Project F1: Vegetation Control and Sediment Removal for Capacity Supplemental information to the Management Response to IMC Recommendations

The capacity of a creek for which a flood protection project has been completed is verified through a combination of field condition assessments and hydraulic modeling analysis. Creeks are regularly inspected for changing conditions, such as sedimentation, increased vegetation, or roughness. The amount and type of maintenance performed is based on the inspections, past effective maintenance practices, and the results of hydraulic modeling. Channel flow conditions are simulated using a hydraulic model to evaluate conveyance capacity relative to a level of service (LOS) flow rate under reference conditions and a variety of sediment and vegetation maintenance scenarios. Staff have been preparing stream maintenance guidelines to better inform the inspection and maintenance process.

While these are being developed, most maintenance guidelines have charts for the reaches of the creeks to help staff determine if sediment removal or vegetation management is needed. These charts are based on a hydraulic model that has been vetted based on a combination of engineering judgment and model calibration. They provide guidance and help show when maintenance may be needed to bring the channel back to capacity.

To better illustrate how maintenance guidelines are used in practice, staff has selected a specific reach of creek and corresponding elements from that creek's maintenance guidelines.

Figure 1 is an example chart or nomograph for a reach of Calabazas Creek downstream of Highway 101 in Santa Clara. This nomograph captures a particular cross-section of Calabazas Creek, intended to be representative of that reach of creek. The x-axis represents water surface elevation. The y-axis represents Manning's n (roughness coefficient). Each of the blue lines represents sediment accumulation scenarios with the left-most line ("Lower bound XS area") representing the cross-section with no additional sediment accumulation. Each of the subsequent blue lines represents different sediment accumulation scenarios (i.e., reduction in channel cross-sectional area relative to the lower bound condition). While this is an example of one creek reach, nomographs are being developed for multiple reaches of multiple creeks for which a flood protection project has been completed. The development of such nomographs is based on manifold runs of hydraulic models.

Figure 1: Example Stream Maintenance Guideline Nomograph for Calabazas Creek, Reach 1c

