Babocomari River PFC Revisited October 2018

Jeff Simms, Fishery Biologist

Background

A casual field visit by BLM staff and the permittee on the Babocomari Allotment (52080) indicated that the river may now have achieved Proper Functioning Condition (PFC) as the vegetation along the river appeared more than adequate to stabilize the banks. The Babocomari River was originally inventoried for PFC five years ago on October 24, 2013. It was agreed that the "no" answers on the PFC check list should be looked at to see if the riparian system was still at risk of degradation (Functional at Risk or FAR).

On the morning of October 26, David Murray, Eric Baker, and myself met Mike Hayhurst and his grandson Chris. Mr. Hayhurst expressed his disbelief concerning the 2013 finding of FAR for the reach from the gage to the confluence with the San Pedro River. He was adamant that he only grazes the river pasture from November through February. When I mentioned that we observed livestock in the river in October 2013, he was in disbelief. I mentioned that we had pictures from that PFC visit and there were numerous cows observed and trails warn into the floodplain. He explained that after the monsoon flooding he does not repair the fences until he is ready to use the river pasture in November. He thought that in 2013 it was possible that livestock from the San Pedro River may have moved upstream into the Babocomari River. Evidently, the warm season grazing of trespass livestock led to the condition of the riparian area observed that year. I explained that the "drift" of livestock from upstream or downstream needs to be prevented in order to keep the river in good condition. We offered to review the PFC rating sheet from 2013 with him, and we discussed the reasons it was given a FAR rating. He was unable to walk the river with us as we looked at the factors that were not satisfactory in 2013, but he had another obligation and sent his grandson Chris with us.

PFC Determination Revisited and Results

PFC was not designed to be a monitoring tool. It is intended to determine (qualitatively) the overall physical function of a stream segment and both its physical and biologic attributes in relation to its potential given its current capability resulting from impairment from outside influences (e.g., upstream dam). The checklist is comprised of 17 elements. Those that are determined to be out of balance with normal stream function or are missing get a "no" answer. If enough checklist items are given a no or a key indicator of stream function like vertical stability is given a no answer, the reach may be found to be FAR. The trend is then estimated from indicators (e.g., fresh erosion or healing of erosion) to determine whether or not healing or further channel degradation is occurring. A PFC survey is a point-in-time inventory and monitoring of factors that lead to a FAR rating should be monitored and land use (e.g. grazing regime) should be adjusted to ensure the recovery of key stream characteristics that lead to improvement of processes that support a health functioning stream.

In 2013, the determination was FAR with "No" answers to items 3, 4, 5, 11, 13, 16, and 17. The apparent vertical instability of the channel and floodplain (secondary cutoff channels following cow trails) were strong indicators that the stream segment was FAR. In addition, riparian tree saplings showed signs of repeated browsing and banks showed that their stability was compromised by hoof sheering, bank trampling, and grazing of bank vegetation.

We walked 1.8 miles of the lower reach where grazing activity had contributed significantly to the FAR rating. We began at the stream gage and finished at the pasture boundary line which took approximately 4 hours. Table 1 shows the comments for six items on the checklist that were not satisfactory in 2013 and what was observed during the current evaluation.

Table 1. List of "No" answers to PFC standard checklist for 2013 and re-evaluation in 2018.

3) 2013 – (No) Sinuosity is poor, most of channel is straight, but some due to confinement in rocky areas. 2018 Check – (Yes) Measured sinuosity is 1.4 and channel somewhat confined by narrow valley type. Point bars forming where vegetation establishes on sand/gravel bars. Width/depth ratio good for first half mile then sediment fills the channel nearly to bankfull skews the w/d ratio dramatically. This may be temporary, as recent flood (350 cfs) may have moved excessive amounts of sediment into the channel that will be cleared by subsequent flooding.
4) 2013 – (No) much bare ground and lots of Johnson Grass. 2018 – (Yes) Riparian trees and herbage across floodplains and banks narrowing as vegetation encroaching on active channel. Ash, cottonwood, willow, deer grass abundant. Bermuda grass stabilizing floodplains and covering old cow trails. Bare soil and Johnson grass occasionally observed on banks and floodplain. Deer grass moving into bare areas.
5) 2013 – (No) - Tongues of sediment in active channel. Occasionally see sediment piled on floodplain. 2018 – (No) Large amounts of sediment coming off watershed. It is being processed for about 0.54 miles and then clogs the channel and heavy deposits on floodplain in some places.
11) 2013 – (No) Cattle trailing appears to have caused cut-off channels, Johnson grass very prevalent in many areas where trees and deer grass are expected to be. Trampling further loosened soil for erosion where cover was poor. Desiccation of banks due to ground water extraction will lessen the ability of vegetation to cover the banks and floodplain over time. It is likely having an effect already.

