

# **Integrated Vegetation Management in Flood Control and Urban Creek Settings**

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## **Introduction**

Maintenance of urban creeks and flood control channels is a valuable and challenging activity. Proper maintenance of these facilities protects people, property, wildlife, and the environment. The challenge for agencies tasked with maintaining these resources is to successfully protect these assets while at the same time adhering to regulatory and permit conditions. Resource limitations (labor, equipment, contractors, funding) and public concerns are additional factors that managers must consider in their decision making process.

## **Discussion**

There are significant differences between water conveyance facilities, and urban creeks and streams. The water level of conveyance systems can often be modified, and in some cases even de-watered as part of an integrated vegetation management plan. This method is not available when maintaining creeks and flood control facilities. Obtaining the necessary permits to de-water a creek or flood control facility is too time consuming and expensive to use for vegetation management.

While there is overlap, the spectrum of problematic weeds is usually different in each of these areas. Weed control in urban creeks and streams usually targets emerged, marginal, and riparian vegetation. Managers of water conveyance facilities focus most of their weed management on submerged and true aquatic vegetation.

Water conveyance facility slopes are often armored with concrete or rock to minimize erosion and water loss, and are seldom vegetated. Urban creek and stream slopes are usually vegetated, and only armored where necessary. The habitat and wildlife value of creek and flood control facilities is usually quite high compared to many (but certainly not all) water conveyance facilities.

The primary reason for active maintenance of urban creeks and streams is flood protection. In California, most counties make flood-related disaster declarations at least once a decade. Private property and infrastructure are often located adjacent to these resources, incurring heavy losses during even short duration flood conditions. Flood related losses in excess of \$1 billion occur at least once a decade in California (California OES).

High flow events can damage flood control channels and slopes as well. High speed flow, often combined with debris, can erode and undercut slopes. Slope repairs and re-establishing low-flow channels to their original design is expensive and requires a lengthy permit process.

There seems to be no correlation between flood events and either El Nino or La Nina conditions (California OES). Since there is no way to know when heavy rain events will occur, maintenance of creeks and flood control facilities must be done to preserve maximum flood protection each year. Most flood events are associated with short duration, high intensity storms, and not necessarily with an above-average rain season.

Fuel load, or fire risk, is another concern for managers of these facilities. Homes and buildings are often located adjacent to urban creek and flood control facilities. Therefore, managers must reduce probability that a fire will escape from their facility. Local fire districts usually have fairly strict fuel abatement guidelines. These guidelines don't always take plant biology into account.

Re-vegetation projects in these facilities, while beneficial to the environment, make maintenance more expensive and time consuming. Maintenance crews need good training and close supervision to prevent damage to desirable vegetation. Maintenance activities need to be altered and adjusted as this vegetation matures.

In addition to maintaining flood capacity, 24 hour/365 day access for crew and equipment should be preserved to allow for quick response to storm-related problems. A clear line of sight of slopes and flow should be preserved as much as possible, allowing inspectors to quickly identify damage and blockages.

Another challenge faced by managers is associated with property rights. Many creeks have private maintenance in some sections, and public maintenance in others. Two or more agencies may have maintenance responsibilities in the same creek or watershed. This is especially challenging when conducting invasive weed control. Privately maintained creeks can be a source of excess organic debris, increasing the risk of blockages.

Most flood control facilities have O&M manuals (operation and maintenance). These give guidance for how much vegetation and silt can be allowed without compromising flood protection. This type of guidance is very helpful in urban creek maintenance. Visual aids and written plans can be used by maintenance crews and the general public.

Invasive weed exclusion and eradication is difficult near water. Once established, they can spread easily throughout the creek or facility. Permits are often required by the Regional Water Resources Control Board, and a limited number of compounds have aquatic registration in California. Introduction of these weeds can be from upstream sources or adjacent property owners. It is helpful to know where these sources are located when trying to limit their spread.

Public perception of pesticides, including herbicides, is decidedly negative. Fears regarding impacts on health are common. Choosing materials with low human and environmental toxicity, and making that information public, can reduce concerns. Political and regulatory opposition to the use of herbicides is difficult to answer effectively. Having written information available on training, licensing, safety precautions can be helpful. Creating an integrated vegetation management plan specific to each area you maintain can help to educate these groups as to the complexity of managing these resources.

Documenting maintenance costs, by method, can be helpful in the education process. It is important to capture all costs when making these calculations. Labor, benefits, equipment, contractors, supervision, inspection, contract administration and administrative overhead are all components of the total cost of maintenance.

Deferred maintenance should be documented and communicated to the managers who have the authority to allow or prohibit specific vegetation management techniques. The underlying reasons for deferred maintenance should be documented as well. Don't assume that elected officials or district managers know and understand all of the reasons for deferred maintenance.

Grazing, manual mowing or removal, machine mowing, and the use of herbicides are all common tools used in urban creek and flood control channel maintenance. Disking is usually not appropriate due to sedimentation concerns. Much is only appropriate when used near or at the top of bank. Fabric barriers can be useful when placed around desirable plants, but is difficult to install correctly and often washed away during high flow events. The use of competitive plantings can be effective in certain circumstances but requires high amounts of labor to maintain during establishment.

A NPDES permit may be required for the use of herbicides in urban creeks and flood control facilities. And depending on how close and what type of application method is used, aquatically approve herbicides may be required as well. Permits may be required by other regulating agencies as well. This can complicated the use of herbicides and increase overhead costs.

The use of low impact application methods (cut-stump, basal bark, low-volume foliar, and directed/spot applications) are often preferable to broadcast applications when treating invasive plants. These methods limit damage to surrounding vegetation. Selective herbicides are also helpful when trying to control specific or closely related weeds species.

Plant species requiring control share some or all of the following characteristics:

- Spread rapidly via fruit or vegetative reproduction
- Grow rapidly in riparian habitats
- Produce large amounts of biomass
- Growth habit impedes the flow of water
- Crowd out native species and/or form a monoculture
- Produce a high fuel load or present a high fire hazard
- Spread easily from urban and suburban landscape

## Conclusion

- ❖ Thorough record-keeping is essential

- ❖ Know the plants in each facility which require control
- ❖ Outline your decision-making process to inform management and public
- ❖ Document the risks of not managing vegetation
- ❖ Tailor management and treatments to fit each resource
- ❖ Review and alter management techniques as needed
- ❖ Keep records of resource limitations and deferred maintenance