will reduce the rate of bank erosion, and associated problems, but will not solve the underlying problem of confined flow conditions. In the Stage 4 sub reach reducing the ability of the river to expend excess energy on the banks may lead to increased vertical scour of the bed, creating deep continuous pools and potentially undermining the banks further. It will also potentially pass the problem downstream to unprotected reaches.

Banktop setbacks and regrading

Setbacks will provide the river with sufficient width to create a new floodplain, relieving erosive energy during high flows and so returning erosion (and subsequent downstream sedimentation) rates to natural levels. Setbacks will allow a sustainable river corridor to develop, and will lead to more diverse channel conditions with long continuous pools replaced by riffle-pool sequences. However, while banktop setbacks will directly solving the underlying problem in this reach, a program of full levee setbacks here will damage or destroy the existing riparian corridor where it exists. In some portions of Reach 4 the riparian corridor is wider and more ecologically valuable than in Reach 1, providing shade and habitat. It is also less vulnerable to bank erosion, due to the slightly wider channel in this reach. Setbacks will also carry a high economic cost, due to construction and loss of land.

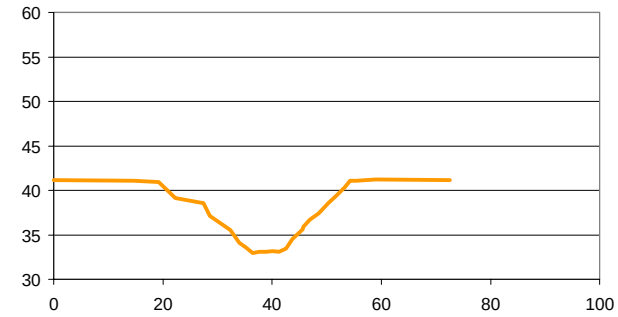
Biotechnical protection

Less bank protection would be needed to stabilize Reach 4 than Reach 1. Biotechnical protection that successfully prevents bank erosion poses the same risks as outlined for hard protection; though locally more environmentally friendly than hard protection, biotechnical protection in this reach will not solve the underlying problem of excess erosive energy. However, in wider portions of the reach local biotechnical protection would have some beneficial effects at absorbing energy and reducing erosion hot spots on outside bends, without deflecting erosive stress onto neighboring banks. In-stream biotechnical structures such as log weirs could also increase channel habitat diversity by creating local patterns of deposition and scour. The advantage of using biotechnical solutions rather than extensive setbacks in this reach is that they preserve the existing riparian corridor, which would be severely impacted or destroyed by extensive setbacks or bank regrading.

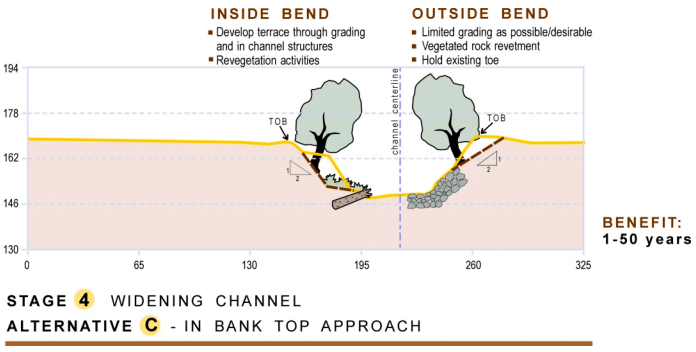
The preferred alternative restoration approach

We recommend a combination of biotechnical stabilization of local areas of high erosion, use of biotechnical structures such as weirs to increase channel diversity, and limited bank setbacks where constraints allow, with the objective of reducing overall erosive forces in the reach and increasing channel

habitat potential. All work should be accompanied by revegetation using appropriate native species. The recommended restoration conceptual alternative is 4C and 5C (page 39 and page 40), and limited 4D and 5D. The proposed alternative would restore more natural function to the river while working within the constraints of preserving the mature riparian canopy.



Typical cross section



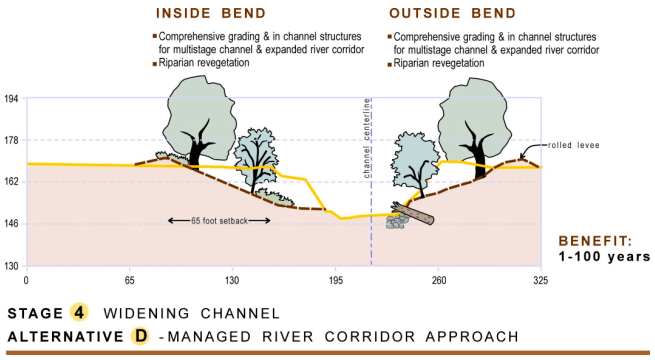


Figure 16. Typical existing conditions and conceptual design for Reach 8