2018 – (Yes) Banks are well armored with ash, cottonwood, willow, and deer grass. Floodplains vegetated with Bermuda grass and other plants that are catching sediment. Water supply appears adequate to support plants. Woody debris observed on banks and floodplains.
13) 2013 – (No) Channel downcutting in some places (active headcuts). Cut-off channels forming along cattle trails. Tributaries downcutting to match lower channel elevation of Babocomari. Some head cuts 1.5 feet deep. 2018 – (Yes) Trees, deer grass, and woody debris more than adequate to dissipate energy of flood flows. Recent flood 2 days prior was 350 cfs. Channel downcutting is not moving at fast pace, but acting more like a gradual channel adjustment. Cobbles stabilized by tree roots and deer grass have created a step-down drop from previous near vertical headcutting. Gradual channel widening may occur but not evident yet as deer grass is holding bank in place, unaltered. Larger tributaries appear vertically stable.
16) 2013 – (No) Headcutting apparent as tributaries are "hanging" about 6 inches above channel. 2018 – (Yes, but) Floodplains generally flat and intact except for one deeply incised (1.5 ft) channel measuring 135ft on a single portion of floodplain. Looks to be the same incision observed in 2013. Likely the result of heavy trailing in the past. One channel adjustment of approximately 3 ft is apparent, but it is sloped and armored by large cobble anchored with tree roots and deer grass. It will likely progress slowly allowing the downstream channel to adjust (widen) to accommodate the vertical change. Geologic control (bedrock located about 150 ft upstream). Considering the sediment load and vegetation density, the channel is expected to aggrade in the future.
17) 2013 – (No) Headcuts and some limited excess sediment observed. 2018 – (No) lower portion of the reach has excess sediment from tributary discharge during storm events. In some places the sediment is processed and stored on the floodplain. In other cases the channel is completely clogged with excess sediment left in piles behind obstructions on floodplain. The level of channel sedimentation appeared to be higher than in 2013.

Photographs illustrating the relative health of various indicators are provided at the end of this document. These images were selected to demonstrate yes or no answered to the checklist in 2013 and 2018.

Conclusions

Careful observations were made of channel and flood plain conditions. Vegetation health and vigor were of primary concern since the stream is a Rosgen C comprised of easily eroded alluvium (sand, gravel, and cobble). These channels have a high sensitivity to erosion from improper grazing, but also have a good potential for recovery once grazing management is improved to benefit streamside vegetation (Rosgen 1996).

No current year grazing or browsing was observed on herbaceous vegetation or riparian sapling trees. Deer grass was utilized fairly heavily in places in 2013 but appeared untouched in 2018. The deer grass was the most conspicuous plant on banks and was observed in high densities where banks were open to the sun. Velvet ash was the most common tree species and was healthy, providing ample bank cover. Goodding willow, coyote willow, and Fremont's cottonwood were also observed but were less numerous. Various age classes of all four species were observed indicating that tree regeneration was occurring at levels that would allow for the replacement of older trees.

Past browsing of sapling cottonwood, willow, and ash trees was evident on nearly all saplings when observe at short distance. Repeated browsing tends to stunt the growth of trees which allows them to be browsed for several years before they reach a height where they out of the reach of livestock and deer. Both cows and deer likely contributed to the generally poor condition of saplings. Nonetheless, most saplings are likely to become young trees given rest from browsing. Ash tree seedlings and saplings were especially abundant and colonizing newly forming point bars and banks. Cottonwood and willow seedlings and saplings were much less common. The short segment in the vicinity of the stream gage which is comprised of bedrock and boulders did have some dead trees. These trees likely did not have access to ground water once surface water ceases in late spring. Otherwise, surface and ground water appeared to be adequate to support a robust riparian area.

Some channel adjustments were noted in both 2013 and 2018. If a channel shows a lack of vertical stability, then it is likely at risk of rapid degradation. Due to the apparent lack of stabilizing vegetation, bank trampling, and well-worn cattle trails with signs of incision on flood plains were the main reasons the reach was given a FAR rating in 2013. In addition, banks were trampled and vegetation could not extend into the channel to form bank extensions and point bars due to trampling. Incision was observed in 2018, but banks were now well vegetated, the vertical gradient adjustments were sloped as opposed to nearly vertical and comprised of cobble substrate held in place by deer grass and/or tree roots. One channel adjustment observed during the recent evaluation was three feet deep and appeared to be moving slowly headward. The recent flooding (350 cfs) just the days before did not appear to have moved headward but some bank vegetation had scoured out in close proximity to the adjacent cobble stepdown indicating the durability of the channel. Cow trails that were incising into the floodplains in 2013 were now covered with vegetation sediment that made them disappear into the flat floodplain surface. The exception was one floodplain with a deep incision nearly two feet deep and a length of 135 feet.