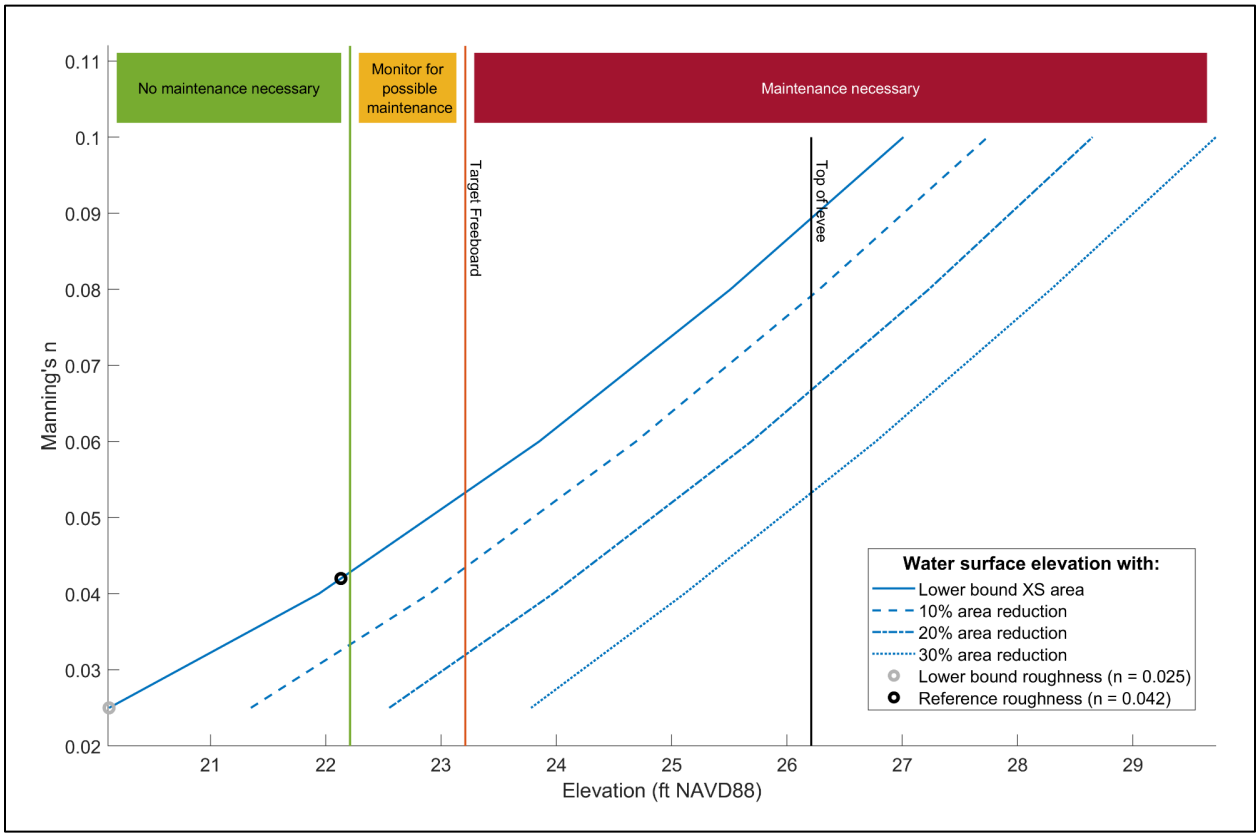


Figure 2 is a more simplified version of the nomograph, providing summary thresholds for maintenance of this reach of Calabazas Creek. Vegetation density and sediment accumulation remain key factors under consideration. Green squares represent conditions under which the target freeboard is met for the LOS flow. Yellow squares represent vegetation/sediment conditions under which the target freeboard is met for the LOS flow, but monitoring is recommended. Red squares represent conditions under which the target freeboard is not met for the LOS flow and maintenance may be required.

Figure 2: Example Stream Maintenance Guideline Summary Thresholds for Maintenance for Calabazas Creek, Reach 1c

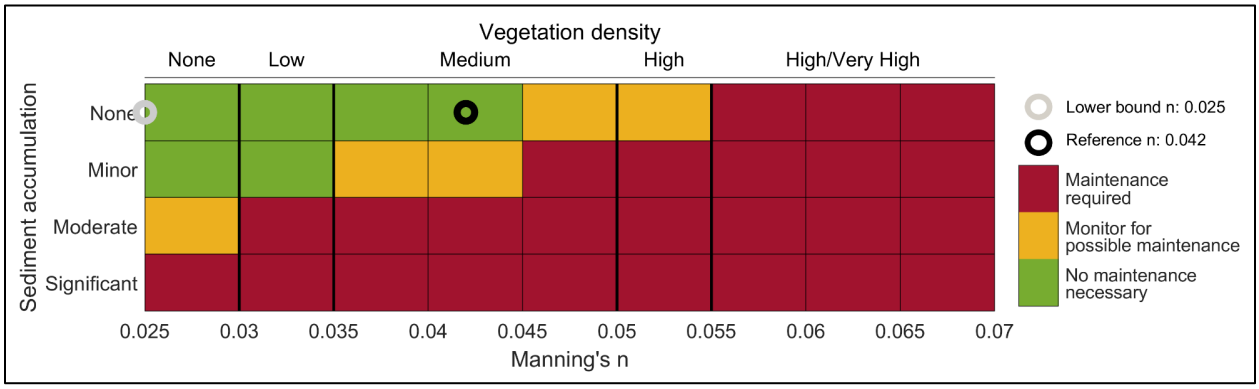


Figure 3 is a 2015 photo of the representative cross-section of this reach of Calabazas Creek. Based on staff observations and referencing a roughness/vegetation photo atlas developed for use on county streams, a composite roughness of 0.042 was ascribed for this site.

<u>Figure 3:</u> Example Stream Maintenance Guideline Representative Cross-Section Photo (2015) for Calabazas Creek, Reach 1c

Calabazas Creek Reach 1c	Composite Roughness: 0.042
Date: Spring, 2015	
Estimated vegetation composition (dotted cross-section): Grasses = 30% Herbaceous = 30% Woody = 20% Bare ground & water = 20%	

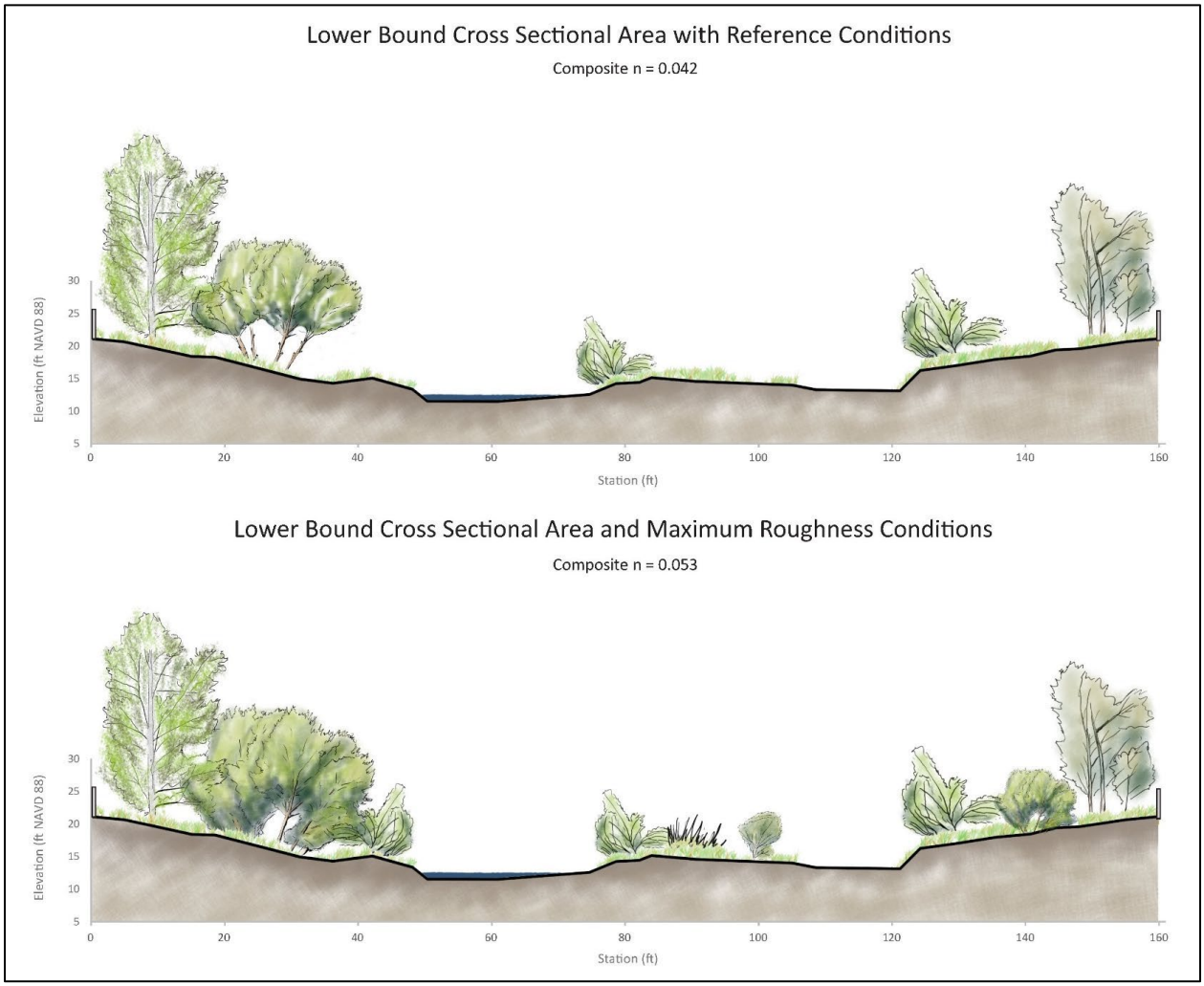
Figure 4 is an August 2022 photo from the same reach. As compared to the photo in Figure 3, the Figure 4 photo indicates much more vegetation has grown in this reach, and while it may not be readily apparent, sediment accumulation has occurred as well. Based on staff's observations, a composite hydraulic roughness of 0.05 to 0.055 was estimated.

Figure 4: Example Stream Maintenance Guideline Photo (2022) for Calabazas Creek, Reach 1c

Figure 5 illustrates the representative roughness cross-section for this reach. To provide a visual comparison of conditions, this figure includes two depictions of the representative section:

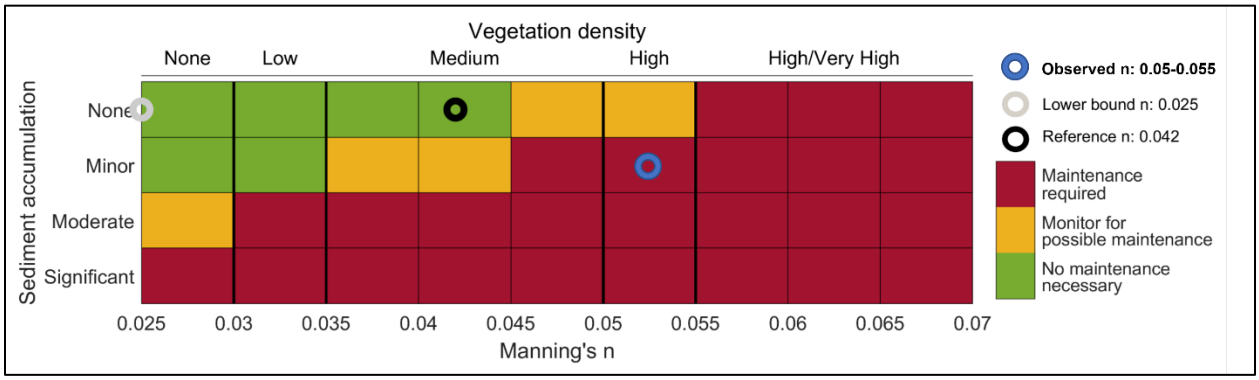
- The upper cross-section portrays roughness characteristics under observed conditions in 2015.
- The lower cross-section portrays the maximum roughness evaluated as part of the analysis. This lower cross-section more closely resembles what was observed in 2022.

<u>Figure 5:</u> Example Stream Maintenance Guideline, Representative Roughness Cross-Section for Calabazas Creek, Reach 1c



Taking the above information into account, with an estimated composite roughness of 0.05 to 0.055 and observed minor sediment accumulation, as depicted by the blue circle in Figure 6, it can be concluded that maintenance is recommended in this reach of Calabazas Creek.

<u>Figure 6:</u> Example Stream Maintenance Guideline Summary Thresholds for Maintenance for Calabazas Creek, Reach 1c with Applied 2022 Observations



While this example was specific to a particular reach of Calabazas Creek, this is the approach staff attempts to employ for all creeks for which flood protection projects have been completed to determine when sediment removal and/or vegetation management is needed to restore flow conveyance capacity.

It is also noted that there are locations for which staff understands sediment accumulation can be an issue requiring action, based on past inspections, hydraulic modeling, and analysis. These include some of the tidal reaches of creeks closer to the Bay and other locations where the channel slope flattens out, the channel is wider, or there may be undersized culverts, all of which tend to contribute to sediment dropping out in channels. For some of these sites, staff has estimated frequencies for how often sediment is expected to be removed from these locations. This can vary from year to year, depending on weather conditions and other factors. Based on routine inspections, staff can identify if sedimentation is an issue, and if it is, it will typically be addressed in the following season, if budget, resources, and regulatory approvals allow for it. If it is not an issue, no action is taken, and staff will continue to monitor the site.

In summary, for completed flood protection projects, staff conducts routine field inspections, performs hydraulic modeling analysis, and are preparing stream maintenance guidelines to maintain the flow capacity of creeks.