There was no sign that it was healing although tree roots appear to be reducing its erosion rate. This secondary channel across the floodplain may remain for some time to come.

Sediment supply was an issue in 2013. The watershed has a lot of exposed soil which is fairly erosive and increasing rural development in upstream portion of the watershed. Five years ago the sediment supply indicated that the watershed was producing excess sediment and that the river was having some trouble processing it. Sediment bars were observed in the channel and piles of sediment were observed on the floodplain in some cases. This year we observed a heavy sediment load that began with a large tributary coming in from the south about 0.68 miles downstream of the gage. The sediment filled the channel to nearly bank full and some floodplains had piles of sediment. The 2018 survey of conditions indicated that the sediment supply was larger than in 2013. Therefore, it was concluded that the river was not in balance with the sediment supply (#17) and the watershed was contributing to degradation (#5).

The conditions of the reach appeared to have improved to the point where the channel has a modest risk of destabilizing given the health and density of the vegetation and relative stability of the vertical adjustments. The use of winter grazing (November through February) appears to prevent excessive trailing, bank trampling, and grazing. The browsing of sapling trees is problematic but is still allowing for regeneration of riparian trees. Where trees are sparse, deer grass grows in dense thickets on banks. Point bars and other depositional features appear to be readily colonized by deer grass, ash, and rushes whereby increasing local sinuosity and narrowing channel width. An oversupply of sediment appears to be main factor limiting the river's potential. Groundwater will play an increasing role in the health of the riparian area as it continues to decline.

Photo Catalog from PFC conducted in October 2013

Figure 1. Cow trail on floodplain becoming incised. Herbaceous cover heavily grazed.

Figure 2, 3 and 4. Sapling trees showing characteristics of being repeatedly browsed.

Figure 5. Cow foraging in riparian area.

Figure 6. Grazed herbaceous bank cover and bank sheering.

Figure 7. Multiple channels resulting from degradation of cow trails.

Figure 8 and 9. Examples of well-worn trail and grazed herbaceous cover. Trails are vulnerable to incision with flooding.

Figure 10. Trampled bank and floodplain on sandy soil. Regular trampling prevents establishment of vegetation and promotes accelerated erosion.

Figure 11. Trampled bank and floodplain on sandy soil. Regular trampling prevents establishment of vegetation and promotes accelerated erosion. Johnson grass abundant on this site.

Figure 12. Flood plain on right has incised cow trail. Note that flow of creek on left.

Figure 13. Point bar forming. Trampling has prevented vegetation recruitment.

Figure 14. Trampled bank and floodplain on sandy soil. Regular trampling prevents establishment of vegetation and promotes accelerated erosion. Healthy sapling cottonwood and willows in background away from waters edge.

Figure 15. Heavily trampled floodplain on sandy soil. Regular trampling prevents establishment of vegetation and promotes accelerated erosion.

Figure 16. Channel incised and bank damage. Note exposed roots and trampling on floodplain.

Photo Catalog from the Filed Survey to Revisit Stream Function in October 2018

Figure 1. Bedrock and boulder channel just below USGS Stream gage. Some dead willows occurred in area likely due to a lack of sufficient soil moisture during late spring. This was uncommon elsewhere in the reach.

Figure 2. Vegetation pushed over by recent flooding. Goodding Willow in foreground. Coyote Willow in background. Flow 2 days earlier peaked at 350 cfs.

Figure 3. Dead willows in boulder field likely died from drought during late spring as there may be little alluvium to hold ground water to allow for survival through the dry season.

Figure 4, 5, 6, and 7. Examples of browsed cottonwood and willow saplings in the reach. Note crooked stems and changes in stem thickness at crooks.

Figure 8. Examples of unbrowsed cotton wood sapling. Note “arrow straight” stem.

Figure 9. Stable bank in confined portion of river reach. Note large cottonwood root extends along bank above deer grass. Bank stability is excellent at this location.

Figure 10. Stable Floodplain with vegetation. Well-worn and incised cow trails from 2013 no longer observed on floodplains. The collection of sediment on vegetated surfaces covered any sign of incision from 2013.

Figure 11 and 12. Heavy sediment supply following flood earlier in the week evident in first photo. Point bar in the distance being colonized by deer grass. Second photo shows sediment capture by deer grass.

Figure 13. Grasses on flood plain laid down by flood protect floodplain surface from erosion.

Figure 14. Floodplain widening slowly through erosion of adjacent slope.

Figure 15. Sediment bars being colonized by deer grass and trees. This process results in narrow and deepening of channel (decreased width/depth ratio).

Figure 16. Floodplain inundated with excess sediment from discharge from upstream tributary that occurred earlier in the